

DEPARTMENT OF PUBLIC WORKS

DIVISION OF CIVIL ENGINEERING

INVITATION TO BID

EAST PATROL OPERATIONS DIVISION NORTH RENOVATIONS RE-BID (10% MBE PARTICIPATION GOAL)

Electronic bids will be received by the Director, Department of Public Works, City of Dayton, Ohio until 12:00 o'clock NOON, Dayton time, **February 12, 2026** for the following improvement in accord with the bidding documents available for download at www.questcdn.com using the QuestCDN eBidDoc Number for this project #10012997. Bids will **ONLY** be received and accepted via the online electronic bid service through www.QuestCDN.com. Bid results will be published and can be viewed on the QuestCDN project page using the project number listed above, shortly after the bids are received. Bid results will also be available on the City of Dayton website at www.daytonohio.gov/bids.aspx.

There will be a voluntary site visit will be held at 10:00 o'clock am, Dayton time, on Tuesday, January 27, 2026, starting in the lobby of East Patrol Operations Division North ("EPODN") facility, located at 417 E Helena Street, Dayton OH 45404.

If the base bid plus all alternates accepted by the City for this Project exceeds \$2,000,000.00, the successful contractor, and all of its subcontractors, will be required to enter into a Project Labor Agreement pursuant to the terms of Dayton R.C.G.O. Section 35.241.

Minority Business Enterprise (MBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at <https://citybots.com/Home/Links> (click the "PEP Certification List" link under City of Dayton Links). This Project is being bid with a **10% MBE Participation** goal. A company must be certified as MBE for the MBE goal at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the **"PEP-Certified MBE Participation Form (for the MBE goal) and PEP-Certified SBE Participation Form (for the SBE goal)"** provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the MBE goal must be submitted on the enclosed **"PEP Participation Commitment and/or Waiver Request Form."**

CHANGES TO THE BID EVALUATION PROCESS

Each Bidder must submit an executed **"PEP Participation Commitment and/or Waiver Request Form"** to summarize the Bidder's overall PEP participation plan and/or to request a full or partial waiver of a PEP participation goal. For each PEP firm whose participation is being counted toward a goal, a Bidder must also submit one (1) executed **"PEP-Certified SBE/MBE/WBE/DLSB Participation Form"** describing the PEP firm's participation on the Base Bid and on Alternates. Participation will be evaluated based on the Base Bid plus Alternates as selected by the awarding department.

If unable to meet the project's PEP participation goal(s), a Bidder must submit a waiver request with its Bid. A Bidder must maintain supporting documentation of its Good Faith Efforts to meet the participation goal(s). If requesting a waiver, documentation of Good Faith Efforts must be submitted to the HRC within two (2) business days of the Bid Opening date. Bidders will receive no further reminders about this deadline.

A waiver will be granted based on a Bidder's Good Faith Efforts, and only when the HRC determines that a Bidder has completed all of the following activities:

1. Solicited the interest of all PEP-Certified Firms having the capability to perform the work of the contract. The Bidder must solicit this interest at least ten (10) business days before the Bid Opening Date in order to allow the PEP-Certified Firm sufficient time to respond to the solicitation. Electronic communication will not be deemed as sufficient Good Faith Efforts, if it is the sole method of communication used.
2. Divided contract work items into economically feasible units to facilitate PEP participation, even when the Bidder/Proposer might otherwise prefer to perform these work items with its own forces.
3. Negotiated in good faith with PEP-Certified Firms and considered the firms' prices and capabilities as well as the contract goals. Rejected PEP-Certified Firms as being unqualified only for reasons based on a diligent investigation of their capabilities. The Bidder's standing within its industry; membership in specific groups, organizations, or associations; and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes to reject or not solicit bids from particular PEP-Certified Firms.
4. Provided interested PEP-Certified Firms with plans and specifications at no cost, or directed them to the Greater Dayton Minority Business Assistance Center (Dayton MBAC) for information about the project's plans, specifications, and requirements at least ten (10) business days prior to the Bid Opening Date in order to assist them in responding to a solicitation.
5. Sought the Dayton MBAC's assistance or used the services of community organizations; contractors' groups; local, state or federal business assistance offices; or similar organizations to find PEP-Certified Firms. Contacting the HRC for a list of certified companies will not be deemed as sufficient Good Faith Efforts.

NOTE: In determining whether a Bidder has made Good Faith Efforts, the HRC may take into account the performance of other Bidders in meeting the goal(s). For example, when the apparent low bidder fails to meet a participation goal but others meet it, the HRC may reasonably raise the question of whether, with additional reasonable efforts, the apparent low bidder could have met the goal.

If you have questions regarding PEP participation or the waiver request process, please contact the Human Relations Council at (937) 333-1430.

Description of Improvement

This project consists of interior renovation services to the entire East Patrol Operations Division North ("EPODN") facility, located at 417 E Helena Street. Renovation work shall include, but not limited to interior demolition, HVAC, plumbing, electrical, data, life safety, access control, and finishes. See contract documents for complete scope of work.

Location

**EAST PATROL OPERATIONS DIVISION
NORTH RENOVATIONS RE-BID
(10% MBE PARTICIPATION GOAL)**

Completion Date

April 30, 2027

**CHARGE FOR PLANS & SPECIFICATIONS: \$70.00
(NON-REFUNDABLE)**

LEGAL NOTICE NO. 5

Electronic bids will be received by the Director of Public Works of the City of Dayton, State of Ohio, until 12:00 Noon, **February 12, 2026** for the following improvement:

EAST PATROL OPERATIONS DIVISION NORTH RENOVATIONS RE-BID **(10% MBE PARTICIPATION GOAL)**

Information and instructions to bidders may be obtained at the City Engineer's Office Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted. Bidding documents for this project may be examined online or downloaded at: www.questcdn.com. The QuestCDN eBidDoc Number for this project is **#10012997**. There is a non-refundable fee of \$70 for each set of bidding documents.

There will be a voluntary site visit will be held at 10:00 o'clock am, Dayton time, on Tuesday, January 27, 2026, starting in the lobby of East Patrol Operations Division North ("EPODN") facility, located at 417 E Helena Street, Dayton OH 45404.

If the base bid plus all alternates accepted by the City for this Project exceeds \$2,000,000.00, the successful contractor, and all of its subcontractors, will be required to enter into a Project Labor Agreement pursuant to the terms of Dayton R.C.G.O. Section 35.241.

Minority Business Enterprise (MBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at <https://citybots.com/Home/Links> (click the "Certification List" link under Procurement Enhancement Program). This Project is being bid with a **10% MBE Participation goal. A company must be certified as **MBE for the MBE goal** at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the **"PEP-Certified MBE Participation Form (for the MBE goal) and PEP-Certified SBE Participation Form (for the SBE goal)"** provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the **MBE goal** must be submitted on the **enclosed "PEP Participation Commitment and/or Waiver Request Form."****

**Thomas Ritchie, Jr., Director
Department of Public Works**

INSTRUCTIONS

Instructions for submitting a Bid are contained in the Invitation to Bid; the City of Dayton Construction and Material Specifications dated October 1, 2008, sections 103.01-103.43 and related modifications; the Amendments to the City of Dayton General Provisions; and any Addendum.

Electronic bids for the **EAST PATROL OPERATIONS DIVISION NORTH RENOVATIONS RE-BID (10% MBE PARTICIPATION GOAL)** project will be received by the Director, Department of Public Works, until 12:00 o'clock NOON, Dayton time, on **February 12, 2026**. Each bid shall be submitted using the QuestCDN vBid portal. Bidders must download the project bid document file from QuestCDN, which will add Bidders to the plan holders list and give Bidders access to vBid Online Bidding. No paper bids will be accepted for this project. There is a non-refundable fee of \$70 to download the bid package and submit an electronic bid. Minority Business Enterprise (MBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at <https://citybots.com/Home/Links> (click the "PEP Certification List" link under City of Dayton Links). This Project is being bid with a 10% MBE Participation goal. A company must be certified as MBE for the MBE goal at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the "PEP-Certified MBE Participation Form (for the MBE goal) and PEP-Certified SBE Participation Form (for the SBE goal)" provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the MBE or SBE goal must be submitted on the enclosed "PEP Participation Commitment and/or Waiver Request Form."

CHANGES TO THE BID EVALUATION PROCESS

Each Bidder must submit an executed "PEP Participation Commitment and/or Waiver Request Form" to summarize the Bidder's overall PEP participation plan and/or to request a full or partial waiver of a PEP participation goal. For each PEP firm whose participation is being counted toward a goal, a Bidder must also submit one (1) executed "PEP-Certified SBE/MBE/WBE/DLSB Participation Form" describing the PEP firm's participation on the Base Bid and on Alternates. Participation will be evaluated based on the Base Bid plus Alternates as selected by the awarding department.

If unable to meet the project's PEP participation goal(s), a Bidder must submit a waiver request with its Bid. A Bidder must maintain supporting documentation of its Good Faith Efforts to meet the participation goal(s). If requesting a waiver, documentation of Good Faith Efforts must be submitted to the HRC within two (2) business days of the Bid Opening date. Bidders will receive no further reminders about this deadline.

The time of completion is April 30, 2027.

Please direct all technical questions to:

Andrew Marks
Department of Public Works
Phone (937) 333-4010
E-mail andrew.marks@daytonohio.gov

Each Bid shall be accompanied by a bond executed by a surety company authorized to do business in the State of Ohio for an amount of **at least ten percent (10%) of the amount of the bid submitted, including Alternates**, as a guarantee that if the bid is accepted, a Contract will be entered into and its performance properly secured.

**NOTE: THIS PROJECT IS STATE OF OHIO SALES TAX EXEMPT
THIS PROJECT IS STATE PREVAILING WAGE**

CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING

The City of Dayton Construction and Material Specifications are hereby modified by this Contract as follows:

100 GENERAL PROVISIONS

ITEM 101 ABBREVIATIONS

101 Abbreviations. The following abbreviations, when used in the Contract Documents, shall have the respective meaning shown below:

ANLA	American Nursery and Landscape Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWG	American Wire Gauge
AWP	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CMS	Construction and Material Specifications of the Ohio Department of Transportation
DCE	District Construction Engineer
DDD	District Deputy Director
DET	District Engineer of Tests
DMA	Declaration Regarding Material Assistance/Non-Assistance to a Terrorist Organization
DNR	Department of Natural Resources
EEI	Edison Electric Institute
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration, Department of Transportation
FSS	Federal Specifications and Standards, General Services Administration
HRC	The Human Relations Council of the City of Dayton
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ISSA	International Slurry Seal Association
ITE	Institute of Transportation Engineers
JMF	Job Mix Formula
MSDS	Material Safety Data Sheet(s)

NCHRP	National Cooperative Highway Research Program
NEMA	National Electrical Manufacturers Association
NISTN	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
ODOT	Ohio Department of Transportation
OMUTCD	Ohio Manual of Uniform Traffic Control Devices
ORC	Ohio Revised Code
ORDC	Ohio Rail Development Commission
OSHA	Occupational Safety and Health Administration
PCC	Portland Cement Concrete
RCGO	City of Dayton Revised Code of General Ordinances
REA	Rural Electrification Administration
SSP	Steel Structures Painting Council
STAR	State Treasurer's Asset Reserve
UL	Underwriters' Laboratories, Inc.

ITEM 102 DEFINITIONS

102 Definitions. The following words or terms, when used in the Contract Documents, are defined to mean as follows:

Addendum or Addenda A written or graphic instruction issued prior to the Bid Deadline which clarifies, amends or interprets the Contract Documents.

Alternate A proposed change in the work described in the Contract Documents providing the City with an option to select between alternative materials, products or systems, or to add or delete portions of the Work.

Alternative Dispute Resolution A method of resolving disputes other than arbitration or litigation.

Approved Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder and approved by the Engineer for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

As-built Drawings Drawings or computer files revised and submitted by the Contractor to show changes made during the construction process.

Authorized Representative Unless otherwise specified in the Contract Documents, the City Manager of the City or any of the City Manager's duly authorized assistants or designees.

Base Bid The amount of money stated in a Bid as the sum for which the Bidder offers to perform the Work described in the Contract Documents, exclusive of adjustments for Alternates.

Bid The offer of a Bidder to perform the Work for the amount or amounts quoted, as applicable.

Bidder A Person who submits a Bid for a Contract with the City.

Bid Deadline The date and time established as the deadline for submission of Bids, either through the Electronic Bidding Service or as otherwise provided by the City, subject to modification by Addendum.

Bid Guaranty Bid Bond or other instrument of security furnished by the Bidder to provide assurance that the Bidder will execute the Contract Form.

Board of Review Committee consisting of the City Manager, City Attorney and Director of the Department of Public Works or any of their respective authorized assistants or designees.

Borrow Area A location from which natural materials are to be removed for use in the Work.

Bridge A Structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of the roadway of more than 10 feet between undercopings of abutments or extreme limits of openings for multiple boxes.

Length. The length of a Bridge Structure is the over all length measured along the center line of Roadway of the surface of the Roadway.

Roadway width. The clear width measured at right angles to the longitudinal centerline of the Bridge between the bottom of curbs or guard timbers or, in the case of multiple heights of curbs, between the bottoms of the lower risers. For curb widths of 1 foot or less, the Roadway width shall be measured between the parapets or railings.

Building Department The City's Department of Building Services.

Bulletin A document issued by the Engineer after the execution of the Contract Form requesting a Proposal from the Contractor which, if approved as provided in the Contract Documents, will cause the execution of a Change Order to modify, amend or alter the Contract Documents. The Bulletin becomes a part of the Contract Documents when a Change Order related to the Bulletin is executed by all applicable Persons.

Certificate of Contract Completion A document signed by the Contractor and the Engineer certifying that Contract Completion has occurred.

Certificate of Partial Occupancy or Use A document signed by the Contractor and the Engineer certifying that City has chosen to occupy or utilize the Project or a designated portion thereof in accordance with 105.03.

Certified Test Data A test report from a manufacturer's Laboratory or an independent Laboratory approved by the City listing actual test results of samples tested for compliance with specified City requirements. The City will accept Certified Test Data from a manufacturer's Laboratory if its products have been used satisfactorily on prior City Contracts and its test data has been confirmed. The Contractor shall include a statement that the test data furnished is representative of the material furnished to a City Project or to a supplier. The report shall contain a characteristic number or date and shall identify the City Project or supplier to which the material is shipped. All reports shall be signed by an individual having legal authority to act for the manufacturer's Laboratory or independent Laboratory, as applicable.

Change Order A document issued by the City after execution of the Contract Form, which authorizes a change in the Work or an adjustment or alteration in the Contract price or the time for Contract Completion. A Change Order which requires only use of contingency funds (a "Field Change Order") may be approved by the Engineer. A Change Order which increases the Contract price must be approved by the City Manager and/or City Commission.

City The City of Dayton, an Ohio municipal corporation.

Claim Affidavit A sworn document containing a claim on funds that are due to a Contractor, created by statute in favor of a Person supplying labor, materials or services for the value of labor, materials or services supplied.

Conduit Any pipe or similar passageway for electricity, gas, water, Sewer or other utility.

Construction Schedule The schedule for the construction of the Work showing the time for completion of the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship of the Contractor's activities with the activities of other Contractors, if any, the Engineer, and the City.

Contingency Fund Moneys reserved by the City within the contract to pay costs resulting from Change Orders, unanticipated conditions, compliance with rulings on building or other codes, incompleteness or inaccuracy of Contract Documents and settlements on judgments related to the Project.

Contract The agreement between the City and the Contractor as set forth in the Contract Documents.

Contract Bond Performance and payment bond or bonds, as applicable, furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Contract and make required payments.

Contract Completion The date upon which all deficiencies noted in the Punch List have been corrected, the Contractor's Work is one hundred percent complete, the as-built drawings have been approved by the Engineer, and the Contractor has complied with all conditions precedent to final payment and release of retainage. When the Contract Documents specify a date for Contract Completion, Contract Completion shall occur on or before the specified date, even if the specified date is a Saturday, Sunday or legal holiday. When the Contract Documents provide that Final Acceptance shall occur a specified number of consecutive days after the date for commencement of Work set forth in the Notice to Proceed, that period of time shall be the time for Contract Completion.

Contract Cost Breakdown A statement furnished by the Contractor to the City reflecting the portions of the Contract price allocated to the various portions of the Work and used as the basis for reviewing the Contractor's Payment Requests.

Contract Documents Collectively, the Plans, plan notes, standard construction Drawings identified in Plans, Specifications, supplemental Specifications, Addenda, definitions,

Legal Notice, instructions to Bidders, equal opportunity requirements, electronic Bid, Bidder's affidavit, non-collusion affidavit, Bid guaranty, Substitution sheet, Contract Form, Contract Bond or Bonds, as applicable, wage rates and Special Provisions, Change Orders and approved Working Drawings, if any.

Contract Form The form furnished by the City that, when completed and signed by the Contractor and the City, evidences the entry into the Contract.

Contractor A Person with whom the City has entered into a Contract for the performance of Work on the Project in cooperation with other Persons and in accordance with the Contract Documents.

Culvert Any Structure not classified as a Bridge that provides an opening under a Roadway.

Day Calendar day, i.e., every day of the year, unless otherwise expressly specified to mean a business day. A business day is any day other than a Saturday, Sunday or legal holiday.

Defective When modifying the word Work, refers to Work that does not conform to the Contract Documents, or does not meet the requirements of any applicable statute, rule or regulation, policy, inspection, reference standard, test or approval, or has been damaged prior to Final Acceptance, unless responsibility for the protection thereof has been expressly assumed by the City, or that is not free from defects in workmanship, material or Equipment during the period of a Guarantee.

Director The Director of the City Department under which the Project is being performed, or the duly authorized designee of the applicable Director.

Drawings See Plans.

Electronic Bidding Service The electronic service used by the City to disseminate bidding information and documents to Bidders and to receive Bids and related documents from Bidders.

Engineer Unless otherwise specified in the Contract Documents, the Engineer of the Department of Public Works, the Water Engineering Manager of the Department of Water of the City of Dayton or the Planning and Engineering Manager of the Department of Aviation under which the Project is being performed, or the duly authorized designee of the Engineer or Manager, as applicable.

Engineer's Estimate An estimate of cost for a Project or a Contract for a Project prepared by the Engineer prior to Bid Deadline.

Equipment All machinery and Equipment, together with the necessary supplies for upkeep and maintenance, tools and apparatus necessary for the construction of the Work.

Fabricator The Subcontractor that fabricates structural metals or prestressed concrete members.

Final Acceptance The City's acceptance of the Work from the Contractor upon approval by the Authorized Representative of the Certificate of Contract Completion.

Final Inspection Final review of the Work of the Contractor by the Engineer to determine whether certification of Contract Completion is appropriate.

Guarantee Legally enforceable assurance, for a period after Contract Completion, of quality or performance of the Contractor's workmanship, material and Equipment.

Inspector A Person assigned by the Engineer to make detailed inspections of the Work.

Laboratory The testing Laboratory designated by the City or determined in accordance with the Contract Documents.

Legal Notice The public announcement inviting Bids for Work.

Liquidated Damages The sum established in the Contract Documents as the predetermined measure of damages to be paid to the City due to the Contractor's failure to complete the Work, or portions thereof, within a stipulated time.

Maintenance Bond A bond furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Guarantee.

Materials Any substances, supplies, products or other items specified or reasonably intended for use in the construction of the Project and its appurtenances.

Material Supplier A Person who furnishes materials for Work on the Project, in any tier.

Mathematically Unbalanced The lump sum amount or Unit Price in a Bid that does not include reasonably sufficient amounts for labor, material, Equipment, overhead and other applicable costs and profit.

Notice of Commencement The notice prepared by the City identifying the Project, the Contractor, the Surety for the Contractor and the name of the Person upon whom a Claim Affidavit may be served.

Notice of Intent to Award The notice provided to the apparently successful Bidder stating that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the City intends to execute a Contract Form with the Bidder.

Notice to Proceed A notice provided by the Engineer to the Contractor authorizing the Contractor to proceed with the Work and establishing the date for commencement of the Work.

Or Equal See Approved Equal.

Owner See City.

Partial Occupancy or Use The stage in the progress of the Work when the Project, or a designated portion thereof, is sufficiently complete in accordance with the Contract Documents so the City can occupy or utilize the Project, or the designated portion thereof, for its intended use, if the City chooses.

Payment Request The form furnished by the City that is to be used by the Contractor in requesting progress payments and which when signed by the Contractor shall serve as an affidavit that payment requests are in proportion to the Work completed as shown by the Contract Cost Breakdown and that payments previously paid by the City have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the Work covered by all prior Payment Requests.

Pedestrian Bridge A Bridge designed and constructed to provide means of traverse for pedestrian traffic only; also known as a foot Bridge.

Permittee Any Person issued a permit by the City to perform Work in accordance with these Specifications in a street, alley, Public Way or place, but not having a Contract with the City.

Person An individual, corporation, business trust, estate, limited liability company, partnership, association or other entity, public or private.

Plans The graphic and pictorial portions of the Contract Documents, showing the design, type of construction, location, dimension and character of the Work to be provided by the Contractor, generally including Drawings, elevations, sections, details, schedules, diagrams, notes, and Specifications, in whole or in part.

Profile Grade The trace of a vertical plane intersecting the top surface of the proposed wearing surface, usually along the longitudinal center line of a Roadbed. Profile Grade means either elevation or gradient of such trace according to the context.

Project The improvement to be constructed, of which the Work performed under the Contract Documents may be the whole or a part.

Project Schedule The schedule for the construction of the Project showing the time for completing the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship between the activities of the Contractor, other Contractors, the Engineer, and the City.

Proposal The offer of the Contractor to complete the Work set forth in a Bulletin.

Proposed Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

Public Way (or Place) A street, road, walk, alley or path used for public travel.

Punch List A list of items of Work to be completed or corrected by the Contractor as a condition precedent to Contract Completion.

Record Drawings Drawings or computer files revised by the Engineer to show the changes made during the construction process, based on the As-built Drawings furnished by the Contractor to the Engineer.

Request for Information Written request from the Contractor to the Engineer seeking an interpretation or clarification of the Contract Documents.

Right-of-Way Land, property, or interest therein, usually in a strip, acquired for or devoted to a road and includes the Roadway, Shoulders or berm, ditch and slopes extending to the Right-of-Way limits under control of the City.

Road A Public Way for purposes of vehicular travel, including the entire area within the Right-of-Way.

Roadbed The graded portion of a road within top and side slopes, prepared as foundation for the pavement Structure and Shoulder.

Roadside The areas between the outside edges of the Shoulders and Right-of-Way boundaries. Unpaved median areas between inside Shoulders of divided highways and infield areas of interchanges are included.

Roadside Development Those items necessary to the complete road that provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the road.

Roadway The portion of a road within the limits of construction.

Samples Physical examples furnished by the Contractor to illustrate materials, Equipment or workmanship and to establish criteria by which the Work will be judged.

Schedule of Values See Contract Cost Breakdown.

Sewer Pipe or Conduit intended for carrying storm drainage or sanitary drainage.

Shop Drawings Drawings, diagrams, illustrations, schedules, performance charts, brochures, catalog data and other data specially prepared or provided by the Contractor, a Subcontractor or Material Supplier to illustrate some portion of the Work.

Shoulder The portion of the road contiguous to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk That portion of the road constructed for the use by pedestrians.

Special Provisions Amendments to the Specifications or supplemental Specifications, which describe conditions unique to a particular Project.

Specifications Those portions of the Contract Documents consisting of the detailed written requirements and standards for materials, Equipment, construction systems and workmanship as applied to the Work and certain procedural details applicable thereto.

Standards The items named in the Specifications to denote kind, quality or performance requirement for the Work. All Bids and Proposals shall be based on the Standards as set forth in the Specifications.

State The State of Ohio.

Street See road.

Structure Bridge, Culvert, catch basin, curb inlet, drop inlet, retaining wall, cribbing, manhole, endwall, building, curb, pavement, Sewer, water main, service pipe, underdrain, foundation drain, and any other features which may be encountered in the Work and not otherwise defined herein.

Subcontractor A Person who undertakes to perform any part of the Work on the Project under a Contract with any Person other than the City, in any tier.

Subgrade The portion of a Roadbed upon which the pavement structure and Shoulders are constructed.

Substitution An item proposed by the Bidder to be used instead of a standard, but not considered in determining the lowest and best Bidder.

Substructure The part of a structure below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with backwalls and wings.

Superintendent The Contractor's Authorized Representative in charge of the Work.

Superstructure The entire structure except the Substructure.

Supplemental Specifications Detailed Specifications supplemental to or amending or superseding the Specifications.

Surety A Person providing a Bid guaranty, Contract Bond or Maintenance Bond to a Bidder or Contractor, as applicable, to indemnify the City against all direct and consequential damages suffered by failure of the Bidder to execute the Contract Form or of the Contractor to perform the Contract and to pay all lawful claims of Subcontractors, Material Suppliers and laborers or to perform the Guarantee, as applicable.

Unit Price An amount stated in the Bid as the price per unit of measurement for Materials or services described in the Contract Documents, which cost shall include overhead, profit and any other expense for the applicable Work.

Warranty Legally enforceable assurance for the specified duration from Final Acceptance of quality or performance of Materials or Equipment.

Waste Area A location in which natural Materials are to be deposited when not used in the Work.

Work The construction services required by the Contract Documents, to include all labor, Materials, Equipment, tools, transportation, supplies, incidental and services performed or provided by the Contractor for the Project.

Working Drawings Stress sheets, shop Drawings, erection Plans, false work Plans, framework Plans, cofferdam Plans, bending diagrams for reinforcing steel, or any other supplementary Plans or similar data which the Contractor is required to submit for acceptance.

ITEM 103 INSTRUCTION TO BIDDERS

- 103.01 Contract Completion and Critical Path Scheduling**
- 103.02 Delay Claims**
- 103.03 Giving Notice**
- 103.04 Examination of Contract Documents**
- 103.05 Evaluation of Work Season and Project Site**
- 103.06 Subsurface and Concealed Physical Conditions**
- 103.07 Pre-bid Meeting**
- 103.08 Request for Information or Clarification**
- 103.09 Interpretation or Clarification by Addendum**
- 103.10 Standards**
- 103.11 Proposed Equals**
- 103.12 Approval or Disapproval of Proposed Equals**
- 103.13 Substitutions**
- 103.14 Electronic Bid**
- 103.15 Alternates**
- 103.16 Submission of Bid**
- 103.17 Submittals with Bid**
- 103.18 Unit Prices**
- 103.19 Changes to Unit Price Work**
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103.01 Contract Completion and Critical Path Scheduling. Unless otherwise provided in the Contract Documents, the time for completion of the Project indicated on the Bid or Electronic Bidding Service shall be the time for Contract Completion applicable to the Bidders. Critical path scheduling methods shall be utilized, unless waived by the Authorized Representative in writing.

103.02 Delay Claims. The only delays for which the Bidder is entitled to additional compensation are those delays which the Bidder has established were proximately caused by an improper action or failure to act by the Owner.

103.03 Giving Notice. Whenever any provision of the Contract Documents requires the giving of notice prior to the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Bidder by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Bidder shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Bidder shall be copied to the Engineer.

103.04 Examination of Contract Documents. Contract Documents are available through the Electronic Bidding Service. The Bidder shall examine all Contract Documents, including without limitation the Drawings and Specifications for all divisions of Work for the Project, noting particularly all requirements which will affect the Bidder's Work in any way prior to submitting the Bidder's Bid. Failure of a Bidder to be acquainted with the amount and nature of Work required to complete any of the Work, in conformity with all requirements of the Project as a whole wherever set forth in the Contract Documents or reasonably inferred therefrom, will not be considered as a basis for additional compensation.

103.05 Evaluation of Work Season and Project Site. The Bidder shall evaluate when the Work may be performed and examine and evaluate the Project site and related Project conditions where the Work will be performed prior to submitting the Bidder's Bid, including without limitation the following:

- (a) The condition, layout and nature of the Project site and surrounding area, including Borrow Areas and Waste Areas, if any;
- (b) The availability and cost of labor;
- (c) The availability and cost of Materials, supplies and Equipment;
- (d) The cost of temporary utilities required;
- (e) The cost of any permit or license required by a local or regional authority having jurisdiction over the Project;
- (f) The usual weather conditions;
- (g) Conditions bearing upon transportation, disposal, handling, and storage of Materials and waste.

103.06 Subsurface and Concealed Physical Conditions. The Contractor may rely upon the general accuracy of the technical data contained in reports and drawings provided to the Contractor by the Owner and, except for such reliance on technical data, the Contractor shall not rely upon or make any claim against the City with respect to: (1) the completeness of such reports and drawings for the Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor, and safety precautions and programs incident thereto; or (2) other data, interpretation, opinions, and information contained in such reports or shown or indicated in such drawings; or (3) any Contractor interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by the Contractor to estimate locations or quantities of subsurface strata are independent factual assumptions which the Owner does not warrant. Subject to the foregoing, if during the progress of the Work subsurface or concealed physical conditions are encountered at the site differing materially from those indicated in the Contract Documents, or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall notify the Engineer of the specific differing conditions before they are disturbed or the affected Work is performed. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with Item 117. The City may decline to issue a Change Order if the notice required by 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extension for the related subsurface or concealed physical conditions.

103.07 Pre-Bid Meeting. All Bidders are required to attend the pre-Bid meeting, where the Engineer will answer questions regarding the Contract Documents. If not given in the Legal Notice, notice of the time and place of any pre-Bid meeting to be held will be given by the Engineer to each Person of record holding Contract Documents. A Bidder's failure to attend the pre-Bid meeting will result in his or her bid being rejected as non-responsive.

103.08 Request for Information or Clarification. If the Bidder finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation the Drawings and Specifications, or between any Contract Documents and any applicable provision of law, the Bidder shall submit a written request to the Engineer for an interpretation or clarification. Such requests must be submitted to the Engineer at least seven Days before the Bid Deadline.

103.09 Interpretation or Clarification by Addendum. If the Engineer determines that an interpretation or clarification is warranted, the Engineer shall issue an Addendum through the Electronic Bidding Service. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than an Addendum issued through the Electronic Bidding Service, shall not be binding and the Bidder shall not rely upon any such interpretation or clarification. The Bidder shall not, at any time before or after the execution of the

Contract Form, be compensated for a claim alleging insufficient data, incomplete, ambiguous, conflicting or erroneous Contract Documents, any discrepancy on or between Contract Documents or incorrectly assumed conditions regarding the nature, extent or character of the Work, if no request for interpretation or clarification regarding such matter was made by the Bidder prior to the Bid Deadline in compliance with 103.08.

103.10 Standards. The articles, devices, Materials, Equipment, forms of construction, fixtures and other items named in the Specifications to denote kind, quality or performance requirement for each significant portion of the Work shall be known as Standards and all Bids shall be based upon those Standards. Where two or more Standards are named, the Bidder may furnish any one of those Standards. Items which are not Standards may be used only if accepted pursuant to the requirements of 103.11 and 103.12.

103.11 Proposed Equals. If the Bidder proposes to use an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications, the Bidder shall submit such a proposal to the Engineer, not later than ten Days prior to the Bid Deadline, certifying that the item is equal in quality, and in all aspects of performance and appearance, to the Standards specified. In addition, the Bidder shall submit information to the Engineer not later than ten Days prior to the Bid Deadline, which information shall include:

- (a) The name and a complete description of the Proposed Equal, including Drawings, performance and test data, and other information necessary for a complete evaluation of the Proposed Equal;
- (b) A statement setting forth any changes which the Proposed Equal will require in the Contract Documents or the Project.

103.12 Approval or Disapproval of Proposed Equals. If the Engineer, in the exercise of the Engineer's sole unfettered discretion, approves the Proposed Equal as a Standard, the Engineer shall issue an Addendum to that effect through the Electronic Bidding Service. If the Engineer does not approve the Proposed Equal as a Standard, the Engineer shall inform the Bidder of the disapproval in writing, no later than ninety-six hours prior to the Bid Deadline, excluding Saturdays, Sundays and legal holidays, which decision shall be final. The Engineer shall have the discretion to reject a Proposed Equal for any reason, including, but not limited to, the Bidder's failure to provide sufficient information to enable the Engineer to completely evaluate the Proposed Equal without delaying the scheduled Bid Deadline.

103.13 Substitutions. If no Addendum is issued approving the Proposed Equal as a Standard, the Bidder may list the item on the Substitution sheet. A Bidder desiring consideration for the use of an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications shall submit a Proposal for the Substitution of same for the applicable standard, using the Substitution sheet provided in the Electronic Bidding Service and listing, for each proposed Substitution: the standard specified, the Substitution, and the change in Bid amount, (or indicate no change, if applicable). The name and a complete description including Drawings, performance and test data, and other information necessary for

a complete evaluation of each Substitution shall be furnished to the Engineer by the Bidder promptly upon request. Any Substitution accepted by the City must be incorporated in the Contract in writing. Substitutions shall not be considered in determining of the lowest and best Bid but may be considered in rejecting all Bids.

103.14 Electronic Bid. Each Bid shall contain the name of every Person interested therein and be submitted through the Electronic Bidding Service. Instructions for using the Electronic Bidding Service are available on the City's website. Failure to properly submit a Bid through the Electronic Bidding Service may cause a Bid to be rejected as nonresponsive. Unless the Bidder withdraws the Bid as provided in 103.31, the Bidder will be required to comply with all requirements of the Contract Documents, regardless of whether the Bidder had actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

103.15 Alternates. When an Alternate is listed in the Electronic Bidding Service, the Bidder shall complete the applicable portion, indicating an amount which will increase or decrease the Base Bid. The City reserves the right to accept or reject any or all Bids on Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order.

103.16 Submission of Bid. If the Bidder is a corporation, limited liability company, partnership or sole proprietorship, an officer, member, partner or principal of the Bidder, as applicable, shall submit and electronically sign the Bid through the Electronic Bidding Service. If the Bidder is a joint venture, an officer, member, partner or principal, as applicable, of each participant of the joint venture shall electronically sign the Bid on behalf of that participant, where applicable. By submitting a Bid, the Bidder warrants that it is not now, and will not become subject to an unresolved finding for recovery under Section 9.24 ORC, prior to the award of any Contract arising out of this Project, without notifying the City of such findings. Section 9.24, ORC prohibits the City from awarding a Contract to any Bidder against whom the Auditor of State has issued findings for recovery if the findings for recovery are unresolved at the time of award. The completed Bid submission of the Bidder with whom the City executes a Contract Form shall be incorporated into the Contract Form as if fully rewritten therein.

103.17 Submittals with Bid. Where indicated in the Electronic Bidding Service, the Bidder must download all documents that are shown as requiring a download and submit every document that is shown as requiring submission. A Bid shall be rejected if the Bidder fails to submit, or submits not fully complete, any document that is shown as requiring submission.

103.18 Unit Prices. When Unit Prices are requested in the Electronic Bidding Service, any scheduled quantities listed by the City are not binding upon the City and are to be used only for the comparison of Bids for purposes of determining the lowest and best Bidder and to determine the maximum quantity to be provided without a Change Order. If Unit Prices are stated to be sought only for informational purposes, they shall not be used for comparison of Bids. Unless otherwise specified in the Contract Documents, the Unit Prices and the totals or extensions thereof set forth shall include all Materials, Equipment, insurance, labor, delivery, installation, overhead, profit and any other cost or expense, in connection with or incidental to,

the performance of that portion of the Work to which the Unit Prices apply. The Bidder shall submit Unit Prices for all items listed unless other instructions are stated.

103.19 Changes to Unit Price Work. The Bidder agrees that the City may increase, decrease or delete entirely the scheduled quantities of Work to be done and Materials to be furnished after execution of the Contract Form without invalidating the Contract. Payments, except for lump sum items in Unit Price Contracts, will be made to the Contractor only for the actual quantities of Work performed or Materials furnished in accordance with the Contract Documents, but not in excess of the maximum set by the scheduled quantities. The Contractor must obtain a Change Order prior to performing Work or furnishing Materials in excess of the scheduled quantities in order to be compensated for the excess.

103.20 Change in Bid Amount. The Bidder may amend or withdraw its Bid through the Electronic Bidding Service at any time prior to the Bid Deadline.

103.21 Timely Submission of Bids. It is the responsibility of the Bidder to submit its Bid through the Electronic Bidding Service prior to the Bid Deadline. Bids arriving after the Bid Deadline shall not be considered.

103.22 Bid Letting. Bidders may submit Bids through the Electronic Bidding Service up to the Bid Deadline. At the Bid Deadline, all Bids will be tabulated and the tabulation made public. The public bid tabulation is for informational purposes only and is not to be construed as an acceptance or rejection of any Bid submitted. The electronic Bid submissions shall be a public record and open for inspection, upon request, at any time after the Bid Deadline, except for any information which is not subject to disclosure as provided by applicable law.

103.23 Bid Deadline Extension. If any Addendum is issued within Seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays and legal holidays, the Bid Deadline shall automatically be extended one week, with no further advertising required. If any Addendum is issued more than seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays, and legal holidays, the Bid Deadline may be revised by the Addendum, at the City's discretion.

103.24 Bid Evaluation Criteria. The City reserves the right to accept or reject any or all Bids, in whole or in part, and reserves the right to reject any Bid or Bids and to award the Contract to any remaining Bidder the City determines to be the lowest and best Bidder. The City reserves the right to accept or reject any or all Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order. The City may reject the Bid of any Bidder who has engaged in collusive Bidding, been involved in violations of ethics laws or who has an unresolved finding against it by the Auditor of State as provided in Section 9.24, ORC, as not the lowest and best Bid. The City reserves the right to waive, or to allow any Bidder a reasonable opportunity to cure a minor irregularity or technical deficiency in a Bid, provided the irregularity or deficiency does not affect the Bid amount or otherwise give the Bidder a competitive advantage. Noncompliance with any requirements of the Contract Documents may cause a Bid to be rejected.

103.25 Bid Evaluation Procedures. The Contract will be awarded to the lowest and best Bidder as determined in the discretion of the City or all Bids will be rejected in accordance with the procedures set forth in 103.26 through 103.31.

103.26 Lowest Bidder. In determining which Bidder is the lowest, the City shall consider the Base Bid and any Alternate or Alternates which the City determines to accept. Substitutions shall not be considered. The total of the Bids for the accepted Alternate(s) shall be added to or deducted from the Base Bid, as applicable, for the purpose of determining the lowest Bidder. If the Project involves multiple Contracts, the City may also receive combined Bids for two or more Contracts, if provided in the Electronic Bidding Service, but no Contract for the entire job or for more than one Contract shall be awarded unless the separate Bids do not cover all the Work and Materials required or unless the combined Bid is lower than the applicable separate Bids in the aggregate. The City may also receive Bids for multiple Projects if provided in the Electronic Bidding Service.

103.27 Rejection of Bids. In addition to any other reason provided for in this Item, a Bid shall be rejected if:

- (a) the Bid fails to respond to the Contract Documents in all material respects;
- (b) the Bid contains irregularities or deviations from the Contract Documents which would affect the amount of the Bid or otherwise give the Bidder a competitive advantage;
- (c) the Bid contains a Bid guaranty executed by a Surety not licensed in Ohio; or
- (d) a Bid guaranty that is otherwise determined to be insufficient by the City.

In addition to any other reason provided for in this Item, a Bid may be rejected if:

- (a) the Bid is Mathematically Unbalanced;
- (b) the Bid does not contain an executed Non-collusion affidavit;
- (c) the Bidder fails to furnish Samples and a complete statement of the origin, composition and manufacture of any or all Materials to be used for the Work, when so requested; or
- (d) the Samples provided by the Bidder fail to demonstrate that Materials are of sufficient quality or fitness for the Work.

103.28 Best Bidder. In determining whether a Bidder is best, factors to be considered include, without limitation:

- (a) Preferences required by law, where applicable;
- (b) The experience of the Bidder;

- (c) The financial condition of the Bidder;
- (d) Compliance by the Bidder and related Persons with ethics laws and City ordinances and regulations, including without limitation submission of an affirmative action program in accordance with Section 35.16 R.C.G.O.;
- (e) The conduct and performance of the Bidder on previous Bids and Contracts with the City or other owners, which shall include, without limitation, compliance with prevailing wage laws, Workers' compensation, income tax laws and equal opportunity requirements;
- (f) The facilities of the Bidder, including without limitation machinery, plant and Equipment, as applicable;
- (g) The management skills of the Bidder;
- (h) The ability of the Bidder to execute the Contract properly, including whether the Bidder's existing workload may hinder or prevent timely completion of the Work;
- (i) The ability of the Bidder to perform at least fifty-one percent of the Work with its own employees;
- (j) The evaluation of a Bid below the median of other Bids pursuant to 103.37.

A Bidder who submits a Bid for Work for electrical, plumbing, hydronics, refrigeration or heating, ventilating and air conditioning shall provide evidence of a valid Contractor's license from the Ohio Construction Industry Licensing board or successor.

103.29 Information. A Bidder shall submit to the Engineer, upon request, any information the Authorized Representative deems appropriate to the consideration of factors showing that such Bidder's Bid is best, including without limitation the following:

- (a) Overall experience of the Bidder, including number of years in business under present and former business names;
- (b) Names and qualifications of key Bidder personnel;
- (c) Complete listing of all ongoing and completed public and private construction Contracts of the Bidder in the last three years, including the nature, status and value of each Contract and a name, address, and phone number for a representative of the Owner of each related Project;
- (d) Complete listing of any EPA, (OSHA) or other regulating entity issues or citations in the last ten years;
- (e) Complete listing of all outstanding liens against the Bidder;
- (f) Certified financial statement with trade and bank references;
- (g) Description of relevant facilities of the Bidder;

(h) Description of the management experience of the Bidder's Project manager(s) and Superintendent(s); who will be assigned to the Project;

(i) Complete list of all Subcontractors and Material Suppliers;

(j) To support a Contract Bond, a current and signed certificate of compliance required under Section 9.311 ORC, issued by the Department of Insurance, showing the Surety is licensed to do business in Ohio;

(k) Current Ohio Workers' Compensation Certificate.

If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State; or, if the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05, ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.

The Engineer may obtain such information from several Bidders simultaneously. Each Bidder shall provide requested information within such time limits as the Engineer shall establish.

103.30 Notice of Intent to Award. The City shall notify the apparent lowest and best Bidder that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the Bidder will be awarded the Contract. The City reserves the right to rescind any Notice of Intent to Award at any time prior to the execution of the Contract if the City determines the Notice of Intent to Award was issued in error.

103.31 Withdrawal of Bid. A Bidder may withdraw its Bid at any time prior to the Bid Deadline through the Electronic Bidding Service. All Bids submitted through the Electronic Bidding Service which were not withdrawn prior to the Bid Deadline shall remain valid and open for acceptance for a period of at least sixty Days after the Bid Deadline; provided, however that during that period a Bidder may withdraw a Bid from consideration if the Bid amount was substantially lower than the amounts of other Bids, providing the Bid was submitted in good faith, and the reason for the Bid amount being substantially lower was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of Work, labor or material made directly in the compilation of the Bid amount. Notice of such a request to withdraw a Bid must be made in writing filed with the Authorized Representative within two business Days after the Bid Deadline. The City reserves the right to request that the Bidder submit evidence substantiating the Bidder's request to withdraw the Bid. No Bid may be withdrawn after the Bid Deadline when the result would be the awarding of the Contract on another Bid to the same Bidder. If a Bid is withdrawn after the Bid Deadline, the City may award the Contract to another Bidder that the City determines to be the lowest and best Bidder, or reject all Bids and advertise for other Bids. If the City advertises for other Bids, the withdrawing Bidder shall pay the costs incurred by the City in connection with the rebidding if the City finds that such costs would not have been incurred but for such withdrawal. A Bidder may withdraw its Bid at any time after the expiration of the described sixty Day period by written notice to the Authorized Representative.

103.32 Refusal to Accept Withdrawal. If the City intends to contest the right of the Bidder to withdraw a Bid after the Bid Deadline, a hearing shall be held by the Authorized Representative within ten Days after the Bid Deadline and an order shall be issued by the City allowing or denying the claim of such right within five Days after such hearing is concluded. The City shall give the withdrawing Bidder timely notice of the time and place of any such hearing. The City shall make a stenographic record of all testimony, other evidence, and rulings on the admissibility of evidence presented at the hearing. The Bidder shall pay the costs of the hearing. If the City denies the claim for withdrawal and the Bidder elects to litigate or otherwise refuses to perform the Contract, the City may reject all Bids or award the Contract to the next lowest and best Bidder, as determined by the City, without waiving any claims against the non-performing Bidder.

103.33 Effect of Withdrawal. No Bidder who is permitted to withdraw a Bid after the Bid Deadline shall for compensation supply any material or labor to, or perform any subcontract or other Work agreement for, the Person to whom the Contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn Bid was submitted, without the written approval of the City. The Person to whom the Contract is awarded and the withdrawing Bidder shall be jointly liable to the City in an amount equal to any compensation paid to or for the benefit of the withdrawing Bidder without such approval. A Bidder who is permitted to withdraw a Bid after Bid Deadline may be considered not the best for future City Contracts.

103.34 Bid Estimate. In no instance shall Contracts be let either as a whole, or in aggregate, if Bids for parts of the Work are taken, which exceed one hundred ten percent of the estimate for the improvement contemplated.

103.35 Review of Low Bid. The City may reject a Bid which is

- (a) more than twenty percent below the median of all higher Bids received for a Contract where the estimate is one hundred thousand dollars or more; or
- (b) more than twenty-five percent below the median of all higher Bids received for a Contract where the estimate is less than one hundred thousand dollars.

In determining whether to reject such a bid, the City may at its discretion, but is not required to:

- (a) Conducts an interview with the Bidder to determine what, if anything has been overlooked in the Bid, and to analyze the process planned by the Bidder to complete the Work;
- (b) Require the Bidder to submit to the City a certified financial statement and a list of recent public Contracts which the Bidder has performed; and/or

(c) Notify the Bidder's Surety in writing that the Bidder with whom the City intends to enter a Contract submitted a Bid determined to be substantially lower than the median of all higher Bids.

103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for the full amount of the Base Bid plus add Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.

103.37 Bid Guaranty Forfeiture. If for any reason, other than as authorized by 103.31 or 103.38, the Bidder fails to execute the Contract Form, and the City awards the Contract to another Bidder which the City determines is the lowest and best Bidder, the Bidder who failed to execute the Contract Form shall be liable to the City for the difference between such Bidder's Bid and the Bid of the lowest and best Bidder, or for a penal sum not to exceed ten percent of the defaulting Bidder's Bid amount, whichever is less. If the City then awards a Contract to another Bidder which the City determines is the lowest and best Bidder and such Bidder also fails or refuses to execute the Contract Form, the liability of such lowest and best Bidder shall, except as provided in 103.38, be the amount of the difference between the Bid amounts of such lowest and best Bidder and another Bidder which the City determines is the lowest and best Bidder, but not in excess of the liability specified in 103.31. Liability on account of an award to each succeeding lowest and best Bidder shall be determined in like manner. If the City does not award the Contract to the another Bidder which the City determines is the lowest and best Bidder but resubmits the Project for Bidding, the Bidder failing to execute the Contract Form shall, except as provided in 103.38, be liable to the City for a penal sum not to exceed ten percent of such Bidder's Bid amount or the costs incurred by the City in connection with the rebidding, whichever is less.

103.38 Exception to Bid Guaranty Forfeiture. A Bidder with the City for a Contract with the City costing less than five hundred thousand dollars may withdraw a Bid from consideration if the Bidder's Bid for some other Contract with the State or any political subdivision, district, institution or agency thereof, excluding ODOT, costing less than five hundred thousand dollars has already been accepted, if the Bidder certifies in good faith that the total price of all such

Bidder's current Contracts is less than five hundred thousand dollars, and if the Bidder's Surety certifies in good faith that the Bidder is unable to perform the subsequent Contract because to perform such Contract would exceed the Bidder's Bonding capacity. If a Bid is withdrawn pursuant to 103.38, the City may award the Contract to another Bidder which the City determines is the lowest and best Bidder or reject all Bids and resubmit the Project for Bidding, and neither the withdrawing Bidder nor such Bidder's Surety shall be liable for the difference between the Bidder's Bid and that of another Bidder which the City determines is the lowest and best Bidder, for a penal sum, or for the costs incurred by the City in connection with the rebidding.

103.39 Contract Bond. If the Bidder executes the Contract Form, the Bidder shall, at the time of signing the Contract Form, provide the Contract Bond required by law in form and substance, and from a Surety, satisfactory to the City. The Contract Bond shall be in the full amount of the Contract to indemnify the City against all direct and consequential damages suffered by failure of the Contractor to perform according to the provisions of the Contract Documents and in accordance with the Plans, Specifications, details and bills of material therefore and to pay all lawful claims of Subcontractors, Material Suppliers, and laborers for labor performed or Materials furnished in carrying forward, performing or completing the Contract. A Contract Bond must be signed by an authorized agent with Power of Attorney from the Surety.

103.40 Personal Property Tax Statement. The successful Bidder shall provide a properly completed and executed affidavit in a form satisfactory to the City in order to fulfill the requirements of Section 5719.042 ORC, which provides as follows:

After the award by a taxing district of any Contract let by competitive Bid and prior to the time the Contract is entered into, the Person making a Bid shall submit to the district's fiscal officer a statement affirmed under oath that the Person with whom the Contract is to be made was not charged at the time the Bid was submitted with any delinquent personal property taxes on the general tax list of personal property of any county in which the taxing district has territory or that such Person was charged with delinquent personal property taxes on any such tax list, in which case the statement shall also set forth the amount of such due and unpaid delinquent taxes and any due and unpaid penalties and interest thereon. If the statement indicates that the taxpayer was charged with any such taxes, a copy of the statement shall be transmitted by the fiscal officer to the county treasurer within thirty Days of the date it is submitted.

A copy of the statement shall also be incorporated into the Contract, and no payment shall be made with respect to any Contract to which 103.40 applies unless such statement has been so incorporated as a part thereof.

103.41 Conditions Precedent for Execution of Contract Form by City. The award of the Contract and the execution of the Contract Form are based upon the expectation that the lowest and best Bidder will execute the Contract Form and comply with all conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award. Failure to execute the Contract Form or noncompliance with the conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award shall be cause permitting the City to cancel the Notice of Intent to Award for the Bidder's failure to be best, and to award the Contract to another Bidder which the City determines is the lowest and best Bidder or to resubmit the Contract for Bidding, at the discretion

of the City. The City may extend the time for submitting the conditions precedent for execution of the Contract Form for good cause shown. No extension shall operate as a waiver of the conditions precedent for execution of the Contract Form. The conditions precedent for execution of the Contract Form by the City are as follows:

- (a) Contract Form;
- (b) Contract Bond and to support the Contract Bond, a power of attorney for any attorney-in-fact signing the Contract Bond and a certificate of compliance issued by the Ohio Department of Insurance showing the Surety is licensed to do business in Ohio;
- (c) Ohio Workers' Compensation Certificate;
- (d) Certificate of Insurance (ACORD form is acceptable) clearly setting forth all exclusions and deductibles and copy of additional insured or loss payee endorsement. The City reserves the right to request a certified copy of the Contractor's insurance policies, including all endorsements.
- (e) If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a Certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State will be required. If the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05 ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.
- (f) Personal property Tax Statement; and
- (g) Evidence of registration of the Contractor and all of the Contractor's Subcontractors with the Building Department and the City's Department of Finance, Division of Revenue and Taxation.
- (h) Material Declaration of Assistance/Non-Assistance to Terrorist Organization, when required.
- (i) If requested by the City, the Bidder shall immediately submit evidence that the Person signing the Contract is authorized to bind the Bidder.

103.42 Time Limits. A Contract Form is not executed until it has been signed on behalf of both the Bidder and the City by Persons authorized to bind the Bidder and the City, respectively. The failure to award the Contract and to execute the Contract Form within ninety Days of the Bid Deadline invalidates the entire Bid process and all Bids submitted, unless the time is extended by written consent of the apparent lowest and best Bidder and the City concurs with such extension. If the Contract is awarded and the Contract Form is executed within ninety Days of the Bid Deadline, any increases in material, labor and subcontract costs shall be borne by the Bidder without alteration of the amount of the Bid. If the cause of the failure to execute the Contract within ninety Days of the Bid Deadline is due to matters for which the City is solely responsible, the Contractor shall be entitled to a Change Order authorizing payment of verifiable increased costs in Materials, labor or subcontracts. If the cause of the failure to execute the

Contract within ninety Days of the Bid Deadline is due to matters for which the Contractor is responsible, no request for increased costs will be granted.

103.43 Notice to Proceed and Submittals. The Authorized Representative shall issue the Contractor a Notice to Proceed which shall establish the date for commencement of the time for Contract Completion. The Contractor shall, within ten Days of the date of the Notice to Proceed, furnish the Engineer the following submittals:

- (a) Contract Cost Breakdown;
- (b) Preliminary schedule including shop Drawings and submittals;
- (c) List of Subcontractors;
- (d) List of Material Suppliers;
- (e) Outline of qualifications of proposed Superintendent.

103.44 Wage Rates and Payment Dates. The Bidder shall base its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor & Worker Safety, Wage and Hour bureau or the U.S. Department of Labor, as applicable, for the Project as provided in Sections 4115.03 and 4115.14, ORC, or the Davis-Bacon Act, respectively. The Contractor shall, within ten Days of the date of the Notice to Proceed, provide to the Engineer for the prevailing Wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

103.45 Written Submissions in lieu of Electronic Bidding Service. Where a Bidder is required by a provision in this Item 103 to make a submission through the Electronic Bidding Service, such submission may be made in paper form only upon prior written authorization from the Engineer. The determination whether to grant such prior written authorization is left to the Engineer and may be exercised by the Engineer's sole unfettered discretion. Submissions outside the Electronic Bidding Service without such prior written authorization may result in a determination that the Bid is non-responsive.

ITEM 104 GENERAL REQUIREMENTS

104.01 Contract Documents

104.02 Applicable Law and ODOT Matters

104.03 Jurisdiction

104.04 Assignment of Antitrust Claims

104.05 Captions

104.06 Nondiscrimination Generally

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104.12 Intent

104.13 Requests for Information

104.14 Ownership and Use of Drawings and Specifications

104.15 Access to Documents

104.16 As-Built Drawings

104.17 Substitutes for Standards or Approved Equals

104.18 Sales and Use Taxes

104.01 Contract Documents. The Contractor, the Engineer and the Authorized Representative shall be familiar with all provisions of the Contract Documents.

104.02 Applicable Law and ODOT Matters. The Contractor and the City shall comply with all applicable Federal, State and local codes, statutes, ordinances and regulations in the performance of the Work on the Project. When the Federal government or the State pays all or any portion of the cost of the Project, the Work shall be subject to the inspection of the appropriate federal or State agency. No such inspection shall make the Federal government or State a party to the Contract and will in no way affect the rights and obligations of the City and the Contractor under the Contract. Any such inspection is solely for the benefit of the City and the Federal or State agency making it, and neither the Contractor nor the Surety shall be entitled to rely upon it for any purpose. References to ODOT matters shall be as set forth in the CMS current as of the Bid Deadline. In such instances, the CMS is incorporated only to the extent that it is not inconsistent with the Specifications.

104.03 Jurisdiction. The Montgomery County Court of Common Pleas, or the United States District Court for the Southern District of Ohio if required by law, shall be the exclusive jurisdiction in which any action or proceeding concerning any Bid, Contract, agreement or performance under the Contract Documents or in connection with the Project shall be filed. In any such action or proceeding the Contract Documents shall be construed in accordance with the laws of the State which shall govern to the exclusion of the law of any other jurisdiction.

104.04 Assignment of Antitrust Claims. By executing the Contract Form, the Contractor assigns, conveys and transfers to the City any right, title and interest to any claims or

causes of action it may have or acquire under State or Federal antitrust laws relating to any goods, products, or services purchased, procured or rendered to the City pursuant to the Contract.

104.05 Captions. Captions throughout the Contract Documents are for convenience and reference only and the words contained in a caption shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of the Contract Documents. Rights and responsibilities of the Contractor, the Engineer and the City are set forth throughout the Contract Documents and are included under different titles, articles and paragraphs for convenience.

104.06 Nondiscrimination Generally. During the performance of the Contract, the Contractor agrees that in the hiring of employees for the performance of Work, including without limitation Work to be performed by a Subcontractor, no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, by reason of race, religion, national origin, age, sex, disability, or color, discriminate against any citizen in the employment of labor or workers who are qualified and available to perform the Work to which the employment relates. The Contractor further agrees that no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work on account of race, religion, national origin, age, sex, disability, or color. In the event of the Contractor's noncompliance with the nondiscrimination clauses, the contract may be terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further City Contracts or such other sanctions as provided by law. Any provision of a hiring hall Contract or agreement which obligates a Contractor to hire, if available, only such employees as are referred to the Contractor by a labor organization shall be void as against public policy and unenforceable with respect to employment under any public improvement Contract unless, at the date of execution of such hiring hall Contract or agreement, or within thirty Days thereafter, such labor organization has in effect procedures for referring qualified employees for hire without regard to race, color, religion, national origin, or ancestry and unless such labor organization includes in its apprentice and journeymen membership, or otherwise has available for job referral without discrimination, qualified employees.

104.07 City's Nondiscrimination Requirements. The Contractor shall comply with RCGO, Section 35.14 which provides as follows and any amendments thereto:

(A) The [Contractor] shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. The [Contractor] shall take affirmative action in accordance with terms outlined in its [Proposal] and the provisions of this [Contract] to insure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The [Contractor] agrees to post in conspicuous places, available to employees and applicants, notices to be provided by the [City] setting forth the provisions of the nondiscrimination clauses.

(B) The [Contractor] shall in all solicitations or advertisements for employees placed by or on behalf of the [Contractor], state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap.

(C) The [Contractor] shall send to each labor union or representative of workers with which [the Contractor] has a collective bargaining agreement or other contract or understanding, a notice to be provided by the [City] advising the labor union or workers' representative of the [Contractor's] commitments, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(D) The [Contractor] shall comply with all rules, regulations, and relevant orders promulgated by the Human Relations council pursuant to its duties created by ordinance.

(E) The [Contractor] shall file, and shall cause each of [the Subcontractors and Material Suppliers] to file, compliance reports with the Human Relations Council as may be directed. Compliance reports shall be filed within such times and shall contain such information as to the practices, policies, programs, and employment policies, programs and employment statistics of the [Contractor, Material Supplier, or Subcontractor] and shall be in such form as the Human Relations Council may prescribe.

(F) The [Contractor] shall furnish all information and reports required by this [Contract] and by the rules, regulations, and orders of the Human Relations Council pursuant hereto, and shall permit reasonable access to the [Contractor's] books, records, and accounts by the Human Relations Council or its representative, as necessary for purposes of investigation to ascertain compliance with this [Contract] and rules, regulations and orders.

(G) In the event of the [Contractor's] failure to comply with the equal employment opportunity and affirmative action provisions of this [Contract], including the affirmative action undertaking outlined in it is [Proposal], or with any of the rules, regulations, or orders herein referred to, it is agreed that the [City], at its option, may do any or all of the following:

(1) Cancel, terminate, or suspend this [Contract], in whole or in part [...].

(2) Declare the [Contractor] ineligible for further [City Contracts].

(3) Recover from the [Contractor] by set-off against the unpaid portion of the [Contract], or otherwise pursuant to this [Contract], the sum of fifty dollars per [Day], as [Liquidated Damages] and not as a penalty, for each [Day] that the [Contractor] shall fail to comply with these provisions of the [Contract], as determined by the Human Relations Council in accordance with its rules and regulations, the said sum being fixed and agreed upon by and between the [Contractor] and the [City] because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the [City] would sustain in the event of such a breach of contract, and that amount is agreed to be the amount of damages which the [City] would sustain.

(4) Impose such other sanctions as may be imposed by the Human Relations Council pursuant to ordinances passed by the Commission, or seek such other remedies as may be provided by law.

(H) The [Contractor] shall include the provisions of this [Contract] in every subcontract, so that such provisions shall be binding upon each [Subcontractor]. The [Contractor] shall take such action with respect to any subcontracts as the Human Relations Council may direct as means of enforcing such provisions, including sanctions for noncompliance. However, in the event the [Contractor] becomes involved in, or is threatened with litigation with a [Subcontractor] as a result of such direction by the Human Relations Council, the [Contractor] may request the City to enter into such litigation to protect the interests of the City.

104.08 Notice of Commencement. The Authorized Representative shall prepare a Notice of Commencement in affidavit form identifying the name and address of the City, the Project, the name, address of the Contractor, the date of execution of the Contract, and the name and address of the Surety for the Contractor, in addition to the name and address of the Authorized Representative upon whom a Claim Affidavit may be served. The Notice of Commencement shall be made available upon request.

104.09 Giving Notice. Whenever any provision of the Contract Documents requires the giving of any notice after the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Contractor by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Contractor shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Contractor shall be copied to the Engineer.

104.10 Computation of Time. When any period of time is referred to in the Contract Documents by Days, it shall be computed to exclude the first and include the last Day of such period. If the last Day of any such period falls on a Saturday, Sunday or a legal holiday, such day will be omitted from the computation and such period shall be deemed to end on the next succeeding day which is not a Saturday, Sunday or legal holiday.

104.11 Facsimile Transmission and Electronic Mail. Any notice required to be given by the Contract Documents may be given by facsimile transmission or electronic mail, provided the original signed notice is delivered within two Days after the date of the facsimile transmission or electronic mail. Facsimile transmittals in excess of 10 pages are discouraged.

104.12 Intent. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. The Contractor shall provide all labor, Equipment and Materials necessary for the entire completion of the Work described in the Contract Documents and reasonably inferred therefrom to produce the intended results. The Specifications may not be superseded or amended by the Drawings

unless so provided in supplemental Specifications or Special Provisions prepared by the Engineer and approved in writing by the Authorized Representative. The Drawings shall generally govern dimensions, details and locations of the Work and calculated dimensions shall govern over scaled dimensions. The Specifications shall generally govern quality of Materials and workmanship. The organization of the Specifications in divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. In the event of inconsistencies within or between the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work, and shall comply with the stricter requirement. Unless otherwise specified in the Contract Documents, words which have well-known technical or construction industry meanings are used in accordance with such recognized meanings.

104.13 Requests for Information. If the Contractor finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation, the Drawings and Specifications, or between any of the Contract Documents and any applicable provision of law, the Contractor, before proceeding with the Work, shall submit a written Request for information to the Engineer for an interpretation or clarification. The Contractor shall be responsible for the prompt delivery of any such Request for information. The Engineer shall respond in writing to any and all requests for information within three business Days of receipt. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than in writing, shall not be binding and the Contractor shall not rely upon any such interpretation or clarification. If any change to the Work is made to accommodate unforeseen circumstances, the Engineer shall initiate the appropriate action and notify the Authorized Representative.

104.14 Ownership and Use of Drawings and Specifications. All Drawings and Specifications are the property of the City. In making copies of the Drawings and Specifications available, the City does not confer a license or grant permission for any use other than Work on the Project. Unless otherwise specified in the Contract Documents, the Engineer shall furnish to the Contractor, free of charge, 7 sets of Drawings and Specifications if the Contract price is five hundred thousand dollars or less, and 10 sets of Drawings and Specifications if the Contract price is in excess of five hundred thousand dollars. The Contractor may obtain additional copies of the Contract Documents from the Engineer, upon request, at the cost of reproduction, if any.

104.15 Access to Documents. The Contractor shall maintain in good order at the Project site one copy of all Drawings, Specifications, Bulletins, Addenda, approved Shop Drawings, catalog data, manufacturer operating and maintenance instructions, certificates, warranties, Change Orders, and other modifications, including As-built Drawings. The Contractor shall at all times permit access to the documents described in 104.15, and any other Contract Documents by the Authorized Representative and the Engineer.

104.16 As-Built Drawings. For Projects administered by the Water Engineering Manager of the City's Department of Water, or the Planning and Engineering Manager of the Department of Aviation, the Contractor shall keep an accurate record of all approved changes made to the Drawings to show Work as actually performed where such Work varies from Work as originally shown, including the exact location and depth of underground utility lines. During the performance of the Work, the Contractor shall record, prior to the submission of each Contractor

Payment Request, any approved changes on the Drawings, neatly in a contrasting color, noting new information not shown on the original Drawings. Failure to so record such changes may cause payment to be withheld or delayed. Where shop Drawings are used, the Contractor shall cross reference the corresponding sheet numbers on the Drawings and sections of the Specifications. The Contractor shall note related Change Order numbers where applicable. The Contractor shall keep a record of any change made to the Specifications, noting particularly any variation from manufacturer's instructions and recommendations. 104.16 shall not apply to any Project administered by the Engineer of the Department of Public Works unless required in the supplemental Specifications or Special Provisions for the Project.

104.17 Substitutes for Standards or Approved Equals. Requests for substitutes for standards or Approved Equals shall not be considered after the Bid Deadline unless listed on the Substitution sheet or after the Contractor can conclusively demonstrate to the Engineer one of the following conditions:

- (a) All applicable standards and Approved Equals are not available through no fault of the Contractor or the Contractor's Subcontractors and Material Suppliers;
- (b) All applicable standards and Approved Equals are no longer produced;
- (c) All applicable standards and Approved Equals will not perform as designed or intended.

104.18 Sales and Use Taxes. Only those Materials which ultimately become a part of the completed Structure or improvement which constitutes the Project will be exempt from State sales tax as provided in Section 5739.02 ORC, and State use tax as provided in Section 5741.01 ORC. The purchase, lease or rental of material, Equipment, parts or expendable items such as form lumber, tools, oils, greases and fuels, which are used in connection with the Work, are subject to the application of State sales tax and State use tax.

ITEM 105 CITY'S RIGHTS AND RESPONSIBILITIES

105.01 Generally

105.02 Right to Perform and Backcharge

105.03 Right to Partial Occupancy or Use

105.04 City's Right to File Suit

105.05 No Personal Liability of Public Officials

105.06 No Waiver of Legal Rights

105.07 No Estoppel

105.01 Generally. Information and services required of the City may be furnished through the Engineer or the Authorized Representative and shall be furnished in good faith and in a timely manner to avoid interference with, delay, hindrance, disruption or impact to the progress of the Project. The City and the City's officials, employees, consultants, agents and representatives as determined by the Engineer shall at all times have access to the Work whenever the Project is in preparation or progress. Upon the issuance of the Notice to Proceed or at a reasonable time thereafter, the City shall provide the Contractor the Project site in such condition to permit the Contractor to perform the Work. The foregoing are in addition to other rights and responsibilities of the City enumerated herein and especially those in respect to the City's right to prosecute the Work, approve payments and accept the Project.

105.02 Right to Perform and Backcharge. If the Contractor provides Defective Work or fails or neglects to perform the Work with the necessary diligence so as to complete the Work within the time specified in the Contract Documents or any portion of the Work by the applicable milestone completion date as set forth in the current Project, the Engineer shall notify the Contractor in writing of such failure or neglect. If such Defective Work, failure, or neglect results in a threat to the safety of any person or property, the Contractor shall immediately commence to correct such Defective Work, failure, or neglect upon receipt of written or oral notice thereof. Otherwise, if the Contractor fails or refuses to cure such Defective Work or failure or neglect within three business Days after receipt of the written notice or immediately in the case of a threat to any person or property, the Engineer shall recommend enforcement of the Contract to the City pursuant to 106.02 and 106.03. Without prejudice to any other remedy the City may have, the City may employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, to correct the deficiency in the Contractor's Work, as determined by the Authorized Representative. In all such cases of Defective Work, failure, or neglect, a Change Order shall be issued deducting from payments then or thereafter due the Contractor the costs arising out of or related to investigating and correcting such Defective Work, failure or neglect, including without limitation, the City's attorneys' and consultants' fees and Liquidated Damages. If the payments then or thereafter due the Contractor are not sufficient to cover such costs, the Contractor and the Contractor's Surety shall pay the amount of the insufficiency to the City. The decision of the Authorized Representative to backcharge the Contractor shall be final, subject to proceedings in accordance with 118.01 through 11

The City reserves the right to furnish at any time such Materials and labor and to prosecute such Work in addition to the Work of the Contractor as the City may desire; provided, however, that if such prosecution of additional Work should unreasonably interfere with, disrupt, hinder, delay or impact the Work of the Contractor, the Contractor shall be entitled to a reasonable extension of time in accordance with these Specifications.

105.03 Right to Partial Occupancy or Use. If the City finds it necessary to occupy or use the Project, or a designated portion of the Project prior to Contract Completion, such use may be accomplished if the Engineer informs the City that the portion in question has been approved for occupancy use, including by the Department of Building Services, if applicable. If Partial Occupancy or Use is approved by the City, the Engineer may process either a Change Order or a Certificate of Partial Occupancy or Use for the applicable portion of the Project listing the uncompleted or Defective Work under the Contract for approval by the City, provided that no such occupancy or use shall commence before any insurers providing property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. From the date of execution of the Change Order or Certificate of Partial Occupancy or Use by the Engineer, the Contractor shall be relieved of obligation to maintain the accepted portion of the Work, but shall remain obligated to correct any incomplete or Defective Work, including, without limitation any Punch List items then uncorrected. The Contractor shall continue to carry the appropriate insurance during performance of any such Work. Partial Occupancy or Use of the Project by the City shall not constitute acceptance of any Work not in conformity with the Contract Documents. Partial Occupancy or Use shall not relieve the Contractor of liability for any express or implied warranties or from responsibility for Defective Work.

105.04 City's Right to File Suit. The City may maintain an action in its own name for violations of any law relating to the Project, for any injury to Persons or property pertaining to the Work or for any other cause which is necessary in the performance of the City's duties.

105.05 No Personal Liability of Public Officials. In carrying out the provisions of the Contract Documents, or in exercising any power or authority granted to them by or within the scope of the Contract Documents, there shall be no liability upon the officers and employees of the City, whether personally or as officials of the City, it being understood that in all such matters they act solely as agents and representatives of the City.

105.06 No Waiver of Legal Rights. No action or omission by the City or the City's officers and employees, nor any approval of any request for payment, claim, or Change Order, nor any payment for or acceptance of any Work, nor any extension of time, nor any possession taken by the City or the City's officers or employees shall operate as a waiver of any provision of the Contract Documents, or of any power herein reserved to the City, or any right to damages herein provided; nor shall any waiver of any breach of the Contract be held to be a waiver of any other subsequent breach.

105.07 No Estoppel. The City shall not be precluded or estopped by any return or certificate given by the Contractor either before or after the final completion and acceptance of the Work from showing the true and correct amount and character of the Work done and Materials furnished, or from showing at any time that any such return or certificate is untrue and incorrect or improperly made, or from showing that the Work, Materials or Equipment do not conform to the Contract Documents or from demanding and recovering from the Contractor such damages as the City may sustain by reason of the Contractor's failure to comply with the Contract Documents.

ITEM 106 THE ENGINEER

106.01 Project Inspection

106.02 Rejection of Work

106.03 Contract Administration

106.04 Monitoring Progress

106.05 Interpretation

106.06 Authorization of Inspection, Testing and Approval

106.07 Review of Payment Requests

106.08 Review of Submittals

106.09 Preparation of Change Orders

106.10 Final Inspections

106.11 Claims Services

106.12 Project Rules and Hours

106.13 Construction Schedule

106.01 Project Inspection. The Engineer or Inspector shall inspect the progress and quality of the Work, including the preparation, fabrication or manufacture of Materials and Equipment, for conformity to the Contract Documents. The Engineer shall be provided access to all parts of the Project and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection. Inspection by the Engineer or an Inspector is solely for the benefit of the City and shall not relieve the Contractor of any of its responsibilities under the Contract Documents. When any unit of government, political subdivision or railroad corporation is to pay a portion of the cost of the Work, its representatives shall have the right to inspect the Work. Such inspection shall in no sense make any unit of government, political subdivision or railroad corporation a party to the Contract, and shall in no way interfere with the rights of the City or the Contractor under the Contract. The Inspector is not authorized to issue instructions contrary to the Contract Documents or to act for, or for the benefit of, the Contractor. Changes to the Contract Documents must be made in accordance with 117.01 through 117.12. No inspection performed pursuant to this Section shall constitute acceptance of the Work.

106.02 Rejection of Work. The Engineer or an Inspector shall have the authority to disapprove or reject any item of Work which is Defective, or that the Engineer or Inspector believes will not produce a Project that conforms to the Contract Documents, or that will prejudice the integrity of the design concept of the Project as a functioning whole as indicated by the Contract Documents. The Engineer or Inspector shall immediately notify the Authorized Representative and the Contractor at any time that Work has been disapproved or rejected. The Engineer or Inspector shall not be responsible for construction means, methods, manners, techniques, sequences, procedures, safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents. No failure of the Engineer or Inspector to reject the Work shall constitute acceptance of the Work.

106.03 Contract Administration. The Engineer or his designee shall provide administration of the Contract for the Project as provided by the applicable agreement between the City and the Engineer, if any, and the Contract Documents. The Engineer shall attend any

and all progress and coordination meetings. The Engineer shall prepare a written report of each progress and coordination meeting and transmit it to the Authorized Representative within three business Days of the meeting. The Engineer shall not delegate the duty to prepare the written report of any Project and coordination meeting attended. The Engineer or Inspector may authorize minor changes or alterations in the Work not involving additional costs or time and not inconsistent with the overall intent of the Contract Documents but has no authority to authorize the Contractor to perform additional or extra Work for which the Contractor will seek compensation in addition to the Contract price or extension of the time for Contract Completion. The Engineer shall review and approve, or recommend approval, of all forms required under the Contract Documents. The Engineer shall render decisions in connection with the Contractor's responsibilities under the Contract Documents and submit recommendations to the Authorized Representative for enforcement of the Contract as necessary.

106.04 Monitoring Progress. The Engineer shall monitor the progress of the Work for conformance with the Construction Schedule and shall initiate revisions of the Construction Schedule as required by the Contract Documents. In the event of default by the Contractor, the Engineer may pursue the Contractor's Surety to Contract Completion. The Engineer shall keep a daily log containing a record of weather, number of workers on site, identification of Equipment, Work accomplished, problems encountered, and other similar relevant data.

106.05 Interpretation. The Engineer will be the initial interpreter of all requirements of the Contract Documents. All decisions of the Engineer shall be subject to final determination by the City. Contractor acknowledges that Engineer, within its limited agency for the City, may consult with the City's legal counsel and that all such consultation and communications are privileged.

106.06 Authorization of Inspection, Testing and Approval. The Engineer shall authorize special inspection, testing or approval of the Work, as provided in 107.31, whenever in the Engineer's reasonable opinion such action is necessary or advisable to insure conformity with the Contract Documents.

106.07 Review of Payment Requests. Based upon the Engineer's on-site observations and evaluation of the Contractor's Payment Request, the Engineer shall review and certify the amounts due the Contractor. The Authorized Representative may recommend to the City that payment be withheld from, or Liquidated Damages be assessed against, a Contractor's Payment Request, stating the reasons for such recommendation. The Engineer's certification for payment shall constitute a representation to the City that the Work has progressed to the point indicated and that, to the best of the Engineer's knowledge, information and belief, the Work is in conformity with the Contract Documents and the Contractor is entitled to payment in the amount certified.

106.08 Review of Submittals. The Engineer shall review and approve or take other appropriate action upon the Contractor's submittals within the required time for the purpose of checking for conformity with the Contract Documents. Such review and approval shall not relieve Contractor of its duty to strictly conform to the Contract Documents.

106.09 Preparation of Change Orders. The Engineer shall prepare all Bulletins and Change Orders, including a cost estimate and supporting documentation and data. Once executed, a Change Order shall constitute the full and complete satisfaction for all claims of all direct and indirect costs, overhead costs of all kinds, inefficiency costs, acceleration costs, the cumulative impact of the Change Order and other Change Orders executed prior to it, the impact of the Change Order on unchanged work and interest related thereto, which has been or may be incurred by Contractor in conjunction with the change in scope and/or project extension set forth in the Change Order.

106.10 Final Inspections. The Engineer shall conduct inspections to determine the date of Contract Completion and shall receive, review and forward to the appropriate Person all Project record submittals required by the Contract Documents. Such inspection shall not constitute acceptance of the Work, nor shall it relieve Contractor from its duty to correct defective or non-confirming work not noted during the inspection.

106.11 Claims Services. The Engineer shall render analyses, written recommendations, or decisions, within the time specified, on all claims, disputes, or other matters in question between the Contractor and the City and shall provide information or services to the City until final disposition of all such claims, disputes, and matters. If Engineer does not approve a Contractor claim or fails to act within the required time, Contractor's claim shall be considered to be denied.

106.12 Project Rules and Hours. The Engineer shall consult with the Authorized Representative to obtain full knowledge of all City rules, regulations or requirements affecting the Project. The Engineer shall establish the regular working hours with the Contractors, subject to approval of the Engineer.

106.13 Construction Schedule. The Engineer shall review the Construction Schedule together with a schedule of submittals which is coordinated with the Construction Schedule in accordance with 109.05 through 109.09. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of 105.02 may be invoked.

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107.01 Construction Procedures. The Contractor shall be responsible for and have control over all construction means, methods, manners, techniques, sequences and procedures for all portions of the Contractor's Work and shall be responsible for any injury or damage which may result from the Contractor's Work or from improper construction, installation, maintenance or operation to the fullest extent permitted by law. Unless otherwise specified in the Contract Documents, the Contractor shall be responsible for properly and accurately laying out all lines, levels, elevations, grades and measurements for all the Work required by the Contract Documents and for the preservation of all related stakes and markers.

107.02 Cutting, Fitting and Patching. The Contractor shall do any cutting, fitting or patching required for the Contractor's Work and shall not endanger the Project by cutting, excavating or otherwise altering the Project, or any part of it. If Contractor requires sleeves, the Contractor shall furnish and coordinate the installation of the sleeves. The Contractor shall be responsible for the exact location and size of all holes and openings required to be formed or built for the Work, to permit coordination with any Work performed by other Persons on the Project. The Contractor shall allow sufficient time for installation of any Work performed by other Persons before covering or closing the applicable portion of the Project. Patching shall match and blend with the existing or adjacent surface. Any patching required because of Defective or ill-timed Work shall be done by and at the expense of the Contractor.

107.03 Excavation. The Contractor shall not cut away any Structure or dig under any foundation or into any wall, or any other part of the Project, without the written approval of the Engineer. Unless otherwise specified in the Contract Documents, the Contractor, prior to starting excavation or trenching, shall give notice at least two business Days in advance to the Owners of underground utilities registered with the Ohio Underground Utility Protection Services (OUPS) at www.oups.org, or by phone at (800) 362-2764 and the Owners of underground utilities shown on the Drawings and Specifications who are not registered members of OUPS. The Owner of an underground utility is required within forty-eight hours of notice, excluding Saturdays, Sundays and legal holidays, to stake, mark or otherwise designate the location of its utilities in the construction area together with its approximate depth. If any underground utility Owner fails to timely perform, the Contractor shall immediately notify the Engineer and contact the Owner of the underground utility. If any underground utility must be moved or adjusted, the Contractor shall notify the Owner of the underground utility in a timely manner so that the Work will not be delayed. Unless otherwise provided in the Contract Documents, any movement or adjustment of any underground utility or utility appurtenances, including without limitation electrical and gas meters, water and gas valves and light standards within the Project site is made by the Owner of the utility at the utility Owner's expense. In performing any excavation or trenching, the Contractor shall exercise caution and implement appropriate safety precautions to avoid property damage and personal injury. The Contractor shall backfill any excavation with the material specified and approved by the Engineer. The right to construct or reconstruct any utility service in the street or right of way or to grant permits for same, at any time, is hereby expressly reserved to the City and the Contractor shall not be entitled to any damages for the digging up of the street or Right-of-Way in accordance with such a permit. Any Person wishing to make an opening in the street must secure a permit from the City. The Contractor shall allow Persons bearing such permits, and only those Persons, to make openings in the street or Right-of-Way. When required by the Engineer, the Contractor shall make all necessary repairs due to such openings under the same conditions as the Work. Any adjustment of the Contract price or of the time for Contract Completion resulting from any such opening or repair may be made by Change Order. When the Work includes construction of underground lines and Structures, the Contractor shall make temporary restoration of street surfaces immediately upon completion of the underground lines and Structures, shall remove surplus excavated Materials and shall grade the street and put it into a safe and passable condition. The Contractor shall immediately refill any settlement in or adjacent to trenches for such construction to the proper grade.

107.04 Borrow and Waste Areas. A Change Order may be issued in accordance with 117.01 to 117.12 to permit the Contractor to use natural Materials found on the site of the Project.

Whenever Materials are to be borrowed or wasted in borrow or Waste Areas or, if allowed by the Contract Documents, wasted on the Project site, the Contractor shall prior to beginning borrow or wasting operations, obtain the Engineer's written approval of a detailed operation plan that addresses the following concerns:

- (a) Control of drainage water;
- (b) Cleanup, shaping, and restoration of disturbed areas;
- (c) Disposal of regulated Materials;
- (d) Avoidance of regulated areas;
- (e) Excavation and filling of waste and Borrow Areas;
- (f) Saving of topsoil;
- (g) Measures to minimize sediment runoff, including keeping sediment and other contaminants from leaving the Project site and from entering streams, lakes, or reservoirs by using methods provided in the Contract Documents.

The Contractor shall use the current versions of ODOT's *Sediment and Erosion Control Handbook* and the *Location and Design Manual, Volume 2, Drainage Design* to design and plot a sedimentation and erosion control plan on Project plan sheets and ensure the plan complies with all current provisions of ORC, Chapter 6111 and the NPDES permit. The Contractor shall not waste material and discharge dredge or fill Materials into the "Waters of the United States" or an isolated wetland without the required permits from U.S. Army Corps of Engineers (404 Permit) and the Ohio EPA (401 Permit). The Contractor shall have the proposed borrow and Waste Areas reviewed by a qualified environmental consultant approved by the City and have the environmental consultant certify that the proposed borrow and waste operations will not impact the "Waters of the United States" or an isolated wetland. If consultant certification is not provided, the Contractor shall obtain the 404/401 Permits necessary to perform the operations as proposed and have the environmental consultant certify that the Work conforms to the requirements of the permits. The Contractor shall provide copies of all documentation submitted to obtain the appropriate permits and copies of the permits to the Engineer. The Contractor shall not waste or borrow material from a cultural resource site or a site eligible for the national Register of Historic Places. For sites found to have historic or prehistoric human remains, the Contractor shall comply with the requirements of Sections 2909.05 and 2927.11, ORC. If the Contract Documents require a cultural resource investigation, a qualified environmental consultant approved by the City for cultural resource investigation shall be used to review and certify that the waste or Borrow Area:

- (a) does not impact a cultural resource;
- (b) is not a cultural resource;
- (c) is not eligible for the national Register of Historic Places; or
- (d) does not consist of historic or prehistoric human remains.

If burning is permitted under the OAC-3745-19 and Section 1503.18, ORC, the Contractor shall submit a copy of the Ohio EPA permit and the Ohio DNR permit to the Engineer and copies

of all information used to obtain the permit. All damage to surrounding property resulting from the instability of borrow and Waste Areas, the removal of borrow Materials, the placement of waste Materials, or the hauling of material to and from these areas is the sole responsibility of the Contractor. Prior to the disposal of waste Materials outside the Project site, the Contractor shall submit to the City an executed copy of the Contract or permission statement from the property Owner. The Contract or permission statement must indicate that the waste Materials are not the property of the City, that the City is not a party to the Contract or permission statement and that the Contractor and property Owner will hold the City harmless from claims that may arise from their Contract or permission statement. Restoration of all borrow and Waste Areas includes cleanup, shaping, replacement of topsoil, and establishment of vegetative cover by seeding and mulching according to the Contract Documents. The Contractor shall ensure that the restored area is well drained unless approval is given by the Engineer to convert a pit area into a pond or lake, in which case the Contractor shall confine restoration measures to the disturbed areas above the anticipated normal water level, and that any proposed waste location is not within the FEMA mapped one hundred year floodplain. If the proposed waste location is within the FEMA mapped one hundred year flood plain, the Contractor shall submit written approval from the local floodplain coordinator for the site. The floodplain coordinator contacts for each county are available through the Ohio DNR, Division of Water, (614) 265-6750. No extension of time or additional compensation will be paid for any delays due to not having the written permit(s) to waste in a floodplain.

107.05 Construction and Demolition Debris. OAC-3745-37, OAC-3745-400, and Chapter 3714 ORC, regulate the use and disposal of construction and demolition debris. The Contractor shall notify the local Board of Health or the local Ohio EPA office seven Days before placing clean hard fill off the Project site or Right-of-Way and submit copies of this notification to the Engineer. The Contractor shall dispose of debris containing wood, road metal, or plaster at a licensed construction and demolition debris site. The disposal of brush, trees, stumps, tree trimmings, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter is restricted. If allowed by the Contract Documents, the Contractor may waste brush, trees, stumps, tree trimming, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter within the Project site or the Right-of-Way. Otherwise, the Contractor shall submit a plan and any required permits to legally dispose of these Materials off the Project site or Right-of-Way to the Engineer and shall provide all documents submitted to obtain this permit to the Engineer. If the Project contains garbage or solid and hazardous waste, the Contractor shall comply with applicable laws and any applicable provisions of the Contract document for the removal of these items. When wasting PCC, the Contractor shall mix the PCC with at least thirty percent natural soil to construct an inner core in the Waste Area, cover this inner core with 3 feet of natural soil on the top and eight feet on the side slopes and place and compact the material according to the Contract Documents to prevent future settlement and sliding.

107.06 Manufacturer's Recommendations. The Contractor shall install all Work in accordance with the Contract Documents and any recommendations of the manufacturer, including required temperature and humidity for installation of the various Materials.

107.07 Construction Supervision. The Contractor shall provide continuous supervision at the Project by a competent Superintendent when any Work is being performed, unless waived by the Authorized Representative. The Superintendent shall have responsibility and authority to

act on behalf of the Contractor. All communications to the Superintendent shall be as binding as if given directly to the Contractor. The Contractor shall submit an outline of the qualifications and experience of the Contractor's proposed Superintendent, including references, to the Engineer within ten Days of the Notice to Proceed. The City reserves the right to reject the Contractor's proposed Superintendent. Any such rejection shall be determined by the Authorized Representative. Failure of the Authorized Representative to notify the Contractor of such rejection within thirty Days of receipt of the required information shall constitute notice that the City has no objection. If the City rejects the Contractor's proposed Superintendent, the Contractor shall replace the Superintendent at no additional cost to the City. The Contractor shall not change or terminate the Superintendent without written approval of the Authorized Representative. If the Contractor proposes to change or terminate the Superintendent, the Contractor shall submit to the Engineer a written justification for the change or termination, along with the name and an outline of qualifications experience of the Contractor's proposed new Superintendent, not less than ten Days prior to any change or termination. The procedure provided above shall be applied to evaluate the Contractor's proposed new Superintendent. If in the City's sole discretion, the performance of the Superintendent is unsatisfactory at any time, the City may require that Contractor replace such Superintendent with a Superintendent satisfactory to the City at no additional cost to the City.

107.08 Protection of Project, Property and Utilities. The Contractor shall protect the Work from weather, and shall maintain the Work and all Materials, including Materials delivered to the Contractor by the City, apparatus, fixtures and other items on or adjacent to the Project site free from injury or damage until Final Acceptance. Non-rubber tired vehicles or Equipment shall not be moved on City streets and off road vehicles shall not be used on bases or pavements without the written approval of the Engineer. Work or items likely to be damaged shall be covered or protected at all times to prevent damage. Any Work or item damaged by failure of the Contractor to provide coverage or protection shall be removed and replaced with new Work or a new item, as applicable, at the Contractor's expense. The Contractor shall perform the Work within the site of the Project and any applicable easement or Right-of-Way. Any adjacent property, including without limitation roads, walks, shrubbery, plants, trees or turf, damaged during the Contractor's Work shall be properly repaired or replaced at the Contractor's expense. Unless otherwise specified in the Contract Documents, the Contractor shall protect the Project and existing or adjacent property and utilities from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take precautions to prevent injury or damage to individuals or property. When mailboxes, road or street name signs and supports are within the Project site, the Contractor shall remove and erect them in a temporary location during construction in a manner satisfactory to the Engineer. After completion of the Work, the Contractor shall erect the mailboxes, road or street name signs and supports in a permanent location in accordance with the Drawings unless otherwise required by Change Order. Removal, temporary erection and permanent erection shall be in accordance with United States postal regulations. When cornerstones, monuments and property corner pins are encountered in the performance of the Work, and monument covers are not listed in the Bid, the City will supply them and supervise their precise location and installation, and the Contractor will furnish all the labor, Materials and Equipment required for such installations. 105.02 may be invoked for the cost to the City for repair, re-evaluation of location and replacement of any cornerstone, monument or property corner pin within the Project, damaged, destroyed or made inaccessible during the progress of the Work by the Contractor. Existing surface or overhead Structures or utility lines are not necessarily shown on the Drawings and the locations of those shown are approximations. The Contractor shall make such investigations as are necessary to determine the extent to which existing surface or overhead Structures may interfere with the

performance of the Work. Any sizes, locations, and depths for such Structures are approximations and the Contractor shall make such investigation or exploration as may be necessary to determine the actual sizes, locations and depths. The Contractor shall field locate all existing utilities before setting line and grade. Unless otherwise specified in the Contract Documents, the Contractor shall remove all snow and ice as may be required for access to and performance of the Work.

107.09 Load Restrictions. The Contractor shall not load, nor permit any part of the Project to be loaded, in any manner that will endanger the Project, or any portion thereof, nor shall the Contractor subject any part of the Project or existing or adjacent property to stress or pressure that will endanger the Project or property. The Contractor shall provide all temporary bracing, shoring and other structural support required for safety of the Project and proper execution of the Work, including without limitation all necessary support and protection of the property of any utility. The Contractor shall comply with all legal load restrictions in the hauling of Materials on public roads and shall operate Equipment of a weight or so loaded as to not cause damage to Structures, Roadway, or other construction. A special permit will not relieve the Contractor of sole liability for damage which may result from the moving of Equipment or Materials. The Contractor shall not haul on concrete pavement, base or Structures before the expiration of the curing period.

107.10 Materials and Equipment. The Contractor shall provide only new Materials and Equipment of the quality specified in the Contract Documents. The Contractor shall immediately remove Materials or Equipment not conforming to the requirements of the Contract Documents. The Contractor shall not incorporate Materials or Equipment, the defects of which have been corrected without written approval from the Engineer. If the City is to furnish any Materials, the City shall deliver them in accordance with the Contract Documents. The Contractor shall coordinate and schedule sufficient time for any such delivery. The Contractor shall provide domestically produced steel as required by law including Sections 153.011 and 5525.21, ORC, and Federal laws and regulations, if applicable. The Contractor shall furnish documentation to the Engineer evidencing the domestic origin of applicable steel and iron products before they are incorporated into the Project. Steel and iron products without a traceable, documented domestic origin will be treated as non-domestic products. The City may reject any item or material provided by a Contractor in violation of this requirement. The Contractor shall notify the Engineer of proposed sources of Materials prior to delivery. The Engineer may approve Materials at the source of supply before delivery. If the proposed source of supply cannot produce the specified Materials, the Contractor shall furnish Materials from Alternate sources without adjustment of the Contract price or the time for Contract Completion.

107.11 Storage. Only the material and Equipment which are to be used directly in the Work shall be brought to or stored at the Project by the Contractor and the Contractor's Subcontractors and Material Suppliers. The Contractor shall be responsible for the proper handling and storage of all material and Equipment brought or delivered to the Project to assure preservation of their quality and fitness for the Project and to facilitate inspection of them. Aggregates shall be transported from any storage site to the Project in tight vehicles so constructed as to prevent loss or segregation of Materials after loading and measuring in order that there may be no inconsistencies in the quantities of Materials intended for incorporation in the Project as loaded, and the quantities as actually received at the site of the Project. After any material or Equipment is no longer required for the Work, the Contractor shall promptly remove

such material and Equipment from the Project. The Contractor's Materials and Equipment shall not be stored in any Right-of-Way unless the location of such storage is approved by the Engineer. The Contractor shall, before storing Materials in gutters, lay suitable drains of sufficient size to carry all the storm water flowing in such gutters. Where the drainage from cross streets or alleys is interfered with or cut off by reason of the nature of the Work, the Contractor shall provide suitable crossings for pedestrians. No material or Equipment shall be stored within 20 feet of any fire hydrant. Private property shall not be used for storage of material and Equipment without the prior written permission of the Owner or lessee of the private property, and if requested by the Engineer, the Contractor shall provide a copy of the written permission to the Engineer. The Contractor shall restore all storage sites to their original conditions. The Contractor's material and Equipment shall not cause damage to the Project or adjacent property and shall not endanger any individual at, or in the vicinity of, the Project. Any injury to any individual or damage to property resulting from the Contractor's material or Equipment shall be the responsibility of the Contractor.

107.12 Labor. The Contractor shall maintain a sufficient workforce to timely perform the Work and enforce good discipline and order among the Contractor's employees and the employees of the Contractor's Subcontractors and Material Suppliers. The Contractor shall not permit employment of individuals not skilled in tasks assigned to them. The Contractor shall dismiss from the Project any individual employed by the Contractor or the Contractor's Subcontractors and Material Suppliers who is found by the Authorized Representative, pursuant to a recommendation from the Engineer, to be incompetent, guilty of misconduct, or detrimental to the Project. The Contractor shall employ all legal efforts to minimize the likelihood or effect of any strike, Work stoppage or other labor disturbance. Informational pickets shall not justify any Work stoppage.

107.13 Maintenance of Utilities. The Contractor shall at all times provide and maintain access to fire hydrants, water valves, water service boxes, gas valves, gas service boxes, manholes and other similar appurtenances. During the course of construction, the Contractor shall be solely responsible to notify any utility or other service when such utility or service is encountered. The Contractor shall protect all above ground utilities, Structures and appurtenances and shall replace any damaged portions thereof. The Contractor shall protect all below ground utilities, Structures and appurtenances that may be accurately located by removing manhole covers, valve box covers, and other access point coverings with reasonable effort using hand tools for such removal and shall replace any damaged portions thereof.

107.14 Maintenance of Traffic. Vehicular and pedestrian public traffic shall be maintained during the Project whether it is traffic through the Project or only cross traffic at intersections, unless otherwise provided in the Contract Documents. The Contractor shall make all repairs to roads necessary to maintain traffic to the satisfaction of the Engineer. If there are locations on the Project where Sewer or water line construction only is called for and a part of the existing pavement will remain in place, traffic shall be maintained and ingress and egress to all public and private entrances shall be provided. The Contractor shall provide all necessary flaggers. The Contractor shall provide and maintain access to adjacent property including by constructing necessary temporary walks, driveways, Bridges, crossings, and Roadways. The Contractor shall notify the applicable fire and police department whenever a street or alley, or a portion of a street or alley is about to be closed to traffic and shall provide notice when such street or alley or portion thereof is to be opened. In the event of the complete closure of any street,

alley or private drive, the City shall give notification to the occupants of all premises affected by the closure. The Contractor shall promptly notify the Engineer of all unforeseen effects of the Project on traffic. Unless the Contract Documents provide otherwise, all traffic control devices shall be furnished, erected, maintained and removed by the Contractor in accordance with the OMUTCD.

107.15 Safety Precautions. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of individuals on or adjacent to the Project and shall comply with all applicable provisions of federal, State and municipal safety laws, regulations, and building codes to prevent injury to individuals on or adjacent to the Project. The Contractor shall comply with the rules, regulations and orders of OSHA. The Contractor shall be responsible for any fine or cost incurred as a result of any violation or alleged violation of such rules, regulations or orders. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of the Project, including without limitations all Materials and Equipment incorporated or to be incorporated in the Project. Prior to the start of any Work, the Engineer shall meet with the Contractor and other applicable Person to coordinate the Contractor's methods and Equipment for protecting the Project, other property and individuals from damage or injury, in accordance with applicable regulations. The Engineer efforts at coordination shall not relieve the Contractor of any responsibility for safety or ensure the Engineer to become responsible for safety. Methods and Equipment for protecting the Project, other property and individuals shall be subject to inspection and approval of the appropriate authority having jurisdiction over the Project site.

107.16 Work Stoppage Due to Hazardous Materials. In the event the Contractor, except a licensed abatement Contractor, encounters Materials reasonably believed to contain asbestos, polychlorinated biphenyl (PCB) or other hazardous waste or material, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Authorized Representative and the Engineer in writing. A licensed abatement Contractor shall report the condition to the Authorized Representative and the Engineer in writing and shall remove the waste or material or render it harmless. The Work in the affected area shall be resumed upon written notice from the Engineer that the waste or material has been removed or rendered harmless. The term "rendered harmless" shall mean that the level of exposure is less than any applicable exposure standards set forth by OSHA or other applicable regulations. Hazardous Materials to be used at the Project shall be identified by a MSDS. The applicable MSDS shall be prepared by the Contractor and submitted to the Engineer prior to a hazardous material being brought to the Project site. The Contractor shall maintain all applicable MSDS on site whenever Work is in preparation or progress.

107.17 Vehicle Damage Claims. When a Person reports damage to a vehicle, whether orally or in writing, to the Contractor, the Contractor shall file a written report, including copies of applicable police reports, with the Authorized Representative within three Days.

107.18 Fire Hydrants. The Contractor shall make any necessary arrangements with the City Department of Water for any use of fire hydrants in connection with the Work and shall pay for all water used from the hydrants. Permits from the Department of Water for use of fire hydrants shall be provided to the Engineer upon request.

107.19 Engineer Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain in a clean condition the following temporary facilities, Equipment and services for use by the Engineer:

- (a) If space is available near the Project, 2 separate office spaces, both of which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;
- (b) If space is not available near the Project, a standard width job trailer shall be provided, which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;
- (c) Each office space shall be equipped with at least 1 desk, 1 desk chair and 2 side chairs and reasonable circulation space;
- (d) Each office space shall have 1 four-drawer filing cabinet or equivalent;
- (e) A plan rack and 4 by 8 foot plan table shall be provided in 1 office space;
- (f) Each office space shall have at least 1 telephone in service;
- (g) Use of a facsimile and copy machine shall be provided for use either in one of the office spaces or in an adjacent office space;
- (h) One office space shall have a computer to the City's criteria with electronic mail capabilities.

107.20 Meeting Spaces. Unless otherwise specified in the Contract Documents, the Contractor shall provide adequate space, Equipment and furnishings to conduct progress and coordination meetings for the Project. The meeting area shall be furnished with an appropriate meeting table and an appropriate number of folding or stacking chairs to adequately seat all participants at the meetings.

107.21 Temporary Heat. Unless otherwise specified in the Contract Documents, the Contractor shall provide temporary heat necessary so that the Work shall proceed expeditiously during inclement weather, and to protect the Contractor's Work and Materials from damage. From a date of partial occupancy, the City is responsible for the cost of providing heat for the occupied portion of the Project.

107.22 Water. Unless otherwise specified in the Contract Documents, the Contractor shall provide all water necessary for the Contractor's Work. From a date of partial occupancy, the City is responsible for the cost of water consumed for the occupied portion of the Project.

107.23 Hoists and Elevators. The Contractor shall provide and maintain adequate hoisting and elevator facilities as required for the Contractor's Work in coordination with the Engineer. If electric service requirements of hoisting or elevator facilities differ from that available at the Project site, the Contractor requiring use of such hoisting or elevator facilities shall make

and pay for all necessary connections. Unless otherwise specified in the Contract Documents, the Contractor requiring use of hoisting or elevator facilities, after the Project is enclosed, shall be responsible for transporting individuals and Materials as required for the Contractor's Work.

107.24 Electricity. Unless otherwise specified in the Contract Documents, the Contractor shall make all arrangements for temporary light and power services and shall pay all charges, both for service installation and removal, if required, and for energy consumed until Final Acceptance of the Project. Unless otherwise specified in the Contract Documents, the Contractor requiring any electrical service requirements relating to temporary hoists, cranes, welding Equipment or elevators shall subcontract with a licensed Contractor for such service requirements and shall be responsible for all costs of such services. From a date of partial occupancy, the City is responsible for the cost of energy consumed for the occupied portion of the Project.

107.25 Temporary Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide, and maintain in a clean condition, adequate and approved sanitary facilities for use by all Persons at the Project in coordination with the Engineer.

107.26 Drainage. The Contractor shall be responsible for all temporary drainage necessary for the Contractor's Work and shall employ pumps, trenches, drains, sumps or other necessary elements as required to afford satisfactory working conditions for the protection, execution and completion of the Project.

107.27 Environmental Protection. The Contractor shall comply with all applicable federal, State and local laws and regulations relating to pollution of the environment and shall take precautions to prevent pollution of water with fuels, oils, bitumens, calcium chloride, sediments and other Materials. When the work area is located in or adjacent to streams and other watercourses, the area shall be separated from the main stream by a dike or barrier to keep sediment from entering the stream. The Contractor shall take care during the construction and removal of such barriers to minimize siltation of the stream and watercourse. Control of ground water and water in excavations shall be accomplished in a manner that will prevent degradation of the quality of any surface water. Wells and well points shall be installed with suitable screens and filters where necessary to prevent the continuous pumping of fines. The discharge of sediment laden water from pumping shall be performed in a manner to prevent degradation of streams, watercourses, lakes, ponds, or other areas of water impoundment. Such prevention may require, without limitation, the use of ditch check dams, sediment traps, sediment basins, sediment pits, filters, filtration bags or other control devices and methods necessary to prevent adverse effects to surface waters as provided in Chapter 3745-1-04 OAC. The cost of constructing and maintaining these measures shall be borne by the Contractor. Water from aggregate washing or other operations containing sediment shall be treated by filtration, settling basins or other measures sufficient to reduce the sediment concentration to not more than that of the stream, watercourse, lake, pond or the area of water impoundment. The Contractor shall not cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to become airborne or cause or permit the Project to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne. The Engineer may require necessary measures to prevent particulate matter from becoming airborne including without limitation the paving or frequent cleaning of roads, driveways and parking lots,

the application of dust-free surfaces, the application of water and the planting and maintenance of vegetative ground cover. When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from the Project or Equipment in such manner and amount as to cause a nuisance or to violate any regulation, the Engineer may require that the Project or Equipment in which processing, handling and storage are done be tightly closed and ventilated in such a way that all air and gases and air or gas-borne material leaving the Project or Equipment are treated by removal or destruction of air contaminants be discharged to the open air.

107.28 NPDES General Permit. The Contractor shall secure any required NPDES general permit by submitting a notice of intent application form to the Ohio EPA at least forty-five Days prior to the start of construction. When required by law, the Contractor shall prepare and certify a storm water pollution prevention plan and process the required notice of termination prior to completion of the Project. The Contractor shall comply with all requirements and conditions of any NPDES general permit, including, but not limited to, implementing and maintaining the control measures specified in the storm water pollution prevention plan, maintaining records of construction activities, and removing Materials no longer required and taking proper action if there is a reportable quantity spill.

107.29 Building Permits. Unless otherwise specified in the Contract Documents, the Contractor shall secure the required general building permits. The Contractor shall schedule and attend all intermediate and Final Inspections required for any permit certification. The Contractor shall schedule inspection for occupancy permits with the appropriate local fire authority and State Fire Marshal. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any inspection.

107.30 Other Permits. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay the fees for any permit, license or tap in required by State or local authorities having jurisdiction over the Project, except the NPDES permit and the general building permits secured by the Engineer in accordance with 107.29. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any related inspection.

107.31 Inspection, Testing and Approval. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay for any inspection, testing or approval required by the Contract Documents, laws, ordinance, rules, regulations or orders of any public authority having jurisdiction over the Project. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for such inspection, testing or approval. The Contractor shall provide an original report of the inspection, testing or approval to the Engineer for approval. If, after the commencement of the Work, the Engineer determines that any portion of the Work requires special inspection, testing or approval, in addition to any inspection, testing or approval provided for or required by the Contract Documents, in order to insure conformance to the Contract Documents, the Engineer may instruct the Contractor in writing to order such special inspection, testing, or approval, or the Engineer may make the arrangements for same. If such special inspection, testing or approval reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall pay all costs associated with such special inspection, testing or approval. If such special inspection, testing or approval reveals that the Work is in compliance with the Contract Documents, the

Contractor will be paid, by appropriate Change Order, for all costs associated with such special inspection, testing or approval. Neither the observations of the Engineer in the administration of the Contract, nor any inspections, tests or approvals by Persons other than the Contractor shall relieve the Contractor from the Contractor's obligation to perform the Work in conformity with the Contract Documents.

107.32 Uncovering the Work. If any Work is covered contrary to the requirements of the Contract Documents or contrary to the written request of the Engineer, such Work must, if required by the Engineer in writing, be uncovered for observation and replaced, if not in conformity with the Contract Documents, and recovered at the Contractor's expense. If any Work has been covered in accordance with the Contract Documents and is Work which the Engineer had not requested the opportunity to observe prior to covering, the Engineer may request that such Work be uncovered by the Contractor. If such Work is found not to be in conformity with the Contract Documents, the Contractor shall pay all costs of uncovering, correcting, replacing, and recovering the Work. If such Work is found to be in conformity with the Contract Documents, a Change Order will be processed to pay the Contractor for the cost of uncovering, correcting, replacing, and recovering the Work, subject to final approval by the City Commission.

107.33 Correction of the Work. The Engineer shall notify the Contractor in writing if any Work is found by the Engineer to be Defective, whether observed before or after Contract Completion. The Engineer shall specify in the written notice the time within which the Contractor shall correct the Defective Work. The Contractor shall bear all costs of correcting such Defective Work, including the cost of any consequential damages. If the Contractor fails to correct any Defective Work within the time fixed in the written notice, the City may correct such Work and obtain recovery of all costs, including without limitation any consequential damages, and all attorneys' and consultants' fees, from the Contractor or the Contractor's Surety.

107.34 Interruption of Existing Services. Whenever it becomes necessary to interrupt existing services in use by the City or its residents, such as Sewer, water, gas, and steam lines, electric or telephone and cable service, the Contractor shall continue the Work on a non-stop twenty-four hour per Day basis until the Work is completed and the service restored, or at such Alternate time required by the Authorized Representative. Before beginning such Work, the Contractor shall apply in writing to and receive approval in writing from the Authorized Representative and the Person with appropriate jurisdiction over the Project, to establish a time when interruption of the service will cause a minimum of interference with the activities of the City, its tenants, if any, and the public.

107.35 Clean Up. During the progress of the Work, the Contractor shall be responsible for the removal and off-site disposal of all waste, excess Materials and rubbish, including without limitation layout stakes, sediment control devices and temporary Structures, attributable to the Work to an appropriate disposal site. Temporary on-site storage of waste, excess Materials and rubbish may be permitted as designated by the Engineer. Unless otherwise provided in the Contract Documents, the Contractor shall perform daily broom cleaning in the area of the Contractor's Work and shall, at the end of each working Day or upon notice from the Engineer, remove all waste Materials and rubbish from the Project. The Contractor shall, as required for the Project or upon notice from the Engineer, clean and remove any waste Materials or rubbish from areas adjacent to the Project. The Contractor shall, as required for the Project or upon

notice from the Engineer, take all necessary actions to minimize and clean dust and mud from the Project and adjacent property in accordance with City ordinances and regulations. If the Contractor fails to clean up during the progress of the Work, the provisions of 105.02 may be invoked. If the Contractor fails to maintain the areas adjacent to the Project clean and free of dust, mud, waste, excess Materials and rubbish, upon written notice from the Engineer, the Authorized Representative shall direct the local jurisdiction having responsibility for the area to clean the area or shall employ City employees or another Person to clean the area. The cost of cleaning the area adjacent to the Project shall be deducted from the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative shall be final, subject to proceedings in accordance with 118.01 through 118.11.

107.36 Explosives and Blasting. Blasting will not be permitted and explosives may not be brought onto or kept on the site of the Project, except with prior written approval of the Authorized Representative and any other authorities having jurisdiction, including without limitation the City's Fire Department. All blasting and all purchasing, storing and handling of explosives shall be done as prescribed in any applicable federal, State or City statutes, ordinances or regulations by Persons experienced in such Work. The Contractor shall carry appropriate liability insurance and shall be responsible for any injuries to individuals or damage to property resulting from any blasting operation. The Contractor shall provide a copy of the policy of such insurance to the Engineer prior to bringing any explosives to the Project and to the Authorized Representative upon request. The Contractor shall take all necessary precautions to protect the Project, existing or adjacent property, water lines, and other underground Structures from blasting. Where there is danger to Structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats. The Contractor shall notify all Owners of adjacent or utility property which may be affected of any intention to use explosives at least eight hours before blasting is commenced. Any inspection of use of explosives by the Engineer does not in any way reduce the responsibility of the Contractor or its Surety for damages that may be caused by such use.

107.37 Emergency. In the event of an emergency affecting the safety of the Project, other property, or individuals, the Contractor, without special instruction or authorization, shall act to prevent any threatened damage, injury, or loss. The Contractor shall give the Engineer and the Authorized Representative prompt written notice if the Contractor believes that any significant change in the Work or variation from the Contract Documents has been caused by any emergency or action taken in response to an emergency. If the Engineer recommends that a change in the Contract Documents be made because of any emergency or action taken in response to an emergency, and the Authorized Representative approves, a Change Order will be processed, subject to final approval by the City Commission, if applicable.

107.38 Royalties and Patents. The Contractor shall pay all royalties and license fees and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents and if, to the knowledge of the Engineer, use of the specified item is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Engineer in the Contract Documents. If the Contractor has reason to believe that use of the specified item is subject to

patent or copyright protection, the Contractor shall immediately notify the Authorized Representative.

ITEM 108 - SUBCONTRACTORS AND MATERIAL SUPPLIERS

108.01 Approval by City

108.02 Replacement

108.03 Contractor's Responsibility

108.04 Warranty and Guarantee

108.05 Prompt Payment

108.06 Prompt Payment Reduction and Interest

108.07 Affidavit of Claim

108.08 Claims Against Contract Bond

108.09 Assignment of Contract

108.01 Approval by City. Within ten Days of the Notice to Proceed, the Contractor shall list the Contractor's proposed Subcontractors and Material Suppliers on forms approved by the Authorized Representative and submit such forms to the Engineer for approval by the Authorized Representative. The City reserves the right to reject any Subcontractor or Material Supplier for any reason, in its sole discretion. Failure of the Engineer to notify the Contractor of rejection within ten Days of receipt of the forms shall constitute notice that the City has no objection. If the City rejects any Subcontractor or Material Supplier, the Contractor shall replace the Subcontractor or Material Supplier at no additional cost to the City.

108.02 Replacement. The Contractor shall not replace any Subcontractor or Material Supplier after execution of the Contract Form without written approval of the Authorized Representative. The Contractor shall submit to the Engineer amended approval forms and a written justification for the change of the Contractor's Subcontractors or Material Suppliers. The Contractor shall submit to the Engineer amended forms whenever any listed information changes for the Contractor's Subcontractors or Material Suppliers. The City may withhold approval of any such proposed replacement for any reason, in its sole discretion.

The City may require the Contractor to replace any Subcontractor or Material Supplier previously approved at no additional cost to the City if the Contractor is in default because of the Subcontractor's or Material Supplier's performance.

108.03 Contractor's Responsibility. The Contractor shall be fully responsible for all acts and omissions of the Contractor's Subcontractors and Material Suppliers and shall be responsible for scheduling and coordinating the Work of the Contractor's Subcontractors and Material Suppliers. Interference, disruption, hindrance, delay or impact attributable to the Contractor's Subcontractors or Material Suppliers shall be deemed to be interference, disruption, hindrance, delay or impact within the control and responsibility of the Contractor. The Contractor shall require that each of the Contractor's Subcontractors have a competent supervisor at the Project whenever Work is being performed by the Subcontractor. The Contractor agrees to bind the Contractor's Subcontractor and Material Supplier to the terms of the Contract Documents, so far as applicable to the Work of such Subcontractor or Material Supplier, and shall not agree to any provisions which seek to bind the City to terms inconsistent with or at variance from the terms of the Contract Documents. Contractor shall require the City to be named as an intended third-party beneficiary of all contracts between Contractor and Subcontractors and Material Suppliers such that the City will be entitled to enforce any rights thereunder to its benefit.

108.04 Warranty and Guarantee. The Contractor shall require each Subcontractor and Material Supplier to fully warrant and Guarantee, for the benefit of the City, the effectiveness, fitness for the purpose intended, quality and merchantability of any Work performed or item provided or installed by such Subcontractor or Material Supplier.

108.05 Prompt Payment. If a Subcontractor or Material Supplier requests payment in time to allow the Contractor to include the request in the Contractor's Contractor Payment Request, the Contractor shall pay within ten Days after receipt of payment from the City:

(a) To a Subcontractor an amount equal to percent of completion allowed by the City for the Subcontractor's Work;

(b) To a Material Supplier an amount equal to all or a portion of the Material Supplier's request for Materials furnished.

108.06 Prompt Payment Reduction and Interest. The Contractor may reduce the amount to be paid to a Subcontractor or Material Supplier pursuant to 108.05 by the amount of any retainage withheld from the Contractor and may withhold amounts necessary to resolve disputed liens or claims involving the Work of the Subcontractor or Material Supplier. If the Contractor fails to comply with the provisions of 108.05, the Contractor shall pay to the applicable Subcontractor or Material Supplier eighteen percent interest on any unpaid amount beginning on the eleventh Day after receipt of payment from the City.

108.07 Affidavit of Claim. In order to establish lien rights, Subcontractors and Material Suppliers not in privity of Contract with the Contractor must serve a notice of furnishing on the Contractor whose Contract is the Contract under which the Subcontractor or Material Supplier is performing. The notice of furnishing must be served upon the Contractor within twenty-one Days of performing the Work or furnishing the Materials. Subcontractors and Material Suppliers not in privity of Contract with the Contractor must, at the time of filing a Claim Affidavit with the Authorized Representative, provide a copy of the notice of furnishing and proof that it was received by the Contractor. In order to establish lien rights, a claimant must file a Claim Affidavit with the Authorized Representative, within one hundred twenty Days from the date of the last Work or furnishing of Materials. In order to receive priority over similar claims, the claimant must file a copy of the claim with the Montgomery County Recorder's office within thirty Days of serving the Authorized Representative. All claimants who serve the Authorized Representative, and file with the Montgomery County Recorder within thirty Days, have no priority among themselves and share in the funds prorata. Claimants, who file with the Authorized Representative, but not with the Montgomery County Recorder, are paid only if there are sufficient funds left after paying those claimants who file with the Montgomery County Recorder. The Authorized Representative shall notify the Contractor of the receipt of the claim within five Days of receiving the Claim Affidavit. A copy of the Claim Affidavit and a statement advising the Contractor of the Contractor's right to dispute the claim will accompany the notice. The Contractor shall have twenty Days to dispute the claim. If the Contractor does not notify the Authorized Representative in writing of an intention to dispute the claim within twenty Days after receipt of the Claim Affidavit, the Contractor is deemed to have assented to its correctness. The City shall detain the amount stated in the Claim Affidavit from subsequent Contractor Payment Requests and deposit said amount in an escrow

account in accordance with a general escrow agreement between the City and a bank. The escrow agent shall hold the deposit and any interest earned thereon until receipt of notice from the Authorized Representative specifying an amount to be released and the Person to whom the amount is to be released. The City reserves the right to pay a Claim Affidavit which is not timely disputed.

108.08 Claims Against Contract Bond. Laborers, Subcontractors or Material Suppliers who have furnished or delivered labor or Materials to the Project may, at any time after performing the labor or delivering the Materials, but not later than ninety Days after Final Acceptance of the Project, by the City, furnish the Surety a statement of the amount due. After furnishing the statement, laborers, Subcontractors or Material Suppliers must wait sixty Days to bring a suit for the amount due. If the Surety has not paid the claim at the expiration of sixty Days, laborers, Subcontractors or Material Suppliers may bring suit for amounts not paid, but must bring the suit within one year of Final Acceptance of the Project, by the City.

108.09 Assignment of Contract. The Contractor shall not sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of any right, title or interest therein, without written consent of the Authorized Representative. No sale, transfer, assignment or other disposition of the Contract shall in any case release the Contractor of liability under the Contract and the Contract Bond.

ITEM 109 CONSTRUCTION PHASE SCHEDULING

- 109.01 Compliance with Schedule**
- 109.02 Responsibility of Contractor**
- 109.03 Preceding Work**
- 109.04 Coordination with City**
- 109.05 Construction Schedule**
- 109.06 Schedule Information**
- 109.07 Construction Schedule Requirements**
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- 109.09 Approval and Acceptance Schedule**
- 109.10 Weekly Contractor Reports**
- 109.11 Monthly Progress Reports**
- 109.12 Time Recovery Plan**
- 109.13 Project Meetings**

109.01 Compliance with Schedule. The Contractor shall complete portions of the Work in such order and time as provided in the current Construction Schedule.

109.02 Responsibility of Contractor. The Contractor shall afford other Persons on the Project reasonable opportunity for the introduction and storage of Materials and Equipment and execution of Work and shall properly connect and coordinate the Contractor's Work with the Work of other Persons on the Project. The Contractor shall perform the Work so as not to interfere with, disturb, hinder, delay, or impact the Work of other Persons on the Project. If the Contractor, or any of the Contractor's Subcontractors or Material Suppliers, causes damage or injury to the property or Work of any other Person on the Project, or by failure to perform the Work with due diligence, delays, interferes with, hinders, disrupts or impacts any other Person on the Project, who suffers damage, injury or expense thereby, the Contractor shall be responsible to the other Person for such damage, injury or expense. Claims, disputes or actions between the Contractor and other Persons on the Project concerning such damages, injury or expense shall not delay completion of the Work which shall be continued by the parties to any such claim dispute or action. The Contractor shall coordinate the Work with the activities and responsibilities of other Persons on the Project, the Engineer and the City to complete the Project in accordance with the Contract Documents. In the event the Contractor fails to prosecute the Work in accordance with the Project Schedule, the Engineer may recommend that the provisions of 105.02 be invoked.

109.03 Preceding Work. If any part of the Contractor's Work is preceded by the Work of another Person, the Contractor shall inspect such preceding Work before commencing any Work, and report in writing to the Engineer any defects which render the preceding work unsuitable as related to the Contractor's work. Failure of the Contractor to make such inspection and report in writing shall constitute an acceptance of the preceding work as fit and proper for the reception of the Contractor's work, except for latent defects which such an inspection would fail to disclose.

109.04 Coordination with City. The Contractor shall supervise and coordinate the Work in conformity with any coordination from the Engineer and the Authorized Representative, as provided in the Contract Documents. The Contractor shall give reasonable notice to the Engineer

when the Engineer's presence is required for special consultations, decisions or recommendations, as required by the Contract Documents. The Contractor shall consult with the Engineer and the Authorized Representative to obtain full knowledge of all rules, regulations or requirements affecting the Project. The Contractor shall establish the regular working hours, subject to approval by the Engineer and the Authorized Representative. Night working hours and working hours on Sundays and holidays are not permitted without the prior written consent of the Engineer and the Authorized Representative. Such consent will not be provided unless the Contractor has given at least forty-eight hours' notice in writing to the Engineer. The Contractor shall cooperate with the Engineer and the Authorized Representative so as not to interfere with, disturb, hinder or delay the responsibilities of the Engineer and the City.

109.05 Construction Schedule. The Contractor shall prepare the Construction Schedule for the Project and a schedule of submittals which is coordinated with the Construction Schedule within thirty Days of the date of the Notice to Proceed or such longer period as mutually agreed between the Engineer and the Contractor in writing upon timely written request by the Contractor. The Contractor shall, within seven Days of the date of the Notice to Proceed, furnish to the Engineer a preliminary Construction Schedule for the prosecution of Work on the Project. The Engineer shall, within seven Days of receipt of the Contractor's preliminary Construction Schedule, provide comments on the preliminary Construction Schedule to the Contractor. The Contractor shall, within five Days of receipt of the comments, prepare a revised Construction Schedule to incorporate those comments and submit the revised Construction Schedule to the Engineer together with all information requested and required by the Engineer. The Engineer shall submit 4 copies of the revised Construction Schedule, together with any recommendation thereon in writing, to the Authorized Representative within three Days of receipt. The Construction Schedule shall not exceed the time limits specified in the Contract Documents and the Notice to Proceed, shall provide for reasonable, efficient and economical execution of the Work and shall be coordinated with the Work of all other Persons or the entire Project to the extent required by the Contract Documents. The Construction Schedule shall be used to plan, organize, and execute the Work, record and report actual performance and progress and show how the Contractor Plans to coordinate all Work to Contract Completion. In preparing the Construction Schedule the Contractor shall use critical path scheduling methods and shall provide without limitation, the information listed in 109.06, unless waived by the Authorized Representative in writing upon the written recommendation of the Engineer.

109.06 Schedule Information. In accordance with 109.05, the Contractor shall provide the following information:

- (a) A graphic presentation of the sequence of the Work for the Project which includes, without limitation, the Contractor's resource loading curve in the media and format required by the Engineer;
- (b) Identification of each phase of the Work and any milestone completion dates;
- (c) Identification of activities and durations for all shop drawing and other submittal review and approval, fabrication and review of mock-up Work, product review and procurement, fabrication, shop inspection and delivery including, without limitation, lead time, coordination drawing delivery, Punch List, Punch List corrections, Project close-out requirements, Contract Completion, and occupancy or utilization requirements;

- (d) Identification of disruptions and shutdowns due to other operations, facilities and functions, if any;
- (e) Identification of the critical path of the Work;
- (f) Identification of crew size and total resource hours for each activity in the Construction Schedule;
- (g) The Contractor's signature and date thereof on the Construction Schedule.

109.07 Construction Schedule Requirements. The Engineer shall provide complete Specifications for the paper and electronic formats of the Construction Schedule. The Contractor shall develop the Construction Schedule using commercially available Personal computer software acceptable to the Engineer, in graphic and tabular form. Final copies shall be provided in color and in such size as is appropriate for the level of detail and shall clearly and legibly show all relevant information. The Contractor shall provide monthly updates of the Construction Schedule and shall update the Construction Schedule if a time recovery plan is approved in accordance with 109.12, in electronic and paper formats, to the Engineer in graphic and tabular form. All base line and updated schedules shall be submitted electronically to the Engineer, in graphic and tabular form. The Contractor shall provide clear graphics, legends and other necessary data, including without limitation, milestones, constraints and items required by the Project and the Engineer. Unless waived by the Authorized Representative in writing upon written recommendation of the Engineer, each baseline and updated schedule shall show the Project name and Contract and contain lines for signatures and dates of signature for all Contractors involved in the Project. Each baseline and updated schedule shall provide activity identification and a description for each activity broken down to a maximum fifteen Day duration, responsibility of each applicable Contractor, the Contractor's resources and crew size for each activity, early start dates, early finish dates, late start dates, late finish dates, predecessor and successor activities for each activity, free float, total float and percentage completion. Each baseline and updated schedule shall identify the logic relationship between all activities and shall show all submittal dates, coordination drawing preparation, Working Drawing submittals and mark-up review and approval durations. Together with each updated schedule, the Contractor shall provide a list of all changes to the previously approved base line Construction Schedule or the previous updated Construction Schedule, including without limitation logic, float and actual start and finish dates of activities.

109.08 Use of Schedule and Float. The Construction Schedule and the Project Schedule, if applicable, shall be used as a tool for scheduling and reporting sequenced progress of the Work using early start dates and early finish dates. Free float and total float are resources of the Project and the use of float associated with an activity is not permitted without the concurrence of the Engineer, and other Contractors, if any.

109.09 Approval and Acceptance Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature or any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation. Immediately after the Contractor has signed the Construction Schedule, the Engineer shall submit it and the

schedule of submittals to the Authorized Representative or return them to the Contractor with recommendations for revision. In the absence of a Construction Schedule approved by the Contractor and accepted by the Authorized Representative, the City may withhold payment from the Contractor in accordance with 114.08 and 114.09. Alternatively, the City, in its sole discretion, may backcharge the Contractor in accordance with 105.02, reassign scheduling responsibility or suspend or terminate the Contract in accordance with 119.01 through 119.04.

109.10 Weekly Contractor Reports. Unless otherwise specified by the Contract Documents, the Contractor shall, on a bi-weekly basis, prepare and submit to the Engineer a written report describing activities begun or finished during the preceding week, work in progress, expected completion of the Work, a Projection of all activities to be started or finished in the upcoming two weeks including without limitation the Contractor's workforce crew size with respect to each activity of Contractor, and total resource hours associated with such Work and any other information requested by the Engineer.

109.11 Monthly Progress Reports. Unless otherwise specified in the Contract Documents, the Engineer shall provide monthly progress reports to the Authorized Representative, which shall include recommendations for adjusting the Construction Schedule or the Project Schedule, as applicable, to meet milestone completion dates and Contract Completion dates.

109.12 Time Recovery Plan. When it is apparent to the Engineer that critical path activities, scheduled milestone completion dates, or Contract Completion dates will not be met, the Engineer shall submit to the Contractor a time recovery plan to avoid or minimize any delay. A time recovery plan may include, without limitation, increasing the Contractor's workforce in such quantities as will eliminate the backlog of Work, increasing the number of working hours per shift, shifts per workday, workdays per week, the amount of construction Equipment, or any combination thereof, rescheduling of activities to achieve maximum practical concurrency of work efforts and, if appropriate, time extensions. If the Contractor approves the time recovery plan within ten Days of receipt, a revised Construction Schedule shall be prepared by the Contractor and signed and accepted in accordance with 109.11 and, if applicable, a revised Project Schedule shall be prepared by the Engineer and approved and signed by the Contractors in accordance with 109.10. If the Contractor fails to approve a time recovery plan within ten Days of receipt, the Contractor shall immediately provide an Alternate time recovery plan to the Engineer in writing, for review and acceptance in accordance with 109.11 and, if applicable, 109.10.

109.13 Project Meetings. The Contractor and all appropriate Subcontractors shall attend Project meetings as requested by the Engineer. The purpose of the Project meetings may include, without limitation, review of progress in the Work, discussion of anticipated progress, and review of critical operations and existing and potential problems and safety matters. The Contractor shall be represented at every Project meeting by a Person authorized with signature authority to make decisions regarding possible modification of the Contract Documents. The Engineer shall notify the Contractor of the time and place of each Project meeting. The Contractor shall have any of the Contractor's Subcontractors and Material Suppliers attend a Project meeting as deemed advisable by the Contractor or as requested by the Engineer. The Engineer or the Engineer's designated representative shall prepare a written report of each Project meeting and distribute such report to the Authorized Representative and the Contractor. The Engineer or the Engineer's designated representative, as applicable, shall not delegate the duty to prepare a

written report of each Project meeting. If any Person objects to anything in a report of a Project meeting, the Person shall notify the Engineer, the Authorized Representative and any other affected Person in writing explaining the objection. The Engineer shall attach any objection made to a report of a Project meeting and any response thereto to the report.

ITEM 110 - WORKING DRAWINGS AND SAMPLES

110.01 Requirement to Provide

110.02 Samples, Tests, Cited Specifications

110.03 Source Sampling and Testing

110.04 Form of Submittals

110.05 Variation from Contract Documents

110.06 Contractor's Review

110.07 Engineer's Review

110.08 Risk of Nonpayment

110.09 Manufacturer's Statement

110.01 Requirement to Provide. Working Drawings, Samples and other submittals, including without limitation stress sheets, erection Plans, falsework Plans, cofferdam Plans, bending diagrams for reinforcing steel, formwork, Plans, and tunneling Plans, shall be provided by the Contractor for any item required by the Contract Documents but not fully described in the Drawings and Specifications, unless waived by the Engineer, and shall include, without limitation:

(a) Construction of the various parts, method of jointery, type of material, grade, quality and thickness of material, alloy of material, profiles of all sections, reinforcement, anchorage, type and grade of finish;

(b) Capacities, types of Materials and performance charts that are pertinent to the Materials and performance charts that are pertinent to the Work. Wiring diagrams, control diagrams, schematic diagrams, working and erection dimensions, arrangement and Specifications;

(c) Notwithstanding any measurements in Drawings or Specifications, where the Work involves repair, renovation, extension or alteration of, or addition to, an existing Structure, the Contractor shall make such measurements of the existing Structure as may be required to accurately attach the Work to the Structure.

110.02 Samples, Tests, Cited Specifications. Unless otherwise provided in the Contract Documents, the City shall test Samples of Materials in accordance with AASHTO, ASTM, AWWA or methods on file in the office of the Director at the expense of the City. Samples will be taken by a qualified representative of the City. References included in these Specifications to AASHTO, ASTM, AWWA, or federal Specifications shall be to the test method, sampling method or specification in effect upon the date of the notice to Bidders for the Contract. Copies of all test results will be furnished to the Contractor. The Contractor shall cooperate fully in the sampling and inspection of Materials and shall notify the Engineer immediately upon the arrival of Materials to be used in the Work. The City reserves the right to retest all Materials and Equipment that have been stored prior to incorporation of those Materials into the Project and to reject all Materials and Equipment which, when retested, do not meet the requirements of the Contract Documents. The Contractor, in all cases, shall furnish the required Samples without charge. Transports and distributors hauling bituminous material shall be equipped with an approved submerged bituminous Materials sampling device.

110.03 Source Sampling and Testing. The Engineer may undertake the sampling and testing of Materials at the source of supply. If source sampling and testing is undertaken:

- (a) The Contractor shall cooperate and assist the Engineer, including without limitation in compliance with applicable inspection, sampling and test requirements, and shall provide all necessary documentation;
- (b) The Contractor shall provide full entry at all times to the parts of the source as may concern the manufacture or production of the Materials being sampled and tested;
- (c) If required by the Engineer, the Contractor shall arrange for an approved building for the use of the inspection which building shall be located conveniently near the source and independent of any building used by the Materials producer;
- (d) The Contractor shall provide and maintain adequate safety measures at the plant at all times;
- (e) The City reserves the right to retest all Materials that were tested at the source prior to the incorporation of those Materials into the Project and to reject all Materials which, when retested, do not meet the requirements of the Contract Documents.

110.04 Form of Submittals. The Contractor shall provide a submittal letter and shall stamp and submit the working Drawings or other submittals to the Engineer in accordance with a schedule established by the Engineer and the Contractor. Unless otherwise specified in the Contract Documents, the Contractor shall submit 3 prints of all working Drawings and 4 copies of any other submittal. Only 1 print copy of all working Drawings will be returned to the Contractor by the Engineer. If the Contractor requires more than 1 copy, additional copies must be provided to the Engineer at the time of the original submission. The Engineer will not produce copies of the working Drawings. The data shown on the working Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, Materials and similar data to show the Engineer the Materials and Equipment which the Contractor proposes to provide. Each sample shall be identified clearly as to material, supplier, and pertinent data such as catalog numbers and the use for which intended and other uses as the Engineer may require to enable the Engineer to intelligently review the submittal. All working Drawings shall indicate the applicable plan sheet and Specifications.

110.05 Variation from Contract Documents. If the working Drawings or other submittals show variations from the requirements of the Contract Documents, the Contractor shall make specific mention of such variations in the Contractor's letter of submittal to the Engineer. If the variation is acceptable to the Engineer, the Engineer shall recommend acceptance of the variation to the Authorized Representative in writing. Upon written approval of the Authorized Representative, the variation shall be incorporated into the Contract Documents. The Contractor shall not be relieved of any responsibility for deviations from the requirements of the Contract Documents by the Engineer's review of working Drawings, Samples or other submittals.

110.06 Contractor's Review. All working Drawings, Samples and other submittals shall be reviewed and stamped by the Contractor prior to submittal to the Engineer. If it is apparent to the Engineer that the Contractor has not reviewed the submittals, or has conducted an incomplete

review, the Engineer shall reject the submittals. The Contractor shall field verify conditions as necessary and make corrections of dimensions, location of various items, encroachments of Work or variations from the requirements of the Contract Documents. If required by the Contract Documents or applicable law, the Contractor shall have the working Drawings or other submittals prepared by Persons possessing expertise and experience in an appropriate trade or profession or by a licensed Engineer, landscape architect, or other design professional.

110.07 Engineer's Review. The Engineer shall review and approve or disapprove working Drawings, Samples or other submittals within fifteen Days of receipt or in accordance with the approved submittal schedule or such other period of time as is mutually agreed by the Engineer and the Contractor. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of working Drawings, Samples or other submittals until approved, which resubmission shall be acted upon by the Engineer with fifteen Days of receipt or such other period of time as is mutually agreed by the Engineer and the Contractor. When resubmitting submittals, the Contractor shall direct the Engineer's attention to any revisions made by noting such revisions on the resubmitted submittal. All costs incurred by the Engineer, the City or other Persons due to the failure of the initial submittal to substantially meet the requirements of the Contract Documents, or due to excessive resubmittals, for attendant delay, interference, hindrance, disruption or impact of the Project, shall be paid by the Contractor. Resubmittals in excess of two may be deemed excessive by the City. The Engineer's review and approval of working Drawings, Samples and other submittals is to determine if the items covered by such submittals will, after installation and incorporation into the Work, conform to the Contract Documents and be compatible with the design concept of the Project as a functioning whole. The Engineer's review and approval shall not extend to means, methods, manners, techniques, sequences, procedure of construction or to safety precautions or programs incident thereto. The Engineer's review and approval of a separate item will not indicate approval of the assembly in which the item functions.

110.08 Risk of Nonpayment. No portion of the Work requiring a Working Drawing, sample or other submittal shall be commenced until the submittal, has been reviewed and approved by the Engineer. Any Work commenced by the Contractor prior to final approval of the Working Drawing, sample or other submittal by the Engineer shall be performed by the Contractor under risk that no payment will be approved or made by the City for such Work.

110.09 Manufacturer's Statement. Working Drawings on all Equipment shall include the following written statement from the manufacturer of the Equipment:

"This Equipment submitted for approval shall perform as specified when installed by the Contractor in the arrangement shown on this drawing and in the Contract Documents and in conjunction with all other accessories such as flues, breachings, piping, controls and Equipment not furnished by this manufacturer but required as an accessory or supplement to this Equipment, providing that the accessory or supplementary items perform as specified and are installed as shown in the Contract Documents."

ITEM 111 PREVAILING WAGE RATES

111.01 Prevailing Wages

111.02 Prevailing Wage Determination

111.03 Fines and Penalties

111.04 Wage Schedule

111.05 Payroll Reports

111.01 Prevailing Wages. The Contractor shall pay the prevailing wage rates of the Project locality, as determined by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour bureau, or the U.S. Department of Labor to laborers and mechanics performing Work on the Project, as applicable. The Contractor shall comply with the provisions, duties, obligations, and is subject to the remedies and penalties of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act, as applicable.

111.02 Prevailing Wage Determination. The Contract Documents include pages setting forth the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour Bureau, or the U.S. Department of Labor for the Project, as applicable. The City shall, within seven business Days after receipt of a notice of a change in the prevailing rates, notify the Contractor of the change. The Contractor shall make the necessary adjustment in the prevailing wage rate and shall pay any wage increase during the term of the Contract.

111.03 Fines and Penalties. Whoever violates Section 4115.08 or 4115.09, ORC, shall be fined pursuant to the applicable provisions of the Ohio Revised Code. Whoever violates division (C) of Section 4115.071, or Section 4115.10 or 4115.11, ORC is guilty of a misdemeanor of the second degree for a first offense. For each subsequent offense such Person is guilty of a misdemeanor of the first degree. Fines and penalties under the Davis-Bacon Act shall be as determined by the U.S. Department of Labor and in accordance with applicable law.

111.04 Wage Schedule. Within ten Days of the date of the Notice to Proceed, the Contractor shall provide the City's prevailing wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

111.05 Payroll Reports. The Contractor shall submit weekly payroll reports with each Contractor Payment Request, which reports shall be certified by the Contractor that the payroll is correct and complete and the wage rates shown are not less than those required by the Contract. The Contractor shall be responsible for submitting all payroll reports of the Contractor's Subcontractors. The payroll report shall indicate the week covered and shall include a list containing the name, address and social security number of each employee of the Contractor and the Contractor's Subcontractors paid for the Work. The payroll report shall list the number of hours each employee worked each Day on the Project during the reporting period, the total hours each week on the Project, the employee's hourly rate of pay, job classification, fringe benefits and all deductions from wages and net pay. The payroll report shall also list each fringe benefit and state if it is paid as cash to the employee or to a named plan. The Contractor and the Contractor's

Subcontractors shall also submit apprenticeship agreements for all apprentices utilized on the Project.

ITEM 112 INSURANCE

112.01 Contractor's Liability Insurance

112.02 Policy Limits

112.03 Explosion, Collapsed and Underground Insurance

112.04 Builder's Risk Insurance

112.05 Coverage Amount

112.06 Railroad Protective Insurance

112.07 Insurance Policy Requirements

112.08 Renewal Certificates

112.09 Waivers of Subrogation

112.01 Contractor's Liability Insurance. The Contractor shall purchase and maintain such liability and other insurance as will protect the Contractor from claims described below which may arise out of or result from the Contractor's performance or obligations under the Contract Documents, whether due to action or inaction by the Contractor, a Subcontractor, any Person directly or indirectly employed by the Contractor or a Subcontractor or any Person for whom the Contractor or a Subcontractor is responsible, or by any Person for whose acts the Contractor or a Subcontractor may be liable:

- (a) Claims under workers' compensation, occupational sickness or disease, disability benefit and other similar employee benefit acts;
- (b) Claims for damages because of bodily injury, disease, illness, death or Personal injury, and other claims usually covered by bodily injury liability insurance;
- (c) Claims for damages because of injury to or destruction of property and other claims usually covered by property damage liability insurance.

The Contractor shall comply with all provisions of the Ohio Workers Compensation Act and all rules of the Ohio Bureau of Workers' Compensation. In addition, if a portion of the Work is performed from a barge or a ship or requires unloading Materials from a barge or a ship on a navigable waterway of the United States, the Contractor shall arrange coverage for that portion of the Work under the Longshore and Harborworkers' Compensation Act, 33 U.S.C. Section 901, et seq., and the Jones Act, 5 U.S.C. Section 751, et seq. and shall provide proof of such coverage to the City. Comprehensive Automobile Liability Insurance shall cover owned, non-owned and hired vehicles.

112.02 Policy Limits. A Commercial General Liability policy and Business Automobile Liability policy shall be maintained to provide insurance as described below. An Umbrella or Excess Liability policy may be used in combination with the Commercial General Liability and business Automobile insurance to meet such limits:

- (a) Policy Limits Commercial General Liability**
 - \$2,000,000 General Aggregate
 - \$2,000,000 Products/Completed Operations Aggregate
 - \$1,000,000 Occurrence Limit
 - \$1,000,000 Personal and Advertising Injury Limit
 - \$100,000 Fire Legal Liability Limit
 - \$10,000 Medical Payments
- (b) Policy Limits Comprehensive Automobile Liability**
 - \$1,000,000 Bodily Injury & Property Damage Occurrence Limit

Contracts in the amount of one hundred thousand dollars or less shall require coverage in the amount of not less than two million dollars general aggregate and one million dollars per occurrence. Contracts in excess of one hundred thousand dollars, but not more than five million dollars shall require coverage in the amount of not less than three million dollars general aggregate and per occurrence. Contracts exceeding the amount of five million dollars shall require coverage in an amount to be determined by the Authorized Representative but in no case less than five million dollars general aggregate and per occurrence. Such policies shall be endorsed to provide that the General Aggregate Limit applies separately to each of the insured Contractor's Projects. By requiring such insurance and insurance limits herein, the City does not represent that coverage and limits will necessarily be adequate to protect the Contractor, and such coverage and limits shall not be deemed as a limitation on the Contractor's liability under the indemnities granted to the City.

112.03 Explosion, Collapsed and Underground Insurance. For any demolition, excavating, tunneling, shoring or similar operations, the Contractor shall purchase and maintain Explosion, Collapse and Underground (XCU) coverage with a limit of liability equal to such limit as specified in 112.02. In addition, if blasting is to be performed, the Contractor shall purchase and maintain XCU coverage providing a minimum Aggregate Limit of 5,000,000 dollars and Each Occurrence Limit of 1,000,000 dollars.

112.031 Pollution Liability Insurance. If required by the Contract Documents, Contractor shall purchase and maintain pollution liability insurance with a limit for any one incident of not less than \$1,000,000 and an aggregate limit of not less than \$2,000,000.

112.032 Completed Operations Insurance. Contractor shall purchase and maintain completed operations coverage to cover such claims for bodily injury or property damage arising out of the Contractor's completed operations, which coverage shall be maintained for no less than five (5) years following final payment.

112.04 Builder's Risk Insurance. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain, during the progress of the Work and until the execution of the Certificate of Contract Completion by the Authorized Representative, a builder's risk insurance policy to cover all Work in the course of construction including falsework, temporary buildings and Structures and Materials used in the construction process, stored on or off site, or while in transit. The amount of coverage shall equal the total completed value of the Project (including the value of permanent fixtures and decorations). Such insurance shall be on a special cause of loss form, which provides coverage on an open perils basis insuring against the direct physical loss of or damage to covered property including flood and earthquake. It shall also include debris removal and demolition occasioned by enforcement of any applicable legal requirement, and shall cover reasonable compensation for the City's services and expenses required to limit further loss. Coverage must include provision to pay the reasonable extra costs of expediting temporary and permanent repairs to, or permanent replacement of, damaged property. This shall include overtime wages and the extra cost of "express" or other means for rapidly transporting Materials, Equipment and supplies necessary to such repair or replacement. The builder's risk policy shall protect both the Contractor and the City from loss and provide coverage for Materials in transit or stored off site and identified for the Project. Coverage for other perils may be required if specified in the Special Provisions.

112.05 Coverage Amount. Unless otherwise specified in the Contract Documents, the builder's risk policy shall be written in the amount equal to one hundred percent of the Contract price, including landscaping, paving and other sitework. The builder's risk policy shall specifically permit and allow for partial occupancy by the City prior to Final Acceptance of the Project by the City.

112.06 Railroad Protective Insurance. Where the Contract requires railroad Protective Insurance and no specific Bid item is provided in the Proposal for the payment of the premium therefore, the cost of such insurance shall be included in the various other Bid items in the Contract.

112.07 Insurance Policy Requirements. Each policy of insurance required to be purchased and maintained by the Contractor shall be obtained from an insurance company authorized by the Ohio Department of Insurance to do business in the State and shall name the City as an additional insured or loss payee, as applicable; provided, however, that such designation shall not cause any claim between the Contractor and the City to be waived except as set forth in 112.09. Each policy and the respective certificate of insurance shall expressly provide that no less than thirty Days prior written notice shall be given to the City in the event of cancellation, non-renewal, expiration or material alteration of the coverage contained in such policy or evidenced by such certificate of insurance. Each policy shall provide that the City shall be covered notwithstanding any action, omission or negligence of the Contractor. Each policy shall be primary and non-contributory. Each policy must include contractual liability insurance covering the Contractor's indemnity obligations. The Contractor shall furnish the City, when requested, a certified copy of any insurance or additional insured or loss payee endorsement required to be purchased or maintained by the Contract Documents. In no event shall any failure of the City to demand a certified copy of any required insurance or endorsement be construed as a waiver of the obligation of the Contractor to obtain insurance required to be purchased or maintained by the Contract Documents. Except for its completed operations insurance, the Contractor shall maintain all insurance in the required amounts, without interruption, from the date

of the execution of the Contract Form until the date of approval of the Certificate of Contract Completion by the Authorized Representative. The Contractor shall require all Subcontractors to provide Workers' Compensation, CGL, and Automobile Liability insurance with the same minimum limits specified herein, unless the Owner agrees to a lesser amount and require the City be named as an additional insured and/or loss payee under such policies. Failure to maintain the required insurance during the time specified shall be cause for termination of the Contract. If the Contractor fails to purchase and maintain, or require to be purchased and maintained, any insurance required under these Specifications, the Owner may, but shall not be obligated to, upon three (3) days written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor upon demand. Insurance policies required to be purchased and maintained by the Contractor may include a reasonable loss deductible and exclusions, which shall be the responsibility of the Contractor to pay in the event of loss. The prompt repair or reconstruction of the Work as a result of an insured loss or damage shall be the Contractor's responsibility and shall be accomplished at no additional cost to the City.

112.08 Renewal Certificates. If the Contractor provides certificates of insurance showing expiration prior to the date of final completion, the Contractor shall provide new certificates to the City showing continuing coverage prior to expiration.

112.09 Waivers of Subrogation. The City and the Contractor waive all rights against each other for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to Item 112 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the City as fiduciary.

ITEM 113 INDEMNIFICATION

113.01 Indemnification for Injury or Damage

113.02 Indemnification for Patent or Copyright Use

113.01 Indemnification for Injury, Damage or Breach of Contract. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the City, the Engineer, any participating railroad or railway company, any property Owner or lessee of adjacent property, or utilities and any private Person providing financing for the Project, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities, from and against all claims, damages, losses, and expenses, direct, indirect or consequential, including but not limited to all fees and charges of design professionals, attorneys, and other professionals and all court, arbitration, or other dispute resolution costs, arising out of or resulting from any claim or action, legal or equitable, caused or alleged to have been caused by the Contractor's performance of the Work or any breach of the Contractor's obligations under the Contract Documents, including but not limited to the breach of any warranty provided in the Contract Documents.

In the event of any such injury, including death, or loss or damage, or claims therefore, the Contractor shall give prompt notice thereof to the Engineer and the Authorized Representative. This provision is intended to be, and shall be construed, as consistent with, and not in conflict with, Section 2305.31 ORC, to the fullest extent permitted. The indemnification obligations of the Contractor under this 113.01 shall not extend to the liability of the Engineer, the Engineer's officials, consultants, agents, representatives or employees for negligent preparation or approval of Drawings, specification, Change Orders, opinions, and any other responsibility of the Engineer, except to the extent covered by the Contractor's insurance.

113.02 Indemnification for Patent or Copyright Use. To the fullest extent permitted by law, the Contractor shall indemnify, hold harmless and defend the City and the Engineer, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities from and against all claims, damages, losses and expenses arising out of the Contractor's infringement of patent rights or copyrights.

ITEM 114 CONTRACTOR PAYMENT

- 114.01 Contract Cost Breakdown**
- 114.02 Contractor Payment Request**
- 114.03 Payment Date**
- 114.04 Labor Payments**
- 114.05 Material Payments**
- 114.06 Retainage**
- 114.07 Retainage Reduction with Consent of Surety**
- 114.08 Payments Withheld**
- 114.09 Payments Detained**
- 114.10 Measurement of Quantities**
- 114.11 Final Payment Request**
- 114.12 Final Payment Date**
- 114.13 Waiver of City's Claims**
- 114.14 Waiver of Contractor's Claims**

114.01 Contract Cost Breakdown. The Contractor shall submit to the Engineer a full, accurate and detailed estimate (the Contract Cost Breakdown) of the various kinds of labor to be performed and material to be furnished, with separate amounts shown for labor and Materials for each branch of Work, following the preferred titles and sequences of sections in the format used by the Engineer in developing the Specifications. The grand total shown on the Contract Cost Breakdown must equal the total Contract price. The City reserves the right to use the approved Contract Cost Breakdown to determine the cost or credit resulting from any change in the Work. The first item should be actual aggregate cost of Contract Bond, insurance, permits and tests required for the Work. The amounts for labor and material shall accurately reflect the cost for each item. Separate items shall not be shown for overhead or profit, but shall be included in the totals for labor and Materials. Whenever the material allocation exceeds fifty-five percent of the Contract price, the Contractor shall provide, upon request, sufficient information to support such higher percentage. Subcontract Work shall show amounts for labor and Materials. Fringe benefits shall be shown as a part of labor costs. When more than one major Structure is included in the Contract, the Contract Cost Breakdown shall be subdivided accordingly if requested by the Engineer, with cost details for each Structure shown separately. A line item shall be included for commissioning, Punch List Work, Project record document submittals, delivery of inventory and specified training. The Contract Cost Breakdown will be returned to the Contractor for resubmittal if it does not meet the requirements set forth above or contains insufficient items or details of the Work. No payment will be made without an approved Contract Cost Breakdown.

114.02 Contractor Payment Request. The Contractor shall submit monthly to the Engineer an itemized Payment Request for Work performed based upon the Contract Cost Breakdown on a form satisfactory to the Authorized Representative. The Contractor Payment Request shall be supported by documentation substantiating the Contractor's right to payment. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.03 Payment Date. Payment of an approved Payment Request shall be made within thirty Days from the date of approval by the Engineer. The City reserves the right to require proof of the renewal of required insurance as a condition precedent to payment. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and the Authorized Representative.

114.04 Labor Payments. Partial payments to the Contractor for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety percent of the amount invoiced through the Payment Request which shows the total Contract Completion at fifty percent or greater. After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved.

114.05 Material Payments. Through the Payment Request which shows total Contract Completion at fifty percent or greater, the City shall pay to the Contractor a sum at the rate of ninety percent of the invoice cost, not to exceed the applicable Bid amount in a Unit Price or lump sum Contract, for material delivered on the site of the Project, or other point in the vicinity of the Project, or other storage site approved by the Engineer, provided the Contractor provides the following information with the Payment Request:

- (a) A list of the fabricated Materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost;
- (b) A certification of Materials stored off site, prepared by the Contractor and signed by the Engineer to evidence that the Materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project. All costs incurred by the Engineer to visit a storage site, other than the areas adjacent to the Project, shall be paid by the Contractor.

After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for Materials furnished under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved. When payment is allowed on account of material delivered on the site of the Project or in the vicinity thereof or under the possession and control of the Contractor but not yet incorporated therein, such material shall become the property of the City, but if such material is stolen, destroyed, or damaged by casualty before being used, the Contractor will be required to replace it at the Contractor's expense. Any such material not ultimately incorporated into the Project may, at the option of the City, be retained by the City or returned to the Contractor for credit to the City of a proportionate amount. Completed line items concealed, underground and buried and not subject to final Punch List may be paid for at the rate of one hundred percent. Such completed line items subject to a final Punch List requiring testing or start-up shall be paid at the rate of ninety-eight percent.

114.06 Retainage. The City will not deposit retainage in any escrow account and will not pay interest on retainage. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract. Payment of retainage to the Contractor shall not be due until thirty Days after approval of a final Contractor Payment Request by the City and execution of the Certificate of Contract Completion by the City. Any reduction or release of retainage, or portion thereof, shall not be a waiver of the City's right to retainage in connection with other payments to the Contractor, or any other right or remedy the City has under the Contract Documents, at law or in equity.

114.07 Retainage Reduction with Consent of Surety. Upon consent by the Contractor's Surety, the City may reduce the amount of funds retained for the faithful performance of Work by fifty percent of the amount of funds required to be retained, provided the Contractor's Surety remains responsible for all damages that may be caused due to default by the Contractor, including without limitation, the following:

- (a) Completion of the Work;
- (b) All interference, disruption, hindrance, delay and impact claims;
- (c) All Liquidated Damages; and
- (d) All additional expenses incurred by the City.

114.08 Payments Withheld. The Engineer shall have the authority to recommend to the City that payments be withheld from, or Liquidated Damages be assessed against and withheld from, a Payment Request, stating the reasons for such recommendation. The City reserves the right to decline to approve any Contractor Payment Request or part thereof, or because of subsequent evidence or inspection, may nullify any previous Payment Request, in whole or in part, to such extent as may be necessary in the Authorized Representative's opinion to protect the City from loss because of:

- (a) Defective Work not remedied;
- (b) Damage caused by the Contractor;
- (c) Failure to comply with the requirements of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act as applicable; and/or
- (d) Liquidated Damages.
- (e) Other damages the City has incurred or is expected to incur due to Contractor's fault.

If a basis for withholding payment is removed, payment shall be made for the amount withheld because of the basis.

114.09 Payments Detained. Whenever the City receives a Claim Affidavit, the Authorized Representative shall detain the stated amount from the Contractor's subsequent Payment Requests unless the Contractor provides a release and waiver of lien with a Payment

Request. The release and waiver of lien shall be executed by the Person supplying labor, Materials or services on a Project, which has or may have a right of claim against the Contractor's proceeds. If the City detains an amount as set forth above, such action shall not be construed as conferring any right on such Subcontractor or Material Supplier, nor as enlarging or altering the application or effect of the existing lien law.

114.10 Measurement of Quantities. For all Contracts, except lump sum Contracts, after an item of the Work is completed and before final payment is made by the City, the Engineer will determine the quantities of various items of Work performed as the basis for final payment. The Contractor, in case of Unit Price items, will be paid as provided in 103.19. After issuance of a Certificate of Contract Completion in accordance with 115.05, the Engineer shall prepare a final estimate for payment based on the actual quantities of completed Work and deducting there from all previous payments made to the Contractor. Any prior estimate is subject to correction in the final estimate.

114.11 Final Payment Request. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and to final payment, shall provide all documents required pursuant to 115.06 for approval by the Engineer with the Contractor's final Payment Request.

114.12 Final Payment Date. Payment of the final Payment Request shall be made within thirty Days from the date of approval by the Engineer unless the City has reason to withhold amounts pursuant to the terms of this Agreement. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

114.13 Waiver of City's Claims. The making of final payment by the City shall constitute a waiver of claims by the City except those relating to unresolved claims of the Contractor or the City and those arising after Contract Completion including, without limitation, the following:

- (a) Defective or nonconforming Work;
- (b) Error by Contractor;
- (c) Outstanding liens, claims, security interests, or other encumbrances arising out of the Contract Documents and unsettled;
- (d) Failure of the Contractor to comply with any warranties or Guarantees required by the Contract Documents;
- (e) audits performed by the City after final payment;
- (f) any claims, damages, losses, or expenses for indemnification under Item 113;
- (g) Inadvertent overpayment by the City.

114.14 Waiver of Contractor's Claims. The acceptance of final payment by the Contractor shall constitute a waiver of all claims against the City except those that the Contractor has previously made in writing in accordance with 118.01 through 118.11 and which remain unresolved at the time of final payment. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62 ORC, to the fullest extent permitted.

ITEM 115 FINAL INSPECTION AND ACCEPTANCE

- 115.01 Contractor's Request**
- 115.02 Engineer's Punch List**
- 115.03 Completion and Correction of Punch List Items.**
- 115.04 Deferred Items**
- 115.05 Certificate of Contract Completion**
- 115.06 Project Record Document Submittals**
- 115.07 Record Drawings**
- 115.08 Guarantee**
- 115.09 Warranty**
- 115.10 Exercise of Guarantee or Warranty**
- 115.11 Final Cleaning**
- 115.12 Final Cleaning Remedies**
- 115.13 Work After Final Cleaning**

115.01 Contractor's Request. When the Work or a designated portion thereof, is nearly complete, the Contractor shall submit a request for a Final Inspection of the Work ("the "Final Inspection") to the Engineer in writing.

115.02 Engineer's Punch List. The Engineer shall, within seven Days of receipt of the request for Final Inspection, notify the Contractor of acceptance or rejection of the request for Final Inspection, stating reasons for any rejection. Upon acceptance of the Contractor's request, the Engineer shall conduct the Final Inspection to determine whether the Work or the designated portion thereof, is in conformity with the Contract Documents. The Engineer shall notify the Contractor and the Authorized Representative of the scheduled time of the Final Inspection. Within three Days of the Final Inspection, the Engineer shall notify the Contractor of any items of Work remaining in a Defective, incomplete or unacceptable condition. The list of such items shall be known as the Engineer's Punch List.

115.03 Completion and Correction of Punch List Items. Within fourteen Days of receipt of the notice required by 115.02, the Contractor shall complete and correct all items on the Engineer's Punch List. If the Contractor does not complete the items on the Engineer's Punch List within fourteen Days of receipt of the notice, the provisions of 105.02 may be invoked. If the Work on the Engineer's Punch List cannot be completed within fourteen Days of receipt of the notice, the Contractor shall justify to the reasonable satisfaction of the Engineer the reasons the items cannot be so completed, and the Contractor shall propose, for approval of the Engineer, a time when such items will be completed. If the Contractor fails to timely correct the items on the Punch List, the City, in its discretion, may perform the Work by itself or others and the cost thereof shall be charged against the Contractor. If the balance of the Contract price is insufficient, the Contractor and/or its surety will pay the Owner the balance on demand. The Contractor's warranties and obligations under the Contract Documents shall remain in full force and effect and cover any remedial work even if performed by others. Failure of the Engineer to include any items on the Engineer's Punch List shall not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents. If multiple inspections of items on the Engineer's Punch List are required due to the Contractor's failure to properly and timely complete

them, the Contractor shall be responsible for any additional costs incurred by the Contractor, other Persons, the Engineer and the City resulting from any attendant delay.

115.04 Deferred Items. With the approval of the Engineer, when upon Final Inspection, items of Work cannot be completed because of seasonal conditions, such as bituminous paving or landscaping, or if the Authorized Representative agrees that a particular item need not be completed until a subsequent date, the Authorized Representative may release payment to the Contractor less twice the cost of completing the remaining Work as determined in the sole discretion of the Authorized Representative.

115.05 Certificate of Contract Completion. When all items on the Engineer's Punch List have been corrected to the satisfaction of the Engineer and the provisions of 115.06 through 115.14 have been fulfilled, the Engineer shall process a Certificate of Contract Completion for execution by the Authorized Representative. The City reserves the right of Final Acceptance of the Project.

115.06 Project Record Document Submittals. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion, release of retainage and final payment, shall provide all Project record documents to the Engineer for approval, which may include, without limitation:

- (a) Certificate of occupancy, if required;
- (b) Any inspection certificates required such as pressure piping, elevator, boiler, electrical, plumbing or piping purification;
- (c) Letter of Approval for fire suppression system, if required;
- (d) Any operating and maintenance manuals, which shall be organized into suitable sets of manageable size. Indexed data shall be bound in individual binders, with pocket folders for folded sheet information and appropriate identification shall be marked on the front and the spine of each binder;
- (e) Neatly and accurately marked sets of As-built Drawings and other Contract Documents reflecting the actual construction of the Project;
- (f) Reproducible detailed Drawings reflecting the exact location of any concealed utilities, mechanical or electrical systems and components;
- (g) Assignment to the City of all warranties and guaranties, including the most recent address and telephone number of any Subcontractors, Material Suppliers, or manufacturers;
- (h) An affidavit from the Contractor to certify that all Subcontractors and Material Suppliers have been paid in full for all Work performed or Materials furnished for the Project and an affidavit from each Subcontractor and Material Supplier that the Subcontractor or Material Supplier has been paid in full for all Work performed or Materials furnished for the Project;
- (i) Final certified payroll reports;

(j) Affidavit to certify that the Contractor and an affidavit from each Subcontractor to certify that the Subcontractor has complied with all requirements of Sections 4115.03 to 4115.22, ORC, or the Davis-Bacon Act, as applicable.

115.07 Record Drawings. Unless otherwise provided in the supplemental Specifications or Special Provisions, upon completion of the Work on Projects administered by the Water Engineering Manager of the City's Department of Water or administered by the Chief Engineer of the Department of Aviation, the Contractor shall organize the As-built Drawings into manageable sets, bind the sets with durable paper cover sheets, certify to the accuracy of the As-built Drawings by signature thereon, and deliver the As-built Drawings to the Engineer. The Engineer shall revise the original Contract drawing tracings or computer files with the information contained on the As-built Drawings provided by the Contractor and create the Record Drawings. The City may thereafter use the As-built Drawings for any purpose relating to the Project including, without limitation, additions to or completion of the Project.

115.08 Guarantee. The Contractor shall provide a Guarantee to the City that all Work is in conformity with the Contract Documents and free from defects in workmanship, Materials and Equipment for full period permitted under Ohio law. The Contract Bond shall remain in effect for the full Guaranty period, unless the Contractor shall provide a Maintenance Bond in form and substance and from a Surety satisfactory to the City. The Guarantee time period shall commence on the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee time period for any incomplete or uncorrected Work at the time of Partial Occupancy or Use, if any, shall commence with the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee provided in this 115.08 shall be in addition to, and not in limitation of, any other Guarantee, Warranty or remedy provided by law or by the Contract Documents.

115.09 Warranty. The Contractor shall, prior to installing material or Equipment which is subject to a Warranty, provide a copy of the Warranty to the Engineer for review and approval.

115.10 Exercise of Guarantee or Warranty. If defects in workmanship, material or Equipment become apparent within the applicable Guarantee or Warranty period, the Authorized Representative shall notify the Contractor in writing and provide a copy of the notice to the Engineer. Within ten Days of receipt of the notice, the Contractor shall visit the Project in the company of a representative of the City to determine the extent of all defects and shall promptly repair or replace the defects, including all adjacent property damaged as a result of such defects or as a result of remedying the defects. If the repair or replacement is considered by the Authorized Representative to be an emergency, the Authorized Representative may require the Contractor to visit the Project within one Day of receipt of the notice. The Contractor shall be fully responsible for the cost of and all expenses associated with temporary Materials or Equipment required during the repair or replacement of the defects, including without limitation labor, permits and other incidentals. If the Contractor does not promptly repair or replace the defects, the City may repair or replace the defects and charge the cost thereof plus any Consultant and attorney fees incurred by the City in enforcing its Guaranty or warranty rights to the Contractor or the Contractor's Surety. Work which is repaired or replaced by the Contractor shall be inspected and

accepted by a representative of the City and shall be Guaranteed by the Contractor for the remainder of the original Guarantee time period.

115.11 Final Cleaning. At the completion of the Work, the Contractor shall restore all property not designated for alteration by the Contract Documents to as near its original condition as practicable and clean the site of the Project and adjacent property of all dust, mud, waste Materials, and rubbish attributable to the Work and shall remove any temporary controls required pursuant to the storm water pollution prevention plan and permit.

115.12 Final Cleaning Remedies. Final cleaning shall be done to the satisfaction of the Engineer and the Authorized Representative. If the Contractor fails to clean up at completion of the Work, the provision of 105.02 may be invoked. If a dispute arises as to responsibility for final cleaning, the Engineer may employ City employees or engage a qualified cleaning company, to perform the clean up and deduct the cost from amounts due to the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative on the responsibility for such cost shall be final, subject to 118.01 through 118.11.

115.13 Work After Final Cleaning. If any Work is performed after a final cleaning by the Contractor, the Contractor shall clean any affected area again as provided in 115.11 and 115.12 so that upon Contract Completion, the Project shall be left ready for occupancy or utilization by the City.

ITEM 116 TIME

116.01 Time of Essence

116.02 Time Extensions

116.03 Critical Path

116.04 Extension Sole Remedy

116.05 Time for Contract Completion

116.06 Liquidated Damages

116.01 Time of Essence. Time is of the essence to the Contract Documents and all obligations thereunder. By executing the Contract Form, the Contractor acknowledges that the time for Contract Completion is, and by signing the Construction Schedule and Project Schedule, if applicable, that any specified milestone completion dates are, reasonable taking into consideration the usual weather and other conditions prevailing in the locality of the Project. The Contractor agrees that the Notice to Proceed shall establish the date for commencement of the Work. The Contractor agrees that the City has entered into, or may enter into, agreements or representations for use of all or part of the Project based upon the Contractor achieving Final Acceptance within the time for Contract Completion. The Contractor agrees that the Work will be prosecuted in a reasonable, efficient and economical sequence, in cooperation with the Engineer and in the order and time as provided in the current Construction Schedule and Project Schedule, if applicable. The Contractor shall perform the Work so as not to interfere with, disrupt, hinder, delay or impact the Work of other Persons on the Project and of such other Persons' Subcontractors and Material Suppliers. The Contractor agrees that the possibility that the Contractor may be subject to interference, disruption, hindrance, delay or impact in the progress of the Work from any and all causes is within the contemplation of the Contractor and the City and that the sole remedy for such interference, disruption, hindrance, delay or impact shall be an extension of time granted pursuant to 116.02, except where the Contractor establishes such interference, disruption, hindrance, delay, or impact was proximately caused by an improper action or failure to act by the Owner, in which case the Contractor may be entitled to additional compensation.

116.02 Time Extensions. If the Contractor is interfered with, disrupted, hindered, delayed or impacted at any time in the progress of the Work by any of the following causes, the time for Contract Completion shall be extended for such reasonable time which the Authorized Representative determines, in consultation with the Engineer, has been caused by the interference, disruption, hindrance, delay, or impact in the Work:

- (a) Due to suspension of the Work for which the Contractor is not responsible; unusually severe weather conditions not normally prevailing in the particular season; labor dispute, excluding informational pickets; fire; or flood; or
- (b) Due to any unforeseeable cause beyond the control and without fault or negligence of the Contractor;
- (c) The Contractor shall request any extension of time pursuant to 117.01 through 117.11.

116.03 Critical Path. Notwithstanding any other provision of the Contract Documents, time extensions will depend upon the extent to which the Work on the critical path of the Construction Schedule is affected, or if the Project involves multiple Contractors the extent to which Work on the critical path of the Project Schedule is affected. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements so interfered with, disrupted, hindered or delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages.

116.04 Extension Sole Remedy. Any extension of time granted pursuant to 116.02 shall be the sole remedy which may be provided by the City, unless Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. . It is within the contemplation of the Contractor and the City that the Contractor may accelerate its performance to meet the Construction Schedule and that such acceleration is solely within the discretion of the Contractor.

116.05 Time for Contract Completion. The Contractor shall diligently prosecute the Work and shall complete all Work so that Final Acceptance occurs on or before the number of consecutive Days set forth in the Contract Documents following the date set forth in the Notice to Proceed, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents. The period of time established by the preceding sentence is referred to herein as the time for Contract Completion. Each applicable portion of the Work shall be completed upon the respective milestone completion date unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

116.06 Liquidated Damages. Upon failure to complete all Work within the time for Contract Completion, the City shall be entitled to retain or recover from the Contractor, as Liquidated Damages, and not as a penalty, the applicable amount set forth in the following table for each and every Day thereafter until Contract Completion, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

LIQUIDATED DAMAGES	Contract
Contract Amount	Completion
\$0 to \$50,000	\$150
more than \$50,000 to \$150,000	\$250
more than \$150,000 to \$500,000	\$500
more than \$500,000 to \$2,000,000	\$1,000
more than \$2,000,000 to \$5,000,000	\$2,000
more than \$5,000,000 to \$10,000,000	\$2,500
more than \$10,000,000	\$3,000

The amount of Liquidated Damages is agreed upon by and between the Contractor and the City because of the impracticability and extreme difficulty of ascertaining the actual amount of damage the City, its taxpayers and the public would sustain. Liquidated Damages only replace the City's actual damages for delays, are not the City's exclusive remedy for breach by the Contractor and are not to be construed in any way as a limitation of any other rights or remedies available to the City under the Contract Documents or otherwise. If a delay of the critical path in

completion of the Project occurs which is caused by the City and the Contractor concurrently, the applicable Liquidated Damages shall be apportioned, and the specific number of Days for which the City is solely responsible for shall be deducted from the total number of Days of the concurrent delay used in calculating the Liquidated Damages and the Contractor shall pay Liquidated Damages for the remaining number of Days of delay. In addition to the amounts specified above, the City may charge the Contractor for all inspection regardless of any time extension.

ITEM 117 - CHANGES IN THE WORK

- 117.01 Change Order**
- 117.02 Payment of Change Order**
- 117.03 Requirement to Perform Changed Work**
- 117.04 Change Order Price Determination**
- 117.05 Change Order Procedures**
- 117.06 Change Order Process**
- 117.07 Paperwork Consolidation**
- 117.08 Change Order Numbering System**
- 117.09 Project Contingency Funds**
- 117.10 Change Order Pricing Guidelines**
- 117.11 Differing Site Conditions**
- 117.12 Time Extension**

117.01 Change Order. The City Commission or the Authorized Representative, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, including without limitation revisions resulting from an extension granted in accordance with 116.04. To the extent the time for Contract Completion or the Contract price is affected, the Contract may be adjusted by Change Order in accordance with 117.01 through 117.12. The Contractor shall proportionately increase the amount of the Contract Bond whenever the Contract price is increased. If notice of any change affecting the Contract is required by the provision of any Contract Bond, the giving of any such notice shall be the Contractor's responsibility, and the amount of each applicable Contract Bond shall be adjusted accordingly.

117.02 Payment of Change Order. The Contractor shall not proceed with any change in the Work without the required written Change Order. If the Contractor believes that any item is not Work required by the Contract Documents or reasonably inferred therefrom to produce the intended results, the Contractor shall obtain a Change Order before proceeding with such item. Except as provided in 118.01 through 118.11, failure to obtain such a Change Order shall constitute a waiver by the Contractor of any claim for additional compensation for such item. The Contractor understands and agrees that agreement to a Change Order is final and without reservation of any rights.

117.03 Requirement to Perform Changed Work. If the Contractor does not agree to, or fails or refuses to sign, a Change Order, the Contractor shall perform any Work related to the Change Order as required by the Authorized Representative in accordance with 117.04; provided, however, the Contractor may seek compensation and time extension in accordance with 117.04 and 117.10 through 117.12, as applicable, and 118.01 through 118.11 for any such Work performed. The City reserves the right to cancel or modify any Change Order authorization.

117.04 Change Order Price Determination. The maximum cost or credit resulting from a change in the Work shall be determined as provided in 117.04 through 117.10. Proposals which do not set forth all information required by 117.05 and 117.10 will not be considered or accepted under any circumstances. A Unit Price Proposal shall only be valid when incorporated into the Contract by Change Order; provided, however, that Unit Price Work set forth on the Bid, included

in the Contract price and which does not exceed the scheduled quantities on the Bid may be performed and paid for without a Change Order. The amounts allowed for overhead and profit are all-inclusive, include all Contractor Project costs relating to field and home office operations, and no additional or other amounts for overhead or profit shall be allowed. The maximum cost or credit as determined by 117.10 includes all compensation for direct, indirect, and cumulative impact costs and no additional or other amounts for impact costs shall be allowed. The Contractor shall not assign any portion of the Work to another whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead or profit. If no agreement can be reached between the Contractor and the City as to the cost or credit resulting from a change in the Work or the Contractor fails or refuses to sign a Change Order, the cost or credit shall be determined by the Authorized Representative, upon the recommendation of the Engineer. The Contractor shall proceed with the Change Order Work when so required by the Authorized Representative in writing. The Contractor may dispute the Authorized Representative's determination of the cost or credit by filing a claim in accordance with 118.01 through 118.11. The City reserves the right to require certified payrolls for labor costs and certified invoices for material costs, together with any other documentation the City deems in its sole discretion to be useful in analyzing the Contractor's claim and reserves the right to audit the records of the Contractor and the Contractor's Subcontractors and Material Suppliers. Failure by the Contractor to provide all requested documentation within 10 days shall constitute an irrevocable waive of Contractor's claim.

117.05 Change Order Procedures. The Contractor must be certain to comply with the applicable procedures or payment may be delayed or denied. The Engineer has responsibility for:

- (a) Preparing, reviewing, recommending, coordinating, monitoring and processing a Change Order and related documents;
- (b) Reviewing the Contractor's pricing within the stated time period, verifying the pricing complies with the pricing guidelines set forth in 117.10 and negotiating pricing, if necessary, to an amount acceptable to the City;
- (c) If the change is to have a not-to-exceed price based on performing the Work on a time and material basis or other cost-plus basis, monitoring the Contractor's progress toward completing the revised portion of the Work and requiring that the Contractor prepare daily records of additional labor, Materials and Equipment required along with a certification from the Contractor that the records are accurate and appropriate for the revised Work. The Engineer shall review these daily records and sign them, but solely for the purposes of signifying that the records are an accurate accounting of the items described therein, and provide a signed copy of the daily records to the Authorized Representative. The signed daily records are also to be attached to the Change Order. If the changed Work should cost less than the maximum amount noted on the Change Order, the Engineer is also responsible for preparing a deduct Change Order for the cost difference;
- (d) Reviewing and resolving the Contractor's request for an extension of time related to a Change Order in accordance with 116.01 through 116.06 and 117.12;
- (e) Confirming that the City concurs with the change and has available funds or a written commitment for funding the Change Order;

(f) Monitoring the overall Change Order process for timeliness and follow up.

The Contractor has responsibility for:

(a) Responding to requests for pricing within the stated time period;

(b) Preparing all necessary Proposals in sufficient detail for intelligent review with pricing and schedule impact, including those of all affected Subcontractors and Material Suppliers according to the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiating pricing, if necessary;

(c) If the change is proposed to have a not-to-exceed price based on performing the Work on a time and material basis or other cost plus basis, furnishing and certifying detailed records of all labor, Materials and Equipment provided. If the changed Work should cost less than the maximum amount noted on the Change Order, the Contractor is also responsible for executing a deduct Change Order prepared for the cost difference;

(d) Proceeding with the Work upon receipt of a fully signed Change Order;

(e) If the Contractor performs Work without the appropriate, required Change Order, the Contractor does so at the Contractor's own risk that payment for such Work may not be approved or made, unless the City has required the Contractor to perform the Work in accordance with 117.03 and 117.04;

(f) Providing the changed Work in a timely manner and as authorized by the Change Order, all in accordance with the requirements of the Contract Documents; and

(g) Timely providing to Engineer and the Authorized Representative all requested backup documentation.

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

(a) Prepare an estimate of the cost of the changed Work and verify with the Authorized Representative that the change is ordered and that funds are available in the amount of the estimate for the Work;

(b) Prepare a detailed scope of Work in Bulletin form, including any necessary Drawings;

(c) Submit the Bulletin to the Authorized Representative for approval, along with a justification letter indicating the reason for the change in the Work;

(d) Upon receipt of approval by the Authorized Representative, release the Bulletin to the Contractor with a date specified for the Contractor to return a Proposal. If the Contractor fails to respond to the Engineer within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer, the Contractor shall be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(e) Review the Contractor's Proposal, verifying that pricing complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiate the price if required to obtain a price less than the maximum established by the pricing guidelines or different from the amount calculated using Unit Prices where appropriate. Within seven Days of receipt of the Contractor's Proposal, the Engineer shall notify the Contractor whether the Proposal is acceptable in form or advise the Contractor in writing of the reasons for disapproval. If negotiation of the price is necessary, any failure of the Contractor to respond appropriately and within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer shall cause the Contractor to be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(f) Determine the basis for pricing the Work and confirm whether the Work is for a fixed price, or for a not-to-exceed price based on performing the Work on a time and material basis, or other cost-plus basis. Verify that any Subcontractor and Material Supplier pricing is included and complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable. Review any requested time extension with the Authorized Representative to be determined according to 116.01 through 116.06 and 117.12 and obtain written recommendation of approval of the Change Order from the Engineer and the applicable Director if other than the Engineer. Sign and obtain the Contractor's signature on the Change Order;

(g) Submit the Proposal to the Authorized Representative or the City Commission, as applicable, for approval along with the written recommendation of approval or disapproval of the Proposal of the City Engineer and other City Department head, if applicable;

(h) Deliver multiple copies of the signed Change Order package to the Authorized Representative for signing and any necessary fund certification. Upon signing by the Authorized Representative, the Authorized Representative shall return copies of the executed Change Order to the Contractor and the Engineer. The Contractor may bill for Work covered by the Change Order only after this final step.

117.07 Paperwork Consolidation. Related transactions occurring at or about the same time shall, whenever possible, be consolidated into the same Bulletin or Change Order, or both. Add and deduct items may be included on the same Change Order, as well as items with different reasons for changed Work so long as the reason and pricing for each item is separately stated.

117.08 Change Order Numbering System. Unless otherwise provided in the Contract Documents, the Engineer shall assign a number to each change which shall be stated on the Bulletin, starting with number 001. All Contractors affected by the change will be recorded under the same number. The Engineer will establish and maintain a Change Order log to track all activities related to Change Order processing and taking care not to duplicate or reuse any Change Order number throughout the Project.

117.09 Project Contingency Funds. Project Contingency Funds shall be reserved to pay costs resulting from Change Orders, unanticipated job conditions, to comply with rulings regarding building and other codes, to pay costs related to errors and omissions in Contract Documents, and to pay the cost of settlements and judgments related to the Project. Change

Orders for which there are sufficient moneys in the Contract price including the Project Contingency Funds must be approved by the Engineer and the Authorized Representative. Change Orders which would increase the Contract price must be approved by the City Commission.

117.10 Change Order Pricing Guidelines. For each change, the Contractor shall furnish a detailed, written Proposal itemized according to these pricing guidelines. Any Subcontractor or Material Supplier pricing shall also be itemized according to these pricing guidelines. Where Unit Prices were included in the Bid and the Contract price, the Engineer may also require incorporation of such Unit Prices or preparation of an Alternate Proposal incorporating such Unit Prices. These pricing guidelines are intended to establish the maximum amount which the City will pay for any Change Order, including without limitation all amounts for interference with, delay, hindrance, disruption or impact of the Work. A Change Order may provide that the City may pay less than the amount established by these pricing guidelines if such amount is negotiated by the Engineer in accordance with 117.06 or is determined in accordance with 118.01 through 118.11. As provided in 114.01 the Contract Cost Breakdown may be used by the City to determine any cost or credit. In order to expedite the review and approval process, all Proposals shall be prepared in the categories and in the order listed below. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62, ORC to the fullest extent permitted. The pricing guidelines are:

- (a) **LABOR** - All field labor shall be priced at the current base rate, excluding fringe benefits, of the prevailing wage in the Project locality. The Proposal and documentation is to include number of hours and rate of pay for each classification of worker. If the Contractor pays an employee a base rate exceeding prevailing wage, the Contractor shall submit certified payroll records that substantiate that rate. Any Contractor performing Work on a time and material basis or the cost-plus basis Work shall submit certified payroll records for all employees performing that Work;
- (b) **FRINGES** - All established payroll taxes, assessments and fringe benefits on the labor. This may include, without limitation, FICA, Federal and State Unemployment, Health and Welfare, pension Funds, Workers' Compensation and Apprentice Fund. Each of the fringes is to be a separate line item. The Contractor shall submit documentation supporting the calculation of the amounts for each fringe for each worker classification;
- (c) **EQUIPMENT RENTALS** - All charges for certain non-owned heavy or specialized Equipment at up to one hundred percent of the documented rental cost. No rental charges will be allowed for hand tools, minor Equipment, simple scaffolds, etc. Downtime due to repairs, maintenance and weather delays will not be allowed. The Contractor shall submit copies of actual paid invoices to substantiate rental costs;
- (d) **OWNED EQUIPMENT** - All charges for certain owned, heavy or specialized Equipment at up to one hundred percent of the cost listed by the Associated Equipment Dealers Green book rental rates and Specifications for construction Equipment. No recovery will be allowed for hand tools, minor Equipment, simple scaffolds, etc. The longest period of time that the Equipment is to be required for the Work will be the basis for the pricing. Downtime due to repairs, maintenance and weather delays will not be allowed;

(e) TRUCKING - A reasonable delivery charge or per-mile trucking charge for delivery of required Materials or Equipment. Charges for use of a pick-up truck will not be allowed;

(f) OVERHEAD - Overhead on items in 117.10 (a)-(d) up to ten percent, which shall include all costs required to schedule and coordinate the Work. Overhead includes, without limitation, telephone, telephone charges, facsimile, electronic mail, telegrams, postage, photos, photocopying, hand tools, simple scaffolds (1 level high), tool breakage, tool repairs, tool replacement, tool blades, tool bits, home office estimating and expediting, home office clerical and accounting support, home office labor (management, supervision, engineering), all other home office expense, legal services, travel and parking expenses; provided, however, shop or engineering labor, which shall not be subject to prevailing wage rates, for steel Fabricators, sheet metal Fabricators and sprinkler system Fabricators will be allowed under 117.10 (a)-(d);

(g) MATERIALS - All Materials purchased by the Contractor and incorporated into the changed Work, showing costs, quantities, or Unit Prices of all items, as appropriate. Reimbursement of material costs shall only be allowed in the amount of the Contractor's actual cost, including any and all discounts, rebates or related credits. One-third of the cost of reusable Materials for each use, such as formwork lumber, shoring or temporary enclosures;

(h) PROFIT - Profit on items in 117.10 (a)-(g) up to ten percent;

(i) SUBCONTRACTOR - The reasonable cost of all labor and material provided by a Subcontractor whose pricing is included and which complies with these pricing guidelines;

(j) CONTRACTOR MARK-UP ON SUBCONTRACTOR - Mark-up on items in 117.10 (i) up to five percent or 2,500 dollars, whichever is less;

(k) MISCELLANEOUS - The following items are allowable as the cost of the Work, with no overhead or profit:

.1 Any additional bond or insurance premium specifically incurred as a result of the Change Order;

.2 Fees for permits, licenses, inspections, test, etc.; and

(l) Costs which will not be reimbursed for Change Order Work include the following:

.1 Overnight lodging, travel and food;

.2 Employee Profit Sharing Plans - regardless of how defined or described, the Contractor will pay these charges from Contractor profit and will not be reimbursed; and

.3 Voluntary Employee Deductions - examples are United Way and U.S. Savings Bonds.

(m) State sales tax shall be allowed on items as described in 104.18.

117.11 Differing Site Conditions. Subject to 103.06, during the progress of the Work, if subsurface or concealed conditions are encountered at the site differing materially from those indicated in the Contract Documents or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall promptly notify the Engineer in writing of the specific differing conditions before they are disturbed or the affected Work is performed and if such notice is not possible, in no event later than 2 Business Days after Contractor first observed the conditions. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with the 117.01 through 117.12, as applicable. The City may decline to issue a Change Order if the notice required by this 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by this 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extensions for the related subsurface or concealed physical condition.

117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the critical path of the Construction Schedule or if the Project involves multiple Contractors of the Project Schedule as determined pursuant to 109.06 and 109.05, respectively. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law. The Contractor shall not be entitled to any time extensions for delays caused by Contractor, its subcontractors, suppliers, normal weather conditions for the time of year and locality, or abnormal weather conditions that do not affect the critical path.

ITEM 118 DISPUTE RESOLUTION PROCEDURE

118.01 Notice and Claim Requirements

118.02 Filing of Notice

118.03 Filing of Claim

118.04 Claim Response

118.05 Claim Review and Decision

118.06 Appeal to Board of Review

118.07 Alternate Dispute Resolution

118.08 Delegation

118.09 Auditing of Claims

118.10 False Certification of Claims

118.11 Performance and Payment

118.01 Notice and Claim Requirements. Whenever the Contractor intends to seek additional time or compensation or mitigation of Liquidated Damages, whether due to delay, extra Work, additional time or Work, breach of Contract, or other causes arising out of or related to the Contract or the Project, the Contractor shall follow the procedures set forth in 118.01 through 118.11. The Contractor acknowledges and agrees that the Owner may delay, interfere with, and/or disrupt the Work of the Contractor, and such actions do not constitute a material breach of contract by the Owner, since the Contractor is entitled to additional compensation by properly submitting and pursuing a Claim as permitted by these Specifications. To the fullest extent permitted by law, failure by the Contractor to follow the procedures in 118.01 through 118.11 is a waiver of any claim for additional time or compensation or for mitigation of Liquidated Damages. Compliance with all applicable procedures in 118.01 through 118.11 is a condition precedent to the filing by the Contractor of any litigation related to the Contract or the Project.

118.02 Filing of Notice. Unless a shorter notice period is provided elsewhere in this Agreement, the Contractor shall file notice of any claim with the Engineer, in writing, no more than ten Days after the initial occurrence of the events, which are the basis of the claim. To the fullest extent permitted by law, failure of the Contractor to timely and completely provide such notice shall constitute a waiver by the Contractor of any claim for additional time or compensation or for mitigation of Liquidated Damages. Every such written notice shall provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and opportunity for mitigation:

- (a) Nature of claim and estimated amount of the claim, including all costs for interference, disruption, hindrance, delay and any impact, which amount shall be calculated in accordance with the pricing guidelines set forth in 117.10, shall be based upon the Contractor's experience and shall be a fair and reasonably accurate assessment of the damages suffered or anticipated by the Contractor, as applicable;
- (b) Specific number of Days of extension requested and specific number of Days for remobilization requested;
- (c) Identification of Persons and events responsible for causing the claim, including without limitation the date or anticipated date, as applicable of the commencement of any interference, disruption, hindrance, delay or impact;

- (d) Identification of activities on the Construction Schedule and the Project Schedule, if applicable, which will or may be affected by the claim or new activities which will or may be created and the relationship with existing activities;
- (e) Anticipated impacts and anticipated duration of any interference, disruption, hindrance, delay or impact and any remobilization period; and
- (f) Recommended action to avoid or minimize any interference, disruption, hindrance, delay or impact.

118.03 Filing of Claim. With respect to every claim submitted, the Contractor shall file three copies of its claim with the Engineer not more than thirty Days after the notice required by 118.02 and, in all events prior to Contract Completion. The Contractor's claim shall detail the amounts claimed and provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and any remaining opportunity for mitigation. If the Contractor is unable to calculate any amount claimed in detail, the Contractor shall use its best efforts to provide a reasonable estimate of such amount:

- (a) A narrative of the event, or combination of events, claimed as resulting in interference, disruption, hindrance, delay or impact to the Contractor, including the start date of the event or events and the actual, or anticipated, finish date;
- (b) A quantification of the planned Work items and the changed scope of Work items claimed as having been impacted;
- (c) A time impact analysis, consistent with standard critical path methodology for scheduling, demonstrating the impact to the Contractor's scheduled activities;
- (d) Copies of the Contractor's daily log for each Day of impact;
- (e) Copies of relevant correspondence and other information regarding or supporting Contractor entitlement;
- (f) Copies of Contractor payroll records for labor impacts claimed by Contractor and any Subcontractor affected by the event or events;
- (g) Copies of invoices for material impacts claimed by the Contractor and any Subcontractor affected by the event or events;
- (h) Copies of Equipment records, or rental invoices, for any Equipment impacts claimed by the Contractor or any Subcontractor affected by the event or events;
- (i) Copies of the most recent Contractor's income statement, including segregated general and administrative expenses for the most recent reporting period, and for the period of the Contract, if available, and similar information for any Subcontractor claim included;
- (j) A copy of Contractor's original coded bid takeoff and estimating records that formed the basis of Contractor's bid;

(k) Contractor's coded Job Cost Report with a key to the coding;

(l) A statement, signed by an authorized representative of the Contractor, certifying that the claims are made in good faith, the supporting data is accurate and complete to the best of the Contractor's knowledge and belief and the amount requested accurately reflects the Contract adjustment for which the Contractor believes the City is liable in accordance with the Contract Documents, in particular the pricing guidelines set forth 117.10.

The City may request documents and information from the Contractor in addition to those listed in this 118.03, as the City determines necessary to evaluate and comment upon the Claim. Upon receipt of such request from the Owner, the Contractor shall provide all requested documents and information within ten (10) days. The Contractor shall provide the requested documents in the formats requested, which include both paper and electronic copies. If requested by the City, the electronic copies shall be provided in native computer language. The Contractor's provision of the requested documents to the City in the format requested by the City shall be a condition precedent to any further proceeding under the Contract Documents. Failure to provide the requested documents shall be a material breach of the Contract, and the Contractor shall indemnify the City for all of the City's costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the Contractor's failure to comply with this provision. If the Contractor fails to provide the requested documents, the Contractor shall be deemed to have irrevocably waived its claim.

118.04 Claim Response. Immediately upon receipt of any claim submitted by the Contractor in accordance with 118.03, the Engineer shall deliver 2 copies to the Authorized Representative. Upon submission of the claim by the Contractor, the Engineer shall convene a meeting with the Contractor and any applicable Subcontractors and Material Suppliers to review and discuss the claim. The Engineer shall review the Contractor's claims with all attendees and discuss any questions regarding the nature or content of the required items. Any items deemed deficient shall be corrected by the Contractor before the Engineer will commence review in accordance with 118.05. The Engineer shall document the timeliness of notice provided under paragraph 118.02 and the actual date of corrected submission of the claim.

118.05 Claim Review and Decision. Upon corrected submission of the claim and all requested documentation by the Contractor, the Engineer shall review the claim and prepare a written analysis of its content. The analysis may include a narrative of the examination of the facts giving rise to the claim, relevant Contract Documents and language therein, an analysis of claimed additional labor, Materials and Equipment for the scope of the Work items described and an analysis of any time extension for any interference, disruption, hindrance, impact or delay claimed (including the calculation of any concurrent delays affecting entitlement) and shall include confirmation of the calculation of claimed labor, Materials and Equipment as conforming to the pricing guidelines set forth in 117.10 and a concluding recommendation regarding Contractor entitlement to, and the appropriateness and reasonableness of, all or any part of, the claimed costs and time extension. The Engineer may include copies of contemporaneous documentation supporting any recommendation regarding the sufficiency or inadequacy of the Contractor's claim, the Contractor's performance or the rebuttal of the claim. The Engineer shall prepare and submit the claim analysis to the Authorized Representative within thirty Days of the corrected

submission of the claim. The Authorized Representative shall examine the Contractor's claim, and the analysis of the claim submitted by the Engineer. The Authorized Representative shall approve or deny all or any part of, the Contractor's claim and forward a written decision to the Contractor and the Engineer within thirty Days after receipt of the Engineer's claim analysis. The decision of the Authorized Representative shall be final and conclusive, unless the Contractor appeals the decision to the Board of Review in accordance with 118.06. In the event either the Engineer or the Authorized Representative fail to act in accordance with the foregoing schedule, the claim shall be deemed denied.

118.06 Appeal to Board of Review. The Contractor may appeal the decision of the Authorized Representative to the Board of Review by written notice to the Authorized Representative within ten Days of receipt of the Authorized Representative's decision or, in the absence of a decision, within 10 days of the expiration of the time set forth in 118.05. Failure by the Contractor to provide notice of an appeal within the said 10-day period shall result in the Engineer's decision becoming final and binding upon the Contractor. The Board of Review shall meet within thirty Days of receipt of the notice by the Authorized Representative. The Contractor shall be given an opportunity to present the claim at the meeting. The purpose of the meeting shall be to settle the issues in dispute. The Board of Review shall render a decision on the claim within thirty Days of the meeting unless a mutual agreement is made between the Contractor and the Board of Review to extend the time for decision. The decision of the Board of Review shall be final and conclusive, unless the Contractor provides written notice to the Authorized Representative of the Contractor's intention to file litigation within ten Days of receipt of the decision. The filing of an appeal and the provision of notice of intention to file litigation are each a condition precedent to the filing of any litigation related to the Project or the Contract by the Contractor and any failure by the Contractor to timely fulfill them will preclude the Contractor from filing any such litigation.

118.07 Alternate Dispute Resolution. If, upon consideration of a claim, the Contractor and the City mutually agree in writing, the dispute resolution procedure may be waived, or the claim may be referred to a form of Alternative Dispute Resolution, including a procedure to equitably share the costs of the Alternative Dispute Resolution.

118.08 Delegation. No provision shall prevent the Board of Review or the Authorized Representative from delegating the duties or authorities of the Board of Review or the Authorized Representative to any third Person selected at the discretion of the Board of Review or Authorized Representative, as applicable.

118.09 Auditing of Claims. All claims by the Contractor shall be subject to audit at any time following the filing of such claim, whether or not such claim is part of litigation pending in the courts of this State. The audit may be performed by employees of the City or by a consultant engaged by the City. The audit may begin on ten Days' notice to the Contractor, Subcontractor or Material Supplier, as applicable. The Contractor, Subcontractor or Material Supplier shall use its best efforts to cooperate with the audit. Failure of the Contractor, Subcontractor or Material Supplier to maintain and retain sufficient records to allow the City to verify the claim shall constitute a waiver of any portion of such claim that cannot be verified. Without limiting the foregoing, and as a minimum, the Contractor, Subcontractor or Material Supplier shall make available to the City the following documents:

- (a) Daily time sheets and foreperson's daily reports;
- (b) Union agreements, if any and employer agreements;
- (c) Insurance, welfare, fringes and benefits records;
- (d) Payroll register;
- (e) Earnings records;
- (f) Payroll tax returns;
- (g) Material invoices, purchase orders, Subcontractor Contracts and all material and supply acquisition Contracts;
- (h) Material cost distribution worksheets;
- (i) Equipment records (list of Contractor Equipment, rates, etc.);
- (j) Vendor rental agreements, and Subcontractor invoices;
- (k) Subcontractor payment certificates;
- (l) Canceled checks (payroll and vendors);
- (m) Job cost reports;
- (n) Job payroll ledger;
- (o) General ledger, general journal, (if used) and all subsidiary ledgers and journals together with all supporting documentation pertinent to entries made in these ledgers and journals;
- (p) Cash disbursements journal;
- (q) Financial statements for all years reflecting operations on the Project;
- (r) Income tax returns for all years reflecting operations on the Project;
- (s) Depreciation records on all Equipment utilized whether such records are maintained by the Contractor involved, its accountant, or others;
- (t) If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating Equipment, all such other source documents;
- (u) All documents which reflect the Contractor's actual profit and overhead, or the calculation of overhead multipliers, during the years the Project was being performed and for each of the five years prior to the commencement of this Project;

(v) All documents related to the preparation of the Contractor's Bid, including the contemporaneous final calculations on which the Bid was based;

(w) All documents which relate to each and every claim together with all documents which support or negate the amount of damages as to each claim;

(x) Worksheets used to prepare the claim establishing the cost components for items of the claim including, but not limited to, labor, fringes, benefits and insurance, Materials, Equipment, Subcontractors, and all documents which establish the time periods, individuals involved, the hours and rate of pay for the individuals; and

(y) All other documents required by the City in its discretion to intelligently review the claim.

118.10 False Certification of Claims. The Contractor shall not knowingly present or cause to be presented to the Owner a false or fraudulent Claim. "Knowingly" shall have the same meaning as in Section 3729(b) USC of the Federal False Claims Act. If the Contractor knowingly presents or causes to be presented a false or fraudulent Claim, then the Contractor shall be liable to the Owner for the same civil penalty and damages as the United States Government would be entitled to recover under such Section 3729(a) USC and shall also indemnify and hold the City harmless from all costs and expenses, including the City's attorneys' and consultants' fees and expenses incurred in investigating and defending against such Claim and in pursuing the collection of such penalty, damages, and fees and expenses. If any Contractor falsely certifies all or any part of a claim, the portion of the claim so certified shall be denied. If any Contractor is found to have falsely certified all or any part of any claim, that fact may be used to support a finding of ineligibility in future Bids for the award of any City Contract.

118.11 Performance and Payment. The Contractor shall proceed with performance of the Work during any dispute resolution process, unless otherwise agreed by the Contractor and the Authorized Representative in writing. The City shall continue to make payment of any undisputed amounts in accordance with the Contract Documents pending final resolution of a claim, unless otherwise agreed by the Contractor and the Authorized Representative in writing. If the Contractor accepts the decision of the Authorized Representative or the City Commission and foregoes litigation of the claim, any payment to be made, credit to be provided or extension of time to be granted pursuant to the decision shall be evidenced by a Change Order package consisting of a completed Change Order form signed by the Contractor, the Engineer and the Authorized Representative, a copy of the approval of the City Commission and any necessary supporting documentation and any payment shall be made pursuant to a Payment Request in accordance with 114.02 and 114.03 or 114.10 through 114.13, as applicable.

118.12 Settlement Offers. If the Contractor initiates a Claim, the City may make settlement offers to settle the Claim at any time up to the date of the trial. Such settlement offers shall be subject to Rule 408 (Compromise and Offers of Compromise) of the Ohio Rules of Evidence. If at any stage of the litigation, including any appeals, the Contractor's Claim is dismissed or found to be without merit, or if the damages awarded to the Contractor on its Claim do not exceed the City's last settlement offer, the Contractor shall be liable to the City and shall reimburse the City for all of the City's attorneys' fees and expenses, and arising out of or related to such Claim since the date of such last settlement offer.

ITEM 119 CONTRACT TERMINATION

119.01 Notice to Surety

119.02 Suspension of Work

119.03 Termination for Convenience

119.04 Termination for Cause

119.05 Contractor Bankruptcy

119.01 Notice to Surety. The Authorized Representative shall provide notice to the Contractor's Surety of any Suspension or Termination pursuant to 119.01 through 119.05; provided, however, the failure to provide such notice shall not release the Surety from any of its obligations.

119.02 Suspension of Work. If, in the judgment of the Authorized Representative, the Contractor is causing undue risk of damage to any part of the Project or adjacent area, the Authorized Representative may suspend the Work temporarily, either wholly or in part, for such period until, in the judgment of the Authorized Representative, the safe and proper prosecution of the Work may be resumed. The Authorized Representative may also suspend the Work either in whole or in part for a specified number of Days on account of public necessity, adverse weather conditions, or other similar reasons which are beyond the control of the Contractor. In case of such a suspension, an extension of time, if appropriate, may be allowed as provided in the Contract Documents but no payment will be made to the Contractor for any expense or damages resulting therefrom, except where Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. Any failure of the Authorized Representative to suspend the Work shall not relieve the Contractor of the Contractor's responsibility to perform the Work safely and in accordance with the Contract Documents. The Contractor shall, upon receipt of notice of suspension, cease Work on the suspended activities and take all necessary or appropriate steps to limit disbursements and minimize costs with respect thereto. The Contractor shall furnish a report to the Authorized Representative, within five Days of receipt of the notice of suspension, describing the status of the Work, including without limitation, results accomplished, conclusions resulting therefrom, and such other information as the Authorized Representative may require. In the event of suspension, the Contractor shall be entitled to payment of compensation due under the Contract Documents, upon submission of a proper invoice, for the Work performed prior to receipt of notice of suspension, which shall be payable based upon the Contract Cost Breakdown.

119.03 Termination for Convenience. The City may, at any time upon seven Days written notice to the Contractor, terminate the Contract in whole or in part for the City's convenience and without cause. Upon receipt of the notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Authorized Representative, proceed with performance of the following duties:

(a) Cease operation as specified in the notice;

(b) Place no further orders and enter into no further subcontracts for Materials, labor, services or facilities except as necessary to complete continued portions of the Project;

- (c) Terminate all subcontracts and orders to the extent they relate to the Work terminated;
- (d) Proceed to complete the performance of any Work not terminated; and
- (e) Take actions that may be necessary, or that the Authorized Representative may require, for the protection and preservation of the terminated Work.

Upon termination for convenience, the Contractor shall be paid in accordance with the Contract Cost Breakdown for Work completed, including any amount retained, and the value of Materials ordered and delivered, less any salvage credit the Contractor may receive for them. All Materials, Equipment, facilities and supplies at the Project site, or stored off site, for which the Contractor has been compensated, shall become property of the City. The Contractor may submit evidence of any reasonable expenses directly attributable to the termination of the Work for consideration by the City. The Contractor shall not be entitled to any profit or overhead for Work not performed and in no event shall the Contractor's compensation exceed the total Contract price. Any dispute as to the sum then payable to the Contractor shall be resolved in accordance with the provisions of 118.01 through 118.11.

119.04 Termination for Cause. If the City determines that the Contractor has failed to prosecute the Work with the necessary force or in a timely manner; failed to make payments to Subcontractors or Suppliers pursuant to the agreements between the Contractor and Subcontractors or Suppliers; disregards any applicable laws, statutes, ordinances, codes, rules, regulations, or lawful orders of a public authority; has refused to remedy any Defective Work; or is otherwise in substantial breach of the Contract Documents, the Authorized Representative shall notify the Contractor and the Contractor's Surety of such failure or refusal. The Contractor shall begin to cure such failure or refusal within two Business Days of receipt of the notice. If the Contractor fails to continuously and diligently pursue and cure such failure or refusal within twenty Days of receipt of the notice, the City may, without prejudice to any of its other rights or remedies, terminate the Contract and employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, and may remove Defective Work. If the Contractor is so terminated, the Contractor's Surety may be given the option to engage another Contractor to perform the Contract, with the approval of the Authorized Representative. If the Contractor's Surety does not commence performance of the Contract within ten Days of the date on which the Contract was terminated, the City may complete the Work by such means as the Authorized Representative deems appropriate. The City may take possession of and use all Materials, facilities, and Equipment at the Project site or stored off site for which the City has paid. If the Contract is so terminated, the Contractor shall not be entitled to any further payment. If the City completes the Work and if the cost of completing the Work exceeds the balance of the Contract price, including compensation for all direct and consequential damages incurred by the Engineer and/or the City as a result of the termination, such excess shall be paid by the Contractor or the Contractor's Surety. If the Contractor's Surety performs the Work, the provisions of the Contract Documents shall govern the Surety's performance, with the Surety being substituted for the Contractor in all such provisions including, without limitation, provisions for payment for the Work and provisions about the right of the City to complete the Work. Upon a final determination, by a court of competent jurisdiction, that the termination pursuant to 119.04 was improper, the termination shall be deemed a termination for convenience pursuant to 119.03.

119.05 Contractor Bankruptcy. If the Contractor files a voluntary petition in bankruptcy or has an involuntary petition in bankruptcy filed against the Contractor, or if the Contractor makes

a general assignment for the benefit of creditors, or if a receiver is appointed for all or a substantial part of the Contractor's business or property, the Authorized Representative shall serve written notice on the Contractor and the Contractor's Surety stating that any failure of the Contractor to provide adequate assurances of continued performance will be considered a rejection of the Contract, which shall result in termination of the Contract for cause. In such event, Surety shall be immediately responsible for timely and property completion of the Work. Such termination of the Contract need not be evidenced by an order of any court rejecting the Contract. Upon a final determination, by a court having jurisdiction, that the termination was improper, the termination will be deemed to be a termination for convenience pursuant to 119.03.

ITEM 120 - AUDITS AND RECORDS

120.01 Examination

120.02 Termination and Disputes

120.03 Non-Disclosure by Contractor

120.04 Interest

120.01 Examination. The City shall have the right to examine all books, records, documents and other data of the Contractor and of the Contractor's Subcontractors and Material Suppliers related to the Bidding, pricing, or performance of the Work, including without limitation for the purpose of evaluating any Proposal or claim. Such Materials shall be made available at the office of the Contractor, Subcontractor, or Material Supplier, as applicable, at all reasonable times for inspection, audit and reproduction until the expiration of seven years after the date of Final Acceptance of the Project by the City. To the extent that the Contractor, Subcontractor, or Material Supplier, as applicable, informs the City in writing that any documents copied by the City are trade secrets, the City shall treat such documents as trade secrets of the Contractor, Subcontractor, or Material Supplier, as applicable. In the event, any dispute arises with any other Person about whether such other Person should be given access to the documents, the Contractor, Subcontractor, or Material Supplier, as applicable, agrees to indemnify the City against all costs, expenses and damages, including without limitation attorneys' fees, incurred or paid by reason of such dispute. The right of inspection, audit, and reproduction shall extend to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and Projections used therein.

120.02 Termination and Disputes. If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to the City for a period of seven years from the date of any applicable final settlement or payment, as applicable. Records which relate to disputes, litigation, or settlement of claims arising out of the performance of the Work shall be made available until such dispute, litigation or settlement has been finally decided or settled.

120.03 Non-Disclosure by Contractor. The Contractor shall not disclose, at any time during or after the Work, either directly or indirectly, any confidential records, knowledge or information which the Contractor may acquire about the Project or the City, except as may be required by law or order of a court of competent jurisdiction.

120.04 Interest. Moneys owed to the Contractor by the City pursuant to the terms of the Contract Documents, which are not paid when due shall accrue straight interest at the rate paid by the STAR Account, from the date the moneys become due until the moneys are paid. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract.

CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING MODIFICATIONS

The City of Dayton Construction and Material Specifications Modifications for Online Bidding are hereby modified by this Contract as follows:

1. The definition of Authorized Representative contained in Section 102 shall be removed and replaced with the following:

Authorized Representative: The Authorized Representative for the Contract is the Director of the City of Dayton, Department of Public Works, or duly authorized designee.

2. The definition of Engineer in Section 102 shall be removed and replaced with the following:

Engineer: The Engineer for the Contract the Chief Engineer – Division of Civil Engineering, Department of Public Works or duly authorized designee.

3. Section 103.36 is hereby removed and replaced with the following:

103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for at least 10% of the full amount of the Base Bid plus any Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.

4. Section 106.13 is hereby removed and replaced with the following:

106.13 Construction Schedule. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of Section 105.02 may be invoked.

5. Section 107.19 is hereby removed.

6. Sections 109.05, 109.06, 109.07, 109.08, 109.09, 109.10, 109.11, and 109.12 are hereby removed and replaced with the following:

109.05 Construction Schedule. The Contractor shall prepare a preliminary Construction Schedule within 30-days of the issuance of a Notice to Proceed. The Contractor shall submit the preliminary Construction Schedule in the form of a Gantt Chart. A Gantt Chart consists of a table of project task information and a bar chart that graphically displays the project schedule, depicting progress in relation to time and often used in planning and tracking projects. The Engineer within seven Days of receipt of the preliminary Construction Schedule shall provide written comments to the Contractor. Within 5 days of receipt of the Engineer's comments, the Contractor shall incorporate the comments and submit a revised Construction Schedule to the Engineer. The Contractor shall update the Construction Schedule every thirty days. The table associated with the Gantt Chart shall be formatted in accordance with the following tables as a minimum:

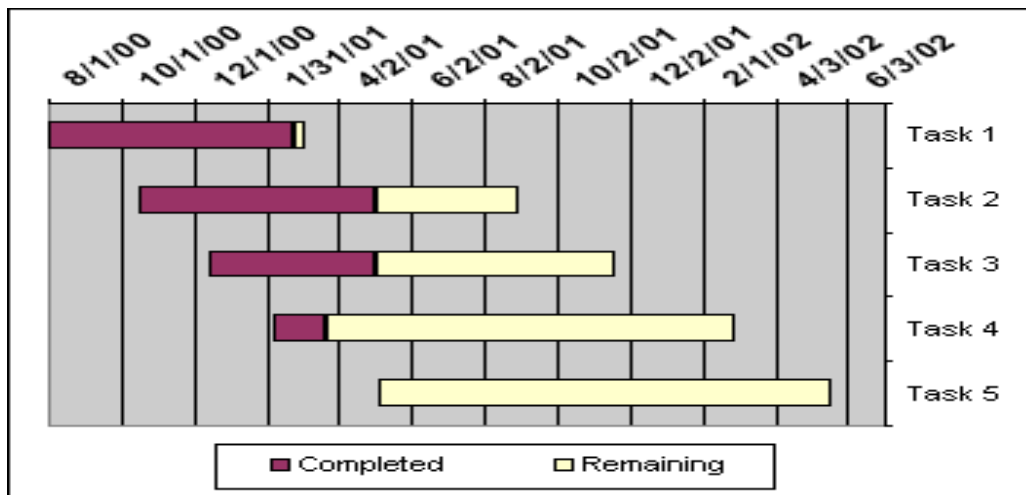
Sample Gantt Chart Table

Task ID	Task Description/ Name	Resource Performing Task	Duration of Task (days)	Start Date	Completion Date	Status
1	Submittals	GC	30	5/15	6/15	Done
2	Mobilize/Setup	GC	10	6/1	6/11	10%
3	Site Clearing	Subcontractor	15	6/12	6/27	0%
Etc.	Etc.	Etc.	Etc.	Etc.	Etc.	Etc.

Note: Table entries are for illustration purposes only.

1. Task ID: Sequential identifier for task (number, alphabetical, alpha-numeric).
2. Task Description/ Name: Brief description or name of major task items.
3. Resource Performing Task: Individuals or company responsible for completion of task and/or with the majority of the work in the task.
4. Duration of Task: Number of days estimated to complete task.
5. Start/Completion dates: Projected dates.
6. Status: Percent completed, description of status, etc.

Sample Graphical Representation of Gantt Chart



109.06 Approval and Acceptance of Contractor Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature on any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation.

7. Sections 114.01, 114.02, 114.04, 114.05, and 114.07 are hereby removed and replaced by the following:

114.01 Contractor Payment Request. After confirming the quantities of work performed with the Engineer, the Contractor shall submit monthly to the Engineer an itemized Payment Request, showing the quantities of work performed. The Contractor shall sign the Payment Request thereby certifying that the quantities are correct and the work has been done in accordance with the Contract, and that it constitutes the total amount of work performed during the period. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.02 Partial Payment. The City shall pay the Contractor an amount equivalent to 90% of the amount listed in each Payment Request within 30 days of the date each Payment Request is executed by the Contractor and approved by the Engineer. After the Contract is 50% complete, as determined by the Engineer, the retainage shall be reduced and the City shall pay 95% of the amount listed in each remaining Payment Request. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and Authorized Representative. Payments due and not paid within such thirty day period shall accrue interest from the date that payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

8. Section 117.06 is hereby removed and replaced with the following:

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

1. Prepare a written request to the Contractor detailing the changes to be made.
2. Reach a written agreement with the Contractor concerning the cost of the Change Order using Unit Prices or the Pricing Guidelines set forth in Section 117.10, whichever the Engineer determines in his or her discretion is applicable.
3. If the cost of the agreed Change Order is less than the available Project Contingency Funds, the Change Order agreement need only be signed by the Engineer.
4. If the cost of the agreed Change Order exceeds the available Project Contingency Funds then the Change Order must be approved by the City Commission and signed by the City Manager. The Contractor may bill for Work covered by the Change Order only after the Change Order is properly executed in accordance with this Section.

9. Section 117.12 is hereby removed and replaced with the following:
117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the Critical Path of the Construction Schedule. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law.

EPODN Renovation Rebid					
ITEM CODE	ITEM DESCRIPTION	UofM	QUANTITY	UNIT PRICE	EXTENSION
Item 1	East Patrol Operations Division North Renovations, Complete, As Per Plan	Lump	1		
Item 2	Building Permit & Application Fee	Lump	1	\$ 42,888.23	\$ 42,888.23
Item 3	Hazardous Material Abatement Allowance	EA	1	\$100,000.00	\$ 100,000.00
Alternate No. 1					
Alt. 1	Construction Contingency Allowance (\$400,000.00)	Lump	1		
Alternate No. 2					
Alt. 2	Allowance for Painted Mural on South Elevation (\$10,000.00)	Lump	1		
Alternate No. 3					
Alt. 3	Addition of Generator Package	Lump	1		

Project Manual

DATE: November 20, 2025



CITY OF DAYTON POLICE DEPARTMENT 1ST DISTRICT EAST PATROL RENOVATIONS

**417 East Helena Street
Dayton, Ohio 45404**



615 Woodside Drive, Englewood, Ohio 45322

T 937.836.8898 F 937.832.3696

www.app-arch.com

PROJECT NUMBER: 4209.00

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CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING

The City of Dayton Construction and Material Specifications are hereby modified by this Contract as follows:

100 GENERAL PROVISIONS

ITEM 101 ABBREVIATIONS

101 Abbreviations. The following abbreviations, when used in the Contract Documents, shall have the respective meaning shown below:

ANLA	American Nursery and Landscape Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWG	American Wire Gauge
AWP	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CMS	Construction and Material Specifications of the Ohio Department of Transportation
DCE	District Construction Engineer
DDD	District Deputy Director
DET	District Engineer of Tests
DMA	Declaration Regarding Material Assistance/Non-Assistance to a Terrorist Organization
DNR	Department of Natural Resources
EEL	Edison Electric Institute
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration, Department of Transportation
FSS	Federal Specifications and Standards, General Services Administration
HRC	The Human Relations Council of the City of Dayton
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ISSA	International Slurry Seal Association
ITE	Institute of Transportation Engineers
JMF	Job Mix Formula
MSDS	Material Safety Data Sheet(s)

NCHRP	National Cooperative Highway Research Program
NEMA	National Electrical Manufacturers Association
NISTN	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
ODOT	Ohio Department of Transportation
OMUTCD	Ohio Manual of Uniform Traffic Control Devices
ORC	Ohio Revised Code
ORDC	Ohio Rail Development Commission
OSHA	Occupational Safety and Health Administration
PCC	Portland Cement Concrete
RCGO	City of Dayton Revised Code of General Ordinances
REA	Rural Electrification Administration
SSP	Steel Structures Painting Council
STAR	State Treasurer's Asset Reserve
UL	Underwriters' Laboratories, Inc.

ITEM 102 DEFINITIONS

102 Definitions. The following words or terms, when used in the Contract Documents, are defined to mean as follows:

Addendum or Addenda A written or graphic instruction issued prior to the Bid Deadline which clarifies, amends or interprets the Contract Documents.

Alternate A proposed change in the work described in the Contract Documents providing the City with an option to select between alternative materials, products or systems, or to add or delete portions of the Work.

Alternative Dispute Resolution A method of resolving disputes other than arbitration or litigation.

Approved Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder and approved by the Engineer for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

As-built Drawings Drawings or computer files revised and submitted by the Contractor to show changes made during the construction process.

Authorized Representative Unless otherwise specified in the Contract Documents, the City Manager of the City or any of the City Manager's duly authorized assistants or designees.

Base Bid The amount of money stated in a Bid as the sum for which the Bidder offers to perform the Work described in the Contract Documents, exclusive of adjustments for Alternates.

Bid The offer of a Bidder to perform the Work for the amount or amounts quoted, as applicable.

Bidder A Person who submits a Bid for a Contract with the City.

Bid Deadline The date and time established as the deadline for submission of Bids, either through the Electronic Bidding Service or as otherwise provided by the City, subject to modification by Addendum.

Bid Guaranty Bid Bond or other instrument of security furnished by the Bidder to provide assurance that the Bidder will execute the Contract Form.

Board of Review Committee consisting of the City Manager, City Attorney and Director of the Department of Public Works or any of their respective authorized assistants or designees.

Borrow Area A location from which natural materials are to be removed for use in the Work.

Bridge A Structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of the roadway of more than 10 feet between undercopings of abutments or extreme limits of openings for multiple boxes.

Length. The length of a Bridge Structure is the over all length measured along the center line of Roadway of the surface of the Roadway.

Roadway width. The clear width measured at right angles to the longitudinal centerline of the Bridge between the bottom of curbs or guard timbers or, in the case of multiple heights of curbs, between the bottoms of the lower risers. For curb widths of 1 foot or less, the Roadway width shall be measured between the parapets or railings.

Building Department The City's Department of Building Services.

Bulletin A document issued by the Engineer after the execution of the Contract Form requesting a Proposal from the Contractor which, if approved as provided in the Contract Documents, will cause the execution of a Change Order to modify, amend or alter the Contract Documents. The Bulletin becomes a part of the Contract Documents when a Change Order related to the Bulletin is executed by all applicable Persons.

Certificate of Contract Completion A document signed by the Contractor and the Engineer certifying that Contract Completion has occurred.

Certificate of Partial Occupancy or Use A document signed by the Contractor and the Engineer certifying that City has chosen to occupy or utilize the Project or a designated portion thereof in accordance with 105.03.

Certified Test Data A test report from a manufacturer's Laboratory or an independent Laboratory approved by the City listing actual test results of samples tested for compliance with specified City requirements. The City will accept Certified Test Data from a manufacturer's Laboratory if its products have been used satisfactorily on prior City Contracts and its test data has been confirmed. The Contractor shall include a statement that the test data furnished is representative of the material furnished to a City Project or to a supplier. The report shall contain a characteristic number or date and shall identify the City Project or supplier to which the material is shipped. All reports shall be signed by an individual having legal authority to act for the manufacturer's Laboratory or independent Laboratory, as applicable.

Change Order A document issued by the City after execution of the Contract Form, which authorizes a change in the Work or an adjustment or alteration in the Contract price or the time for Contract Completion. A Change Order which requires only use of contingency funds (a "Field Change Order") may be approved by the Engineer. A Change Order which increases the Contract price must be approved by the City Manager and/or City Commission.

City The City of Dayton, an Ohio municipal corporation.

Claim Affidavit A sworn document containing a claim on funds that are due to a Contractor, created by statute in favor of a Person supplying labor, materials or services for the value of labor, materials or services supplied.

Conduit Any pipe or similar passageway for electricity, gas, water, Sewer or other utility.

Construction Schedule The schedule for the construction of the Work showing the time for completion of the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship of the Contractor's activities with the activities of other Contractors, if any, the Engineer, and the City.

Contingency Fund Moneys reserved by the City within the contract to pay costs resulting from Change Orders, unanticipated conditions, compliance with rulings on building or other codes, incompleteness or inaccuracy of Contract Documents and settlements on judgments related to the Project.

Contract The agreement between the City and the Contractor as set forth in the Contract Documents.

Contract Bond Performance and payment bond or bonds, as applicable, furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Contract and make required payments.

Contract Completion The date upon which all deficiencies noted in the Punch List have been corrected, the Contractor's Work is one hundred percent complete, the as-built drawings have been approved by the Engineer, and the Contractor has complied with all conditions precedent to final payment and release of retainage. When the Contract Documents specify a date for Contract Completion, Contract Completion shall occur on or before the specified date, even if the specified date is a Saturday, Sunday or legal holiday. When the Contract Documents provide that Final Acceptance shall occur a specified number of consecutive days after the date for commencement of Work set forth in the Notice to Proceed, that period of time shall be the time for Contract Completion.

Contract Cost Breakdown A statement furnished by the Contractor to the City reflecting the portions of the Contract price allocated to the various portions of the Work and used as the basis for reviewing the Contractor's Payment Requests.

Contract Documents Collectively, the Plans, plan notes, standard construction Drawings identified in Plans, Specifications, supplemental Specifications, Addenda, definitions,

Legal Notice, instructions to Bidders, equal opportunity requirements, electronic Bid, Bidder's affidavit, non-collusion affidavit, Bid guaranty, Substitution sheet, Contract Form, Contract Bond or Bonds, as applicable, wage rates and Special Provisions, Change Orders and approved Working Drawings, if any.

Contract Form The form furnished by the City that, when completed and signed by the Contractor and the City, evidences the entry into the Contract.

Contractor A Person with whom the City has entered into a Contract for the performance of Work on the Project in cooperation with other Persons and in accordance with the Contract Documents.

Culvert Any Structure not classified as a Bridge that provides an opening under a Roadway.

Day Calendar day, i.e., every day of the year, unless otherwise expressly specified to mean a business day. A business day is any day other than a Saturday, Sunday or legal holiday.

Defective When modifying the word Work, refers to Work that does not conform to the Contract Documents, or does not meet the requirements of any applicable statute, rule or regulation, policy, inspection, reference standard, test or approval, or has been damaged prior to Final Acceptance, unless responsibility for the protection thereof has been expressly assumed by the City, or that is not free from defects in workmanship, material or Equipment during the period of a Guarantee.

Director The Director of the City Department under which the Project is being performed, or the duly authorized designee of the applicable Director.

Drawings See Plans.

Electronic Bidding Service The electronic service used by the City to disseminate bidding information and documents to Bidders and to receive Bids and related documents from Bidders.

Engineer Unless otherwise specified in the Contract Documents, the Engineer of the Department of Public Works, the Water Engineering Manager of the Department of Water of the City of Dayton or the Planning and Engineering Manager of the Department of Aviation under which the Project is being performed, or the duly authorized designee of the Engineer or Manager, as applicable.

Engineer's Estimate An estimate of cost for a Project or a Contract for a Project prepared by the Engineer prior to Bid Deadline.

Equipment All machinery and Equipment, together with the necessary supplies for upkeep and maintenance, tools and apparatus necessary for the construction of the Work.

Fabricator The Subcontractor that fabricates structural metals or prestressed concrete members.

Final Acceptance The City's acceptance of the Work from the Contractor upon approval by the Authorized Representative of the Certificate of Contract Completion.

Final Inspection Final review of the Work of the Contractor by the Engineer to determine whether certification of Contract Completion is appropriate.

Guarantee Legally enforceable assurance, for a period after Contract Completion, of quality or performance of the Contractor's workmanship, material and Equipment.

Inspector A Person assigned by the Engineer to make detailed inspections of the Work.

Laboratory The testing Laboratory designated by the City or determined in accordance with the Contract Documents.

Legal Notice The public announcement inviting Bids for Work.

Liquidated Damages The sum established in the Contract Documents as the predetermined measure of damages to be paid to the City due to the Contractor's failure to complete the Work, or portions thereof, within a stipulated time.

Maintenance Bond A bond furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Guarantee.

Materials Any substances, supplies, products or other items specified or reasonably intended for use in the construction of the Project and its appurtenances.

Material Supplier A Person who furnishes materials for Work on the Project, in any tier.

Mathematically Unbalanced The lump sum amount or Unit Price in a Bid that does not include reasonably sufficient amounts for labor, material, Equipment, overhead and other applicable costs and profit.

Notice of Commencement The notice prepared by the City identifying the Project, the Contractor, the Surety for the Contractor and the name of the Person upon whom a Claim Affidavit may be served.

Notice of Intent to Award The notice provided to the apparently successful Bidder stating that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the City intends to execute a Contract Form with the Bidder.

Notice to Proceed A notice provided by the Engineer to the Contractor authorizing the Contractor to proceed with the Work and establishing the date for commencement of the Work.

Or Equal See Approved Equal.

Owner See City.

Partial Occupancy or Use The stage in the progress of the Work when the Project, or a designated portion thereof, is sufficiently complete in accordance with the Contract Documents so the City can occupy or utilize the Project, or the designated portion thereof, for its intended use, if the City chooses.

Payment Request The form furnished by the City that is to be used by the Contractor in requesting progress payments and which when signed by the Contractor shall serve as an affidavit that payment requests are in proportion to the Work completed as shown by the Contract Cost Breakdown and that payments previously paid by the City have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the Work covered by all prior Payment Requests.

Pedestrian Bridge A Bridge designed and constructed to provide means of traverse for pedestrian traffic only; also known as a foot Bridge.

Permittee Any Person issued a permit by the City to perform Work in accordance with these Specifications in a street, alley, Public Way or place, but not having a Contract with the City.

Person An individual, corporation, business trust, estate, limited liability company, partnership, association or other entity, public or private.

Plans The graphic and pictorial portions of the Contract Documents, showing the design, type of construction, location, dimension and character of the Work to be provided by the Contractor, generally including Drawings, elevations, sections, details, schedules, diagrams, notes, and Specifications, in whole or in part.

Profile Grade The trace of a vertical plane intersecting the top surface of the proposed wearing surface, usually along the longitudinal center line of a Roadbed. Profile Grade means either elevation or gradient of such trace according to the context.

Project The improvement to be constructed, of which the Work performed under the Contract Documents may be the whole or a part.

Project Schedule The schedule for the construction of the Project showing the time for completing the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship between the activities of the Contractor, other Contractors, the Engineer, and the City.

Proposal The offer of the Contractor to complete the Work set forth in a Bulletin.

Proposed Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

Public Way (or Place) A street, road, walk, alley or path used for public travel.

Punch List A list of items of Work to be completed or corrected by the Contractor as a condition precedent to Contract Completion.

Record Drawings Drawings or computer files revised by the Engineer to show the changes made during the construction process, based on the As-built Drawings furnished by the Contractor to the Engineer.

Request for Information Written request from the Contractor to the Engineer seeking an interpretation or clarification of the Contract Documents.

Right-of-Way Land, property, or interest therein, usually in a strip, acquired for or devoted to a road and includes the Roadway, Shoulders or berm, ditch and slopes extending to the Right-of-Way limits under control of the City.

Road A Public Way for purposes of vehicular travel, including the entire area within the Right-of-Way.

Roadbed The graded portion of a road within top and side slopes, prepared as foundation for the pavement Structure and Shoulder.

Roadside The areas between the outside edges of the Shoulders and Right-of-Way boundaries. Unpaved median areas between inside Shoulders of divided highways and infield areas of interchanges are included.

Roadside Development Those items necessary to the complete road that provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the road.

Roadway The portion of a road within the limits of construction.

Samples Physical examples furnished by the Contractor to illustrate materials, Equipment or workmanship and to establish criteria by which the Work will be judged.

Schedule of Values See Contract Cost Breakdown.

Sewer Pipe or Conduit intended for carrying storm drainage or sanitary drainage.

Shop Drawings Drawings, diagrams, illustrations, schedules, performance charts, brochures, catalog data and other data specially prepared or provided by the Contractor, a Subcontractor or Material Supplier to illustrate some portion of the Work.

Shoulder The portion of the road contiguous to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk That portion of the road constructed for the use by pedestrians.

Special Provisions Amendments to the Specifications or supplemental Specifications, which describe conditions unique to a particular Project.

Specifications Those portions of the Contract Documents consisting of the detailed written requirements and standards for materials, Equipment, construction systems and workmanship as applied to the Work and certain procedural details applicable thereto.

Standards The items named in the Specifications to denote kind, quality or performance requirement for the Work. All Bids and Proposals shall be based on the Standards as set forth in the Specifications.

State The State of Ohio.

Street See road.

Structure Bridge, Culvert, catch basin, curb inlet, drop inlet, retaining wall, cribbing, manhole, endwall, building, curb, pavement, Sewer, water main, service pipe, underdrain, foundation drain, and any other features which may be encountered in the Work and not otherwise defined herein.

Subcontractor A Person who undertakes to perform any part of the Work on the Project under a Contract with any Person other than the City, in any tier.

Subgrade The portion of a Roadbed upon which the pavement structure and Shoulders are constructed.

Substitution An item proposed by the Bidder to be used instead of a standard, but not considered in determining the lowest and best Bidder.

Substructure The part of a structure below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with backwalls and wings.

Superintendent The Contractor's Authorized Representative in charge of the Work.

Superstructure The entire structure except the Substructure.

Supplemental Specifications Detailed Specifications supplemental to or amending or superseding the Specifications.

Surety A Person providing a Bid guaranty, Contract Bond or Maintenance Bond to a Bidder or Contractor, as applicable, to indemnify the City against all direct and consequential damages suffered by failure of the Bidder to execute the Contract Form or of the Contractor to perform the Contract and to pay all lawful claims of Subcontractors, Material Suppliers and laborers or to perform the Guarantee, as applicable.

Unit Price An amount stated in the Bid as the price per unit of measurement for Materials or services described in the Contract Documents, which cost shall include overhead, profit and any other expense for the applicable Work.

Warranty Legally enforceable assurance for the specified duration from Final Acceptance of quality or performance of Materials or Equipment.

Waste Area A location in which natural Materials are to be deposited when not used in the Work.

Work The construction services required by the Contract Documents, to include all labor, Materials, Equipment, tools, transportation, supplies, incidental and services performed or provided by the Contractor for the Project.

Working Drawings Stress sheets, shop Drawings, erection Plans, false work Plans, framework Plans, cofferdam Plans, bending diagrams for reinforcing steel, or any other supplementary Plans or similar data which the Contractor is required to submit for acceptance.

ITEM 103 INSTRUCTION TO BIDDERS

- 103.01 Contract Completion and Critical Path Scheduling**
- 103.02 Delay Claims**
- 103.03 Giving Notice**
- 103.04 Examination of Contract Documents**
- 103.05 Evaluation of Work Season and Project Site**
- 103.06 Subsurface and Concealed Physical Conditions**
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- 103.22 Bid Letting**
- 103.23 Bid Deadline Extension**
- 103.24 Bid Evaluation Criteria**
- 103.25 Bid Evaluation Procedures**
- 103.26 Lowest Bidder**
- 103.27 Rejection of Bids**
- 103.28 Best Bidder**
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- 103.30 Notice of Intent to Award**
- 103.31 Withdrawal of Bid**
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- 103.33 Effect of Withdrawal**
- 103.34 Bid Estimate**
- 103.35 Review of Low Bid**
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- 103.37 Bid Guaranty Forfeiture**
- 103.38 Exception to Bid Guaranty Forfeiture**
- 103.39 Contract Bond**
- 103.40 Personal Property Tax Statement**
- 103.41 Conditions Precedent for Execution of Contract Form
by City**
- 103.42 Time Limits**
- 103.43 Notice to Proceed and Submittals**
- 103.44 Wage Rates and Payment Dates**
- 103.45 Written Submissions in lieu of Electronic Bidding Service**

103.01 Contract Completion and Critical Path Scheduling. Unless otherwise provided in the Contract Documents, the time for completion of the Project indicated on the Bid or Electronic Bidding Service shall be the time for Contract Completion applicable to the Bidders. Critical path scheduling methods shall be utilized, unless waived by the Authorized Representative in writing.

103.02 Delay Claims. The only delays for which the Bidder is entitled to additional compensation are those delays which the Bidder has established were proximately caused by an improper action or failure to act by the Owner.

103.03 Giving Notice. Whenever any provision of the Contract Documents requires the giving of notice prior to the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Bidder by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Bidder shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Bidder shall be copied to the Engineer.

103.04 Examination of Contract Documents. Contract Documents are available through the Electronic Bidding Service. The Bidder shall examine all Contract Documents, including without limitation the Drawings and Specifications for all divisions of Work for the Project, noting particularly all requirements which will affect the Bidder's Work in any way prior to submitting the Bidder's Bid. Failure of a Bidder to be acquainted with the amount and nature of Work required to complete any of the Work, in conformity with all requirements of the Project as a whole wherever set forth in the Contract Documents or reasonably inferred therefrom, will not be considered as a basis for additional compensation.

103.05 Evaluation of Work Season and Project Site. The Bidder shall evaluate when the Work may be performed and examine and evaluate the Project site and related Project conditions where the Work will be performed prior to submitting the Bidder's Bid, including without limitation the following:

- (a) The condition, layout and nature of the Project site and surrounding area, including Borrow Areas and Waste Areas, if any;
- (b) The availability and cost of labor;
- (c) The availability and cost of Materials, supplies and Equipment;
- (d) The cost of temporary utilities required;
- (e) The cost of any permit or license required by a local or regional authority having jurisdiction over the Project;
- (f) The usual weather conditions;
- (g) Conditions bearing upon transportation, disposal, handling, and storage of Materials and waste.

103.06 Subsurface and Concealed Physical Conditions. The Contractor may rely upon the general accuracy of the technical data contained in reports and drawings provided to the Contractor by the Owner and, except for such reliance on technical data, the Contractor shall not rely upon or make any claim against the City with respect to: (1) the completeness of such reports and drawings for the Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor, and safety precautions and programs incident thereto; or (2) other data, interpretation, opinions, and information contained in such reports or shown or indicated in such drawings; or (3) any Contractor interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by the Contractor to estimate locations or quantities of subsurface strata are independent factual assumptions which the Owner does not warrant. Subject to the foregoing, if during the progress of the Work subsurface or concealed physical conditions are encountered at the site differing materially from those indicated in the Contract Documents, or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall notify the Engineer of the specific differing conditions before they are disturbed or the affected Work is performed. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with Item 117. The City may decline to issue a Change Order if the notice required by 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extension for the related subsurface or concealed physical conditions.

103.07 Pre-Bid Meeting. All Bidders are required to attend the pre-Bid meeting, where the Engineer will answer questions regarding the Contract Documents. If not given in the Legal Notice, notice of the time and place of any pre-Bid meeting to be held will be given by the Engineer to each Person of record holding Contract Documents. A Bidder's failure to attend the pre-Bid meeting will result in his or her bid being rejected as non-responsive.

103.08 Request for Information or Clarification. If the Bidder finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation the Drawings and Specifications, or between any Contract Documents and any applicable provision of law, the Bidder shall submit a written request to the Engineer for an interpretation or clarification. Such requests must be submitted to the Engineer at least seven Days before the Bid Deadline.

103.09 Interpretation or Clarification by Addendum. If the Engineer determines that an interpretation or clarification is warranted, the Engineer shall issue an Addendum through the Electronic Bidding Service. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than an Addendum issued through the Electronic Bidding Service, shall not be binding and the Bidder shall not rely upon any such interpretation or clarification. The Bidder shall not, at any time before or after the execution of the

Contract Form, be compensated for a claim alleging insufficient data, incomplete, ambiguous, conflicting or erroneous Contract Documents, any discrepancy on or between Contract Documents or incorrectly assumed conditions regarding the nature, extent or character of the Work, if no request for interpretation or clarification regarding such matter was made by the Bidder prior to the Bid Deadline in compliance with 103.08.

103.10 Standards. The articles, devices, Materials, Equipment, forms of construction, fixtures and other items named in the Specifications to denote kind, quality or performance requirement for each significant portion of the Work shall be known as Standards and all Bids shall be based upon those Standards. Where two or more Standards are named, the Bidder may furnish any one of those Standards. Items which are not Standards may be used only if accepted pursuant to the requirements of 103.11 and 103.12.

103.11 Proposed Equals. If the Bidder proposes to use an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications, the Bidder shall submit such a proposal to the Engineer, not later than ten Days prior to the Bid Deadline, certifying that the item is equal in quality, and in all aspects of performance and appearance, to the Standards specified. In addition, the Bidder shall submit information to the Engineer not later than ten Days prior to the Bid Deadline, which information shall include:

- (a) The name and a complete description of the Proposed Equal, including Drawings, performance and test data, and other information necessary for a complete evaluation of the Proposed Equal;
- (b) A statement setting forth any changes which the Proposed Equal will require in the Contract Documents or the Project.

103.12 Approval or Disapproval of Proposed Equals. If the Engineer, in the exercise of the Engineer's sole unfettered discretion, approves the Proposed Equal as a Standard, the Engineer shall issue an Addendum to that effect through the Electronic Bidding Service. If the Engineer does not approve the Proposed Equal as a Standard, the Engineer shall inform the Bidder of the disapproval in writing, no later than ninety-six hours prior to the Bid Deadline, excluding Saturdays, Sundays and legal holidays, which decision shall be final. The Engineer shall have the discretion to reject a Proposed Equal for any reason, including, but not limited to, the Bidder's failure to provide sufficient information to enable the Engineer to completely evaluate the Proposed Equal without delaying the scheduled Bid Deadline.

103.13 Substitutions. If no Addendum is issued approving the Proposed Equal as a Standard, the Bidder may list the item on the Substitution sheet. A Bidder desiring consideration for the use of an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications shall submit a Proposal for the Substitution of same for the applicable standard, using the Substitution sheet provided in the Electronic Bidding Service and listing, for each proposed Substitution: the standard specified, the Substitution, and the change in Bid amount, (or indicate no change, if applicable). The name and a complete description including Drawings, performance and test data, and other information necessary for

a complete evaluation of each Substitution shall be furnished to the Engineer by the Bidder promptly upon request. Any Substitution accepted by the City must be incorporated in the Contract in writing. Substitutions shall not be considered in determining of the lowest and best Bid but may be considered in rejecting all Bids.

103.14 Electronic Bid. Each Bid shall contain the name of every Person interested therein and be submitted through the Electronic Bidding Service. Instructions for using the Electronic Bidding Service are available on the City's website. Failure to properly submit a Bid through the Electronic Bidding Service may cause a Bid to be rejected as nonresponsive. Unless the Bidder withdraws the Bid as provided in 103.31, the Bidder will be required to comply with all requirements of the Contract Documents, regardless of whether the Bidder had actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

103.15 Alternates. When an Alternate is listed in the Electronic Bidding Service, the Bidder shall complete the applicable portion, indicating an amount which will increase or decrease the Base Bid. The City reserves the right to accept or reject any or all Bids on Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order.

103.16 Submission of Bid. If the Bidder is a corporation, limited liability company, partnership or sole proprietorship, an officer, member, partner or principal of the Bidder, as applicable, shall submit and electronically sign the Bid through the Electronic Bidding Service. If the Bidder is a joint venture, an officer, member, partner or principal, as applicable, of each participant of the joint venture shall electronically sign the Bid on behalf of that participant, where applicable. By submitting a Bid, the Bidder warrants that it is not now, and will not become subject to an unresolved finding for recovery under Section 9.24 ORC, prior to the award of any Contract arising out of this Project, without notifying the City of such findings. Section 9.24, ORC prohibits the City from awarding a Contract to any Bidder against whom the Auditor of State has issued findings for recovery if the findings for recovery are unresolved at the time of award. The completed Bid submission of the Bidder with whom the City executes a Contract Form shall be incorporated into the Contract Form as if fully rewritten therein.

103.17 Submittals with Bid. Where indicated in the Electronic Bidding Service, the Bidder must download all documents that are shown as requiring a download and submit every document that is shown as requiring submission. A Bid shall be rejected if the Bidder fails to submit, or submits not fully complete, any document that is shown as requiring submission.

103.18 Unit Prices. When Unit Prices are requested in the Electronic Bidding Service, any scheduled quantities listed by the City are not binding upon the City and are to be used only for the comparison of Bids for purposes of determining the lowest and best Bidder and to determine the maximum quantity to be provided without a Change Order. If Unit Prices are stated to be sought only for informational purposes, they shall not be used for comparison of Bids. Unless otherwise specified in the Contract Documents, the Unit Prices and the totals or extensions thereof set forth shall include all Materials, Equipment, insurance, labor, delivery, installation, overhead, profit and any other cost or expense, in connection with or incidental to,

the performance of that portion of the Work to which the Unit Prices apply. The Bidder shall submit Unit Prices for all items listed unless other instructions are stated.

103.19 Changes to Unit Price Work. The Bidder agrees that the City may increase, decrease or delete entirely the scheduled quantities of Work to be done and Materials to be furnished after execution of the Contract Form without invalidating the Contract. Payments, except for lump sum items in Unit Price Contracts, will be made to the Contractor only for the actual quantities of Work performed or Materials furnished in accordance with the Contract Documents, but not in excess of the maximum set by the scheduled quantities. The Contractor must obtain a Change Order prior to performing Work or furnishing Materials in excess of the scheduled quantities in order to be compensated for the excess.

103.20 Change in Bid Amount. The Bidder may amend or withdraw its Bid through the Electronic Bidding Service at any time prior to the Bid Deadline.

103.21 Timely Submission of Bids. It is the responsibility of the Bidder to submit its Bid through the Electronic Bidding Service prior to the Bid Deadline. Bids arriving after the Bid Deadline shall not be considered.

103.22 Bid Letting. Bidders may submit Bids through the Electronic Bidding Service up to the Bid Deadline. At the Bid Deadline, all Bids will be tabulated and the tabulation made public. The public bid tabulation is for informational purposes only and is not to be construed as an acceptance or rejection of any Bid submitted. The electronic Bid submissions shall be a public record and open for inspection, upon request, at any time after the Bid Deadline, except for any information which is not subject to disclosure as provided by applicable law.

103.23 Bid Deadline Extension. If any Addendum is issued within Seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays and legal holidays, the Bid Deadline shall automatically be extended one week, with no further advertising required. If any Addendum is issued more than seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays, and legal holidays, the Bid Deadline may be revised by the Addendum, at the City's discretion.

103.24 Bid Evaluation Criteria. The City reserves the right to accept or reject any or all Bids, in whole or in part, and reserves the right to reject any Bid or Bids and to award the Contract to any remaining Bidder the City determines to be the lowest and best Bidder. The City reserves the right to accept or reject any or all Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order. The City may reject the Bid of any Bidder who has engaged in collusive Bidding, been involved in violations of ethics laws or who has an unresolved finding against it by the Auditor of State as provided in Section 9.24, ORC, as not the lowest and best Bid. The City reserves the right to waive, or to allow any Bidder a reasonable opportunity to cure a minor irregularity or technical deficiency in a Bid, provided the irregularity or deficiency does not affect the Bid amount or otherwise give the Bidder a competitive advantage. Noncompliance with any requirements of the Contract Documents may cause a Bid to be rejected.

103.25 Bid Evaluation Procedures. The Contract will be awarded to the lowest and best Bidder as determined in the discretion of the City or all Bids will be rejected in accordance with the procedures set forth in 103.26 through 103.31.

103.26 Lowest Bidder. In determining which Bidder is the lowest, the City shall consider the Base Bid and any Alternate or Alternates which the City determines to accept. Substitutions shall not be considered. The total of the Bids for the accepted Alternate(s) shall be added to or deducted from the Base Bid, as applicable, for the purpose of determining the lowest Bidder. If the Project involves multiple Contracts, the City may also receive combined Bids for two or more Contracts, if provided in the Electronic Bidding Service, but no Contract for the entire job or for more than one Contract shall be awarded unless the separate Bids do not cover all the Work and Materials required or unless the combined Bid is lower than the applicable separate Bids in the aggregate. The City may also receive Bids for multiple Projects if provided in the Electronic Bidding Service.

103.27 Rejection of Bids. In addition to any other reason provided for in this Item, a Bid shall be rejected if:

- (a) the Bid fails to respond to the Contract Documents in all material respects;
- (b) the Bid contains irregularities or deviations from the Contract Documents which would affect the amount of the Bid or otherwise give the Bidder a competitive advantage;
- (c) the Bid contains a Bid guaranty executed by a Surety not licensed in Ohio; or
- (d) a Bid guaranty that is otherwise determined to be insufficient by the City.

In addition to any other reason provided for in this Item, a Bid may be rejected if:

- (a) the Bid is Mathematically Unbalanced;
- (b) the Bid does not contain an executed Non-collusion affidavit;
- (c) the Bidder fails to furnish Samples and a complete statement of the origin, composition and manufacture of any or all Materials to be used for the Work, when so requested; or
- (d) the Samples provided by the Bidder fail to demonstrate that Materials are of sufficient quality or fitness for the Work.

103.28 Best Bidder. In determining whether a Bidder is best, factors to be considered include, without limitation:

- (a) Preferences required by law, where applicable;
- (b) The experience of the Bidder;

- (c) The financial condition of the Bidder;
- (d) Compliance by the Bidder and related Persons with ethics laws and City ordinances and regulations, including without limitation submission of an affirmative action program in accordance with Section 35.16 R.C.G.O.;
- (e) The conduct and performance of the Bidder on previous Bids and Contracts with the City or other owners, which shall include, without limitation, compliance with prevailing wage laws, Workers' compensation, income tax laws and equal opportunity requirements;
- (f) The facilities of the Bidder, including without limitation machinery, plant and Equipment, as applicable;
- (g) The management skills of the Bidder;
- (h) The ability of the Bidder to execute the Contract properly, including whether the Bidder's existing workload may hinder or prevent timely completion of the Work;
- (i) The ability of the Bidder to perform at least fifty-one percent of the Work with its own employees;
- (j) The evaluation of a Bid below the median of other Bids pursuant to 103.37.

A Bidder who submits a Bid for Work for electrical, plumbing, hydronics, refrigeration or heating, ventilating and air conditioning shall provide evidence of a valid Contractor's license from the Ohio Construction Industry Licensing board or successor.

103.29 Information. A Bidder shall submit to the Engineer, upon request, any information the Authorized Representative deems appropriate to the consideration of factors showing that such Bidder's Bid is best, including without limitation the following:

- (a) Overall experience of the Bidder, including number of years in business under present and former business names;
- (b) Names and qualifications of key Bidder personnel;
- (c) Complete listing of all ongoing and completed public and private construction Contracts of the Bidder in the last three years, including the nature, status and value of each Contract and a name, address, and phone number for a representative of the Owner of each related Project;
- (d) Complete listing of any EPA, (OSHA) or other regulating entity issues or citations in the last ten years;
- (e) Complete listing of all outstanding liens against the Bidder;
- (f) Certified financial statement with trade and bank references;
- (g) Description of relevant facilities of the Bidder;

(h) Description of the management experience of the Bidder's Project manager(s) and Superintendent(s); who will be assigned to the Project;

(i) Complete list of all Subcontractors and Material Suppliers;

(j) To support a Contract Bond, a current and signed certificate of compliance required under Section 9.311 ORC, issued by the Department of Insurance, showing the Surety is licensed to do business in Ohio;

(k) Current Ohio Workers' Compensation Certificate.

If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State; or, if the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05, ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.

The Engineer may obtain such information from several Bidders simultaneously. Each Bidder shall provide requested information within such time limits as the Engineer shall establish.

103.30 Notice of Intent to Award. The City shall notify the apparent lowest and best Bidder that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the Bidder will be awarded the Contract. The City reserves the right to rescind any Notice of Intent to Award at any time prior to the execution of the Contract if the City determines the Notice of Intent to Award was issued in error.

103.31 Withdrawal of Bid. A Bidder may withdraw its Bid at any time prior to the Bid Deadline through the Electronic Bidding Service. All Bids submitted through the Electronic Bidding Service which were not withdrawn prior to the Bid Deadline shall remain valid and open for acceptance for a period of at least sixty Days after the Bid Deadline; provided, however that during that period a Bidder may withdraw a Bid from consideration if the Bid amount was substantially lower than the amounts of other Bids, providing the Bid was submitted in good faith, and the reason for the Bid amount being substantially lower was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of Work, labor or material made directly in the compilation of the Bid amount. Notice of such a request to withdraw a Bid must be made in writing filed with the Authorized Representative within two business Days after the Bid Deadline. The City reserves the right to request that the Bidder submit evidence substantiating the Bidder's request to withdraw the Bid. No Bid may be withdrawn after the Bid Deadline when the result would be the awarding of the Contract on another Bid to the same Bidder. If a Bid is withdrawn after the Bid Deadline, the City may award the Contract to another Bidder that the City determines to be the lowest and best Bidder, or reject all Bids and advertise for other Bids. If the City advertises for other Bids, the withdrawing Bidder shall pay the costs incurred by the City in connection with the rebidding if the City finds that such costs would not have been incurred but for such withdrawal. A Bidder may withdraw its Bid at any time after the expiration of the described sixty Day period by written notice to the Authorized Representative.

103.32 Refusal to Accept Withdrawal. If the City intends to contest the right of the Bidder to withdraw a Bid after the Bid Deadline, a hearing shall be held by the Authorized Representative within ten Days after the Bid Deadline and an order shall be issued by the City allowing or denying the claim of such right within five Days after such hearing is concluded. The City shall give the withdrawing Bidder timely notice of the time and place of any such hearing. The City shall make a stenographic record of all testimony, other evidence, and rulings on the admissibility of evidence presented at the hearing. The Bidder shall pay the costs of the hearing. If the City denies the claim for withdrawal and the Bidder elects to litigate or otherwise refuses to perform the Contract, the City may reject all Bids or award the Contract to the next lowest and best Bidder, as determined by the City, without waiving any claims against the non-performing Bidder.

103.33 Effect of Withdrawal. No Bidder who is permitted to withdraw a Bid after the Bid Deadline shall for compensation supply any material or labor to, or perform any subcontract or other Work agreement for, the Person to whom the Contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn Bid was submitted, without the written approval of the City. The Person to whom the Contract is awarded and the withdrawing Bidder shall be jointly liable to the City in an amount equal to any compensation paid to or for the benefit of the withdrawing Bidder without such approval. A Bidder who is permitted to withdraw a Bid after Bid Deadline may be considered not the best for future City Contracts.

103.34 Bid Estimate. In no instance shall Contracts be let either as a whole, or in aggregate, if Bids for parts of the Work are taken, which exceed one hundred ten percent of the estimate for the improvement contemplated.

103.35 Review of Low Bid. The City may reject a Bid which is

- (a) more than twenty percent below the median of all higher Bids received for a Contract where the estimate is one hundred thousand dollars or more; or
- (b) more than twenty-five percent below the median of all higher Bids received for a Contract where the estimate is less than one hundred thousand dollars.

In determining whether to reject such a bid, the City may at its discretion, but is not required to:

- (a) Conducts an interview with the Bidder to determine what, if anything has been overlooked in the Bid, and to analyze the process planned by the Bidder to complete the Work;
- (b) Require the Bidder to submit to the City a certified financial statement and a list of recent public Contracts which the Bidder has performed; and/or

(c) Notify the Bidder's Surety in writing that the Bidder with whom the City intends to enter a Contract submitted a Bid determined to be substantially lower than the median of all higher Bids.

103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for the full amount of the Base Bid plus add Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.

103.37 Bid Guaranty Forfeiture. If for any reason, other than as authorized by 103.31 or 103.38, the Bidder fails to execute the Contract Form, and the City awards the Contract to another Bidder which the City determines is the lowest and best Bidder, the Bidder who failed to execute the Contract Form shall be liable to the City for the difference between such Bidder's Bid and the Bid of the lowest and best Bidder, or for a penal sum not to exceed ten percent of the defaulting Bidder's Bid amount, whichever is less. If the City then awards a Contract to another Bidder which the City determines is the lowest and best Bidder and such Bidder also fails or refuses to execute the Contract Form, the liability of such lowest and best Bidder shall, except as provided in 103.38, be the amount of the difference between the Bid amounts of such lowest and best Bidder and another Bidder which the City determines is the lowest and best Bidder, but not in excess of the liability specified in 103.31. Liability on account of an award to each succeeding lowest and best Bidder shall be determined in like manner. If the City does not award the Contract to the another Bidder which the City determines is the lowest and best Bidder but resubmits the Project for Bidding, the Bidder failing to execute the Contract Form shall, except as provided in 103.38, be liable to the City for a penal sum not to exceed ten percent of such Bidder's Bid amount or the costs incurred by the City in connection with the rebidding, whichever is less.

103.38 Exception to Bid Guaranty Forfeiture. A Bidder with the City for a Contract with the City costing less than five hundred thousand dollars may withdraw a Bid from consideration if the Bidder's Bid for some other Contract with the State or any political subdivision, district, institution or agency thereof, excluding ODOT, costing less than five hundred thousand dollars has already been accepted, if the Bidder certifies in good faith that the total price of all such

Bidder's current Contracts is less than five hundred thousand dollars, and if the Bidder's Surety certifies in good faith that the Bidder is unable to perform the subsequent Contract because to perform such Contract would exceed the Bidder's Bonding capacity. If a Bid is withdrawn pursuant to 103.38, the City may award the Contract to another Bidder which the City determines is the lowest and best Bidder or reject all Bids and resubmit the Project for Bidding, and neither the withdrawing Bidder nor such Bidder's Surety shall be liable for the difference between the Bidder's Bid and that of another Bidder which the City determines is the lowest and best Bidder, for a penal sum, or for the costs incurred by the City in connection with the rebidding.

103.39 Contract Bond. If the Bidder executes the Contract Form, the Bidder shall, at the time of signing the Contract Form, provide the Contract Bond required by law in form and substance, and from a Surety, satisfactory to the City. The Contract Bond shall be in the full amount of the Contract to indemnify the City against all direct and consequential damages suffered by failure of the Contractor to perform according to the provisions of the Contract Documents and in accordance with the Plans, Specifications, details and bills of material therefore and to pay all lawful claims of Subcontractors, Material Suppliers, and laborers for labor performed or Materials furnished in carrying forward, performing or completing the Contract. A Contract Bond must be signed by an authorized agent with Power of Attorney from the Surety.

103.40 Personal Property Tax Statement. The successful Bidder shall provide a properly completed and executed affidavit in a form satisfactory to the City in order to fulfill the requirements of Section 5719.042 ORC, which provides as follows:

After the award by a taxing district of any Contract let by competitive Bid and prior to the time the Contract is entered into, the Person making a Bid shall submit to the district's fiscal officer a statement affirmed under oath that the Person with whom the Contract is to be made was not charged at the time the Bid was submitted with any delinquent personal property taxes on the general tax list of personal property of any county in which the taxing district has territory or that such Person was charged with delinquent personal property taxes on any such tax list, in which case the statement shall also set forth the amount of such due and unpaid delinquent taxes and any due and unpaid penalties and interest thereon. If the statement indicates that the taxpayer was charged with any such taxes, a copy of the statement shall be transmitted by the fiscal officer to the county treasurer within thirty Days of the date it is submitted.

A copy of the statement shall also be incorporated into the Contract, and no payment shall be made with respect to any Contract to which 103.40 applies unless such statement has been so incorporated as a part thereof.

103.41 Conditions Precedent for Execution of Contract Form by City. The award of the Contract and the execution of the Contract Form are based upon the expectation that the lowest and best Bidder will execute the Contract Form and comply with all conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award. Failure to execute the Contract Form or noncompliance with the conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award shall be cause permitting the City to cancel the Notice of Intent to Award for the Bidder's failure to be best, and to award the Contract to another Bidder which the City determines is the lowest and best Bidder or to resubmit the Contract for Bidding, at the discretion

of the City. The City may extend the time for submitting the conditions precedent for execution of the Contract Form for good cause shown. No extension shall operate as a waiver of the conditions precedent for execution of the Contract Form. The conditions precedent for execution of the Contract Form by the City are as follows:

- (a) Contract Form;
- (b) Contract Bond and to support the Contract Bond, a power of attorney for any attorney-in-fact signing the Contract Bond and a certificate of compliance issued by the Ohio Department of Insurance showing the Surety is licensed to do business in Ohio;
- (c) Ohio Workers' Compensation Certificate;
- (d) Certificate of Insurance (ACORD form is acceptable) clearly setting forth all exclusions and deductibles and copy of additional insured or loss payee endorsement. The City reserves the right to request a certified copy of the Contractor's insurance policies, including all endorsements.
- (e) If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a Certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State will be required. If the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05 ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.
- (f) Personal property Tax Statement; and
- (g) Evidence of registration of the Contractor and all of the Contractor's Subcontractors with the Building Department and the City's Department of Finance, Division of Revenue and Taxation.
- (h) Material Declaration of Assistance/Non-Assistance to Terrorist Organization, when required.
- (i) If requested by the City, the Bidder shall immediately submit evidence that the Person signing the Contract is authorized to bind the Bidder.

103.42 Time Limits. A Contract Form is not executed until it has been signed on behalf of both the Bidder and the City by Persons authorized to bind the Bidder and the City, respectively. The failure to award the Contract and to execute the Contract Form within ninety Days of the Bid Deadline invalidates the entire Bid process and all Bids submitted, unless the time is extended by written consent of the apparent lowest and best Bidder and the City concurs with such extension. If the Contract is awarded and the Contract Form is executed within ninety Days of the Bid Deadline, any increases in material, labor and subcontract costs shall be borne by the Bidder without alteration of the amount of the Bid. If the cause of the failure to execute the Contract within ninety Days of the Bid Deadline is due to matters for which the City is solely responsible, the Contractor shall be entitled to a Change Order authorizing payment of verifiable increased costs in Materials, labor or subcontracts. If the cause of the failure to execute the

Contract within ninety Days of the Bid Deadline is due to matters for which the Contractor is responsible, no request for increased costs will be granted.

103.43 Notice to Proceed and Submittals. The Authorized Representative shall issue the Contractor a Notice to Proceed which shall establish the date for commencement of the time for Contract Completion. The Contractor shall, within ten Days of the date of the Notice to Proceed, furnish the Engineer the following submittals:

- (a) Contract Cost Breakdown;
- (b) Preliminary schedule including shop Drawings and submittals;
- (c) List of Subcontractors;
- (d) List of Material Suppliers;
- (e) Outline of qualifications of proposed Superintendent.

103.44 Wage Rates and Payment Dates. The Bidder shall base its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor & Worker Safety, Wage and Hour bureau or the U.S. Department of Labor, as applicable, for the Project as provided in Sections 4115.03 and 4115.14, ORC, or the Davis-Bacon Act, respectively. The Contractor shall, within ten Days of the date of the Notice to Proceed, provide to the Engineer for the prevailing Wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

103.45 Written Submissions in lieu of Electronic Bidding Service. Where a Bidder is required by a provision in this Item 103 to make a submission through the Electronic Bidding Service, such submission may be made in paper form only upon prior written authorization from the Engineer. The determination whether to grant such prior written authorization is left to the Engineer and may be exercised by the Engineer's sole unfettered discretion. Submissions outside the Electronic Bidding Service without such prior written authorization may result in a determination that the Bid is non-responsive.

ITEM 104 GENERAL REQUIREMENTS

- 104.01 Contract Documents**
- 104.02 Applicable Law and ODOT Matters**
- 104.03 Jurisdiction**
- 104.04 Assignment of Antitrust Claims**
- 104.05 Captions**
- 104.06 Nondiscrimination Generally**
- 104.07 City's Nondiscrimination Requirements**
- 104.08 Notice of Commencement**
- 104.09 Giving Notice**
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- 104.11 Facsimile Transmission and Electronic Mail**
- 104.12 Intent**
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- 104.14 Ownership and Use of Drawings and Specifications**
- 104.15 Access to Documents**
- 104.16 As-Built Drawings**
- 104.17 Substitutes for Standards or Approved Equals**
- 104.18 Sales and Use Taxes**

104.01 Contract Documents. The Contractor, the Engineer and the Authorized Representative shall be familiar with all provisions of the Contract Documents.

104.02 Applicable Law and ODOT Matters. The Contractor and the City shall comply with all applicable Federal, State and local codes, statutes, ordinances and regulations in the performance of the Work on the Project. When the Federal government or the State pays all or any portion of the cost of the Project, the Work shall be subject to the inspection of the appropriate federal or State agency. No such inspection shall make the Federal government or State a party to the Contract and will in no way affect the rights and obligations of the City and the Contractor under the Contract. Any such inspection is solely for the benefit of the City and the Federal or State agency making it, and neither the Contractor nor the Surety shall be entitled to rely upon it for any purpose. References to ODOT matters shall be as set forth in the CMS current as of the Bid Deadline. In such instances, the CMS is incorporated only to the extent that it is not inconsistent with the Specifications.

104.03 Jurisdiction. The Montgomery County Court of Common Pleas, or the United States District Court for the Southern District of Ohio if required by law, shall be the exclusive jurisdiction in which any action or proceeding concerning any Bid, Contract, agreement or performance under the Contract Documents or in connection with the Project shall be filed. In any such action or proceeding the Contract Documents shall be construed in accordance with the laws of the State which shall govern to the exclusion of the law of any other jurisdiction.

104.04 Assignment of Antitrust Claims. By executing the Contract Form, the Contractor assigns, conveys and transfers to the City any right, title and interest to any claims or

causes of action it may have or acquire under State or Federal antitrust laws relating to any goods, products, or services purchased, procured or rendered to the City pursuant to the Contract.

104.05 Captions. Captions throughout the Contract Documents are for convenience and reference only and the words contained in a caption shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of the Contract Documents. Rights and responsibilities of the Contractor, the Engineer and the City are set forth throughout the Contract Documents and are included under different titles, articles and paragraphs for convenience.

104.06 Nondiscrimination Generally. During the performance of the Contract, the Contractor agrees that in the hiring of employees for the performance of Work, including without limitation Work to be performed by a Subcontractor, no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, by reason of race, religion, national origin, age, sex, disability, or color, discriminate against any citizen in the employment of labor or workers who are qualified and available to perform the Work to which the employment relates. The Contractor further agrees that no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work on account of race, religion, national origin, age, sex, disability, or color. In the event of the Contractor's noncompliance with the nondiscrimination clauses, the contract may be terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further City Contracts or such other sanctions as provided by law. Any provision of a hiring hall Contract or agreement which obligates a Contractor to hire, if available, only such employees as are referred to the Contractor by a labor organization shall be void as against public policy and unenforceable with respect to employment under any public improvement Contract unless, at the date of execution of such hiring hall Contract or agreement, or within thirty Days thereafter, such labor organization has in effect procedures for referring qualified employees for hire without regard to race, color, religion, national origin, or ancestry and unless such labor organization includes in its apprentice and journeymen membership, or otherwise has available for job referral without discrimination, qualified employees.

104.07 City's Nondiscrimination Requirements. The Contractor shall comply with RCGO, Section 35.14 which provides as follows and any amendments thereto:

(A) The [Contractor] shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. The [Contractor] shall take affirmative action in accordance with terms outlined in its [Proposal] and the provisions of this [Contract] to insure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The [Contractor] agrees to post in conspicuous places, available to employees and applicants, notices to be provided by the [City] setting forth the provisions of the nondiscrimination clauses.

(B) The [Contractor] shall in all solicitations or advertisements for employees placed by or on behalf of the [Contractor], state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap.

(C) The [Contractor] shall send to each labor union or representative of workers with which [the Contractor] has a collective bargaining agreement or other contract or understanding, a notice to be provided by the [City] advising the labor union or workers' representative of the [Contractor's] commitments, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(D) The [Contractor] shall comply with all rules, regulations, and relevant orders promulgated by the Human Relations council pursuant to its duties created by ordinance.

(E) The [Contractor] shall file, and shall cause each of [the Subcontractors and Material Suppliers] to file, compliance reports with the Human Relations Council as may be directed. Compliance reports shall be filed within such times and shall contain such information as to the practices, policies, programs, and employment policies, programs and employment statistics of the [Contractor, Material Supplier, or Subcontractor] and shall be in such form as the Human Relations Council may prescribe.

(F) The [Contractor] shall furnish all information and reports required by this [Contract] and by the rules, regulations, and orders of the Human Relations Council pursuant hereto, and shall permit reasonable access to the [Contractor's] books, records, and accounts by the Human Relations Council or its representative, as necessary for purposes of investigation to ascertain compliance with this [Contract] and rules, regulations and orders.

(G) In the event of the [Contractor's] failure to comply with the equal employment opportunity and affirmative action provisions of this [Contract], including the affirmative action undertaking outlined in it is [Proposal], or with any of the rules, regulations, or orders herein referred to, it is agreed that the [City], at its option, may do any or all of the following:

(1) Cancel, terminate, or suspend this [Contract], in whole or in part [...].

(2) Declare the [Contractor] ineligible for further [City Contracts].

(3) Recover from the [Contractor] by set-off against the unpaid portion of the [Contract], or otherwise pursuant to this [Contract], the sum of fifty dollars per [Day], as [Liquidated Damages] and not as a penalty, for each [Day] that the [Contractor] shall fail to comply with these provisions of the [Contract], as determined by the Human Relations Council in accordance with its rules and regulations, the said sum being fixed and agreed upon by and between the [Contractor] and the [City] because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the [City] would sustain in the event of such a breach of contract, and that amount is agreed to be the amount of damages which the [City] would sustain.

(4) Impose such other sanctions as may be imposed by the Human Relations Council pursuant to ordinances passed by the Commission, or seek such other remedies as may be provided by law.

(H) The [Contractor] shall include the provisions of this [Contract] in every subcontract, so that such provisions shall be binding upon each [Subcontractor]. The [Contractor] shall take such action with respect to any subcontracts as the Human Relations Council may direct as means of enforcing such provisions, including sanctions for noncompliance. However, in the event the [Contractor] becomes involved in, or is threatened with litigation with a [Subcontractor] as a result of such direction by the Human Relations Council, the [Contractor] may request the City to enter into such litigation to protect the interests of the City.

104.08 Notice of Commencement. The Authorized Representative shall prepare a Notice of Commencement in affidavit form identifying the name and address of the City, the Project, the name, address of the Contractor, the date of execution of the Contract, and the name and address of the Surety for the Contractor, in addition to the name and address of the Authorized Representative upon whom a Claim Affidavit may be served. The Notice of Commencement shall be made available upon request.

104.09 Giving Notice. Whenever any provision of the Contract Documents requires the giving of any notice after the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Contractor by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Contractor shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Contractor shall be copied to the Engineer.

104.10 Computation of Time. When any period of time is referred to in the Contract Documents by Days, it shall be computed to exclude the first and include the last Day of such period. If the last Day of any such period falls on a Saturday, Sunday or a legal holiday, such day will be omitted from the computation and such period shall be deemed to end on the next succeeding day which is not a Saturday, Sunday or legal holiday.

104.11 Facsimile Transmission and Electronic Mail. Any notice required to be given by the Contract Documents may be given by facsimile transmission or electronic mail, provided the original signed notice is delivered within two Days after the date of the facsimile transmission or electronic mail. Facsimile transmittals in excess of 10 pages are discouraged.

104.12 Intent. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. The Contractor shall provide all labor, Equipment and Materials necessary for the entire completion of the Work described in the Contract Documents and reasonably inferred therefrom to produce the intended results. The Specifications may not be superseded or amended by the Drawings

unless so provided in supplemental Specifications or Special Provisions prepared by the Engineer and approved in writing by the Authorized Representative. The Drawings shall generally govern dimensions, details and locations of the Work and calculated dimensions shall govern over scaled dimensions. The Specifications shall generally govern quality of Materials and workmanship. The organization of the Specifications in divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. In the event of inconsistencies within or between the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work, and shall comply with the stricter requirement. Unless otherwise specified in the Contract Documents, words which have well-known technical or construction industry meanings are used in accordance with such recognized meanings.

104.13 Requests for Information. If the Contractor finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation, the Drawings and Specifications, or between any of the Contract Documents and any applicable provision of law, the Contractor, before proceeding with the Work, shall submit a written Request for information to the Engineer for an interpretation or clarification. The Contractor shall be responsible for the prompt delivery of any such Request for information. The Engineer shall respond in writing to any and all requests for information within three business Days of receipt. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than in writing, shall not be binding and the Contractor shall not rely upon any such interpretation or clarification. If any change to the Work is made to accommodate unforeseen circumstances, the Engineer shall initiate the appropriate action and notify the Authorized Representative.

104.14 Ownership and Use of Drawings and Specifications. All Drawings and Specifications are the property of the City. In making copies of the Drawings and Specifications available, the City does not confer a license or grant permission for any use other than Work on the Project. Unless otherwise specified in the Contract Documents, the Engineer shall furnish to the Contractor, free of charge, 7 sets of Drawings and Specifications if the Contract price is five hundred thousand dollars or less, and 10 sets of Drawings and Specifications if the Contract price is in excess of five hundred thousand dollars. The Contractor may obtain additional copies of the Contract Documents from the Engineer, upon request, at the cost of reproduction, if any.

104.15 Access to Documents. The Contractor shall maintain in good order at the Project site one copy of all Drawings, Specifications, Bulletins, Addenda, approved Shop Drawings, catalog data, manufacturer operating and maintenance instructions, certificates, warranties, Change Orders, and other modifications, including As-built Drawings. The Contractor shall at all times permit access to the documents described in 104.15, and any other Contract Documents by the Authorized Representative and the Engineer.

104.16 As-Built Drawings. For Projects administered by the Water Engineering Manager of the City's Department of Water, or the Planning and Engineering Manager of the Department of Aviation, the Contractor shall keep an accurate record of all approved changes made to the Drawings to show Work as actually performed where such Work varies from Work as originally shown, including the exact location and depth of underground utility lines. During the performance of the Work, the Contractor shall record, prior to the submission of each Contractor

Payment Request, any approved changes on the Drawings, neatly in a contrasting color, noting new information not shown on the original Drawings. Failure to so record such changes may cause payment to be withheld or delayed. Where shop Drawings are used, the Contractor shall cross reference the corresponding sheet numbers on the Drawings and sections of the Specifications. The Contractor shall note related Change Order numbers where applicable. The Contractor shall keep a record of any change made to the Specifications, noting particularly any variation from manufacturer's instructions and recommendations. 104.16 shall not apply to any Project administered by the Engineer of the Department of Public Works unless required in the supplemental Specifications or Special Provisions for the Project.

104.17 Substitutes for Standards or Approved Equals. Requests for substitutes for standards or Approved Equals shall not be considered after the Bid Deadline unless listed on the Substitution sheet or after the Contractor can conclusively demonstrate to the Engineer one of the following conditions:

- (a) All applicable standards and Approved Equals are not available through no fault of the Contractor or the Contractor's Subcontractors and Material Suppliers;
- (b) All applicable standards and Approved Equals are no longer produced;
- (c) All applicable standards and Approved Equals will not perform as designed or intended.

104.18 Sales and Use Taxes. Only those Materials which ultimately become a part of the completed Structure or improvement which constitutes the Project will be exempt from State sales tax as provided in Section 5739.02 ORC, and State use tax as provided in Section 5741.01 ORC. The purchase, lease or rental of material, Equipment, parts or expendable items such as form lumber, tools, oils, greases and fuels, which are used in connection with the Work, are subject to the application of State sales tax and State use tax.

ITEM 105 CITY'S RIGHTS AND RESPONSIBILITIES

105.01 Generally

105.02 Right to Perform and Backcharge

105.03 Right to Partial Occupancy or Use

105.04 City's Right to File Suit

105.05 No Personal Liability of Public Officials

105.06 No Waiver of Legal Rights

105.07 No Estoppel

105.01 Generally. Information and services required of the City may be furnished through the Engineer or the Authorized Representative and shall be furnished in good faith and in a timely manner to avoid interference with, delay, hindrance, disruption or impact to the progress of the Project. The City and the City's officials, employees, consultants, agents and representatives as determined by the Engineer shall at all times have access to the Work whenever the Project is in preparation or progress. Upon the issuance of the Notice to Proceed or at a reasonable time thereafter, the City shall provide the Contractor the Project site in such condition to permit the Contractor to perform the Work. The foregoing are in addition to other rights and responsibilities of the City enumerated herein and especially those in respect to the City's right to prosecute the Work, approve payments and accept the Project.

105.02 Right to Perform and Backcharge. If the Contractor provides Defective Work or fails or neglects to perform the Work with the necessary diligence so as to complete the Work within the time specified in the Contract Documents or any portion of the Work by the applicable milestone completion date as set forth in the current Project, the Engineer shall notify the Contractor in writing of such failure or neglect. If such Defective Work, failure, or neglect results in a threat to the safety of any person or property, the Contractor shall immediately commence to correct such Defective Work, failure, or neglect upon receipt of written or oral notice thereof. Otherwise, if the Contractor fails or refuses to cure such Defective Work or failure or neglect within three business Days after receipt of the written notice or immediately in the case of a threat to any person or property, the Engineer shall recommend enforcement of the Contract to the City pursuant to 106.02 and 106.03. Without prejudice to any other remedy the City may have, the City may employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, to correct the deficiency in the Contractor's Work, as determined by the Authorized Representative. In all such cases of Defective Work, failure, or neglect, a Change Order shall be issued deducting from payments then or thereafter due the Contractor the costs arising out of or related to investigating and correcting such Defective Work, failure or neglect, including without limitation, the City's attorneys' and consultants' fees and Liquidated Damages. If the payments then or thereafter due the Contractor are not sufficient to cover such costs, the Contractor and the Contractor's Surety shall pay the amount of the insufficiency to the City. The decision of the Authorized Representative to backcharge the Contractor shall be final, subject to proceedings in accordance with 118.01 through 11

The City reserves the right to furnish at any time such Materials and labor and to prosecute such Work in addition to the Work of the Contractor as the City may desire; provided, however, that if such prosecution of additional Work should unreasonably interfere with, disrupt, hinder, delay or impact the Work of the Contractor, the Contractor shall be entitled to a reasonable extension of time in accordance with these Specifications.

105.03 Right to Partial Occupancy or Use. If the City finds it necessary to occupy or use the Project, or a designated portion of the Project prior to Contract Completion, such use may be accomplished if the Engineer informs the City that the portion in question has been approved for occupancy use, including by the Department of Building Services, if applicable. If Partial Occupancy or Use is approved by the City, the Engineer may process either a Change Order or a Certificate of Partial Occupancy or Use for the applicable portion of the Project listing the uncompleted or Defective Work under the Contract for approval by the City, provided that no such occupancy or use shall commence before any insurers providing property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. From the date of execution of the Change Order or Certificate of Partial Occupancy or Use by the Engineer, the Contractor shall be relieved of obligation to maintain the accepted portion of the Work, but shall remain obligated to correct any incomplete or Defective Work, including, without limitation any Punch List items then uncorrected. The Contractor shall continue to carry the appropriate insurance during performance of any such Work. Partial Occupancy or Use of the Project by the City shall not constitute acceptance of any Work not in conformity with the Contract Documents. Partial Occupancy or Use shall not relieve the Contractor of liability for any express or implied warranties or from responsibility for Defective Work.

105.04 City's Right to File Suit. The City may maintain an action in its own name for violations of any law relating to the Project, for any injury to Persons or property pertaining to the Work or for any other cause which is necessary in the performance of the City's duties.

105.05 No Personal Liability of Public Officials. In carrying out the provisions of the Contract Documents, or in exercising any power or authority granted to them by or within the scope of the Contract Documents, there shall be no liability upon the officers and employees of the City, whether personally or as officials of the City, it being understood that in all such matters they act solely as agents and representatives of the City.

105.06 No Waiver of Legal Rights. No action or omission by the City or the City's officers and employees, nor any approval of any request for payment, claim, or Change Order, nor any payment for or acceptance of any Work, nor any extension of time, nor any possession taken by the City or the City's officers or employees shall operate as a waiver of any provision of the Contract Documents, or of any power herein reserved to the City, or any right to damages herein provided; nor shall any waiver of any breach of the Contract be held to be a waiver of any other subsequent breach.

105.07 No Estoppel. The City shall not be precluded or estopped by any return or certificate given by the Contractor either before or after the final completion and acceptance of the Work from showing the true and correct amount and character of the Work done and Materials furnished, or from showing at any time that any such return or certificate is untrue and incorrect or improperly made, or from showing that the Work, Materials or Equipment do not conform to the Contract Documents or from demanding and recovering from the Contractor such damages as the City may sustain by reason of the Contractor's failure to comply with the Contract Documents.

ITEM 106 THE ENGINEER

106.01 Project Inspection

106.02 Rejection of Work

106.03 Contract Administration

106.04 Monitoring Progress

106.05 Interpretation

106.06 Authorization of Inspection, Testing and Approval

106.07 Review of Payment Requests

106.08 Review of Submittals

106.09 Preparation of Change Orders

106.10 Final Inspections

106.11 Claims Services

106.12 Project Rules and Hours

106.13 Construction Schedule

106.01 Project Inspection. The Engineer or Inspector shall inspect the progress and quality of the Work, including the preparation, fabrication or manufacture of Materials and Equipment, for conformity to the Contract Documents. The Engineer shall be provided access to all parts of the Project and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection. Inspection by the Engineer or an Inspector is solely for the benefit of the City and shall not relieve the Contractor of any of its responsibilities under the Contract Documents. When any unit of government, political subdivision or railroad corporation is to pay a portion of the cost of the Work, its representatives shall have the right to inspect the Work. Such inspection shall in no sense make any unit of government, political subdivision or railroad corporation a party to the Contract, and shall in no way interfere with the rights of the City or the Contractor under the Contract. The Inspector is not authorized to issue instructions contrary to the Contract Documents or to act for, or for the benefit of, the Contractor. Changes to the Contract Documents must be made in accordance with 117.01 through 117.12. No inspection performed pursuant to this Section shall constitute acceptance of the Work.

106.02 Rejection of Work. The Engineer or an Inspector shall have the authority to disapprove or reject any item of Work which is Defective, or that the Engineer or Inspector believes will not produce a Project that conforms to the Contract Documents, or that will prejudice the integrity of the design concept of the Project as a functioning whole as indicated by the Contract Documents. The Engineer or Inspector shall immediately notify the Authorized Representative and the Contractor at any time that Work has been disapproved or rejected. The Engineer or Inspector shall not be responsible for construction means, methods, manners, techniques, sequences, procedures, safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents. No failure of the Engineer or Inspector to reject the Work shall constitute acceptance of the Work.

106.03 Contract Administration. The Engineer or his designee shall provide administration of the Contract for the Project as provided by the applicable agreement between the City and the Engineer, if any, and the Contract Documents. The Engineer shall attend any

and all progress and coordination meetings. The Engineer shall prepare a written report of each progress and coordination meeting and transmit it to the Authorized Representative within three business Days of the meeting. The Engineer shall not delegate the duty to prepare the written report of any Project and coordination meeting attended. The Engineer or Inspector may authorize minor changes or alterations in the Work not involving additional costs or time and not inconsistent with the overall intent of the Contract Documents but has no authority to authorize the Contractor to perform additional or extra Work for which the Contractor will seek compensation in addition to the Contract price or extension of the time for Contract Completion. The Engineer shall review and approve, or recommend approval, of all forms required under the Contract Documents. The Engineer shall render decisions in connection with the Contractor's responsibilities under the Contract Documents and submit recommendations to the Authorized Representative for enforcement of the Contract as necessary.

106.04 Monitoring Progress. The Engineer shall monitor the progress of the Work for conformance with the Construction Schedule and shall initiate revisions of the Construction Schedule as required by the Contract Documents. In the event of default by the Contractor, the Engineer may pursue the Contractor's Surety to Contract Completion. The Engineer shall keep a daily log containing a record of weather, number of workers on site, identification of Equipment, Work accomplished, problems encountered, and other similar relevant data.

106.05 Interpretation. The Engineer will be the initial interpreter of all requirements of the Contract Documents. All decisions of the Engineer shall be subject to final determination by the City. Contractor acknowledges that Engineer, within its limited agency for the City, may consult with the City's legal counsel and that all such consultation and communications are privileged.

106.06 Authorization of Inspection, Testing and Approval. The Engineer shall authorize special inspection, testing or approval of the Work, as provided in 107.31, whenever in the Engineer's reasonable opinion such action is necessary or advisable to insure conformity with the Contract Documents.

106.07 Review of Payment Requests. Based upon the Engineer's on-site observations and evaluation of the Contractor's Payment Request, the Engineer shall review and certify the amounts due the Contractor. The Authorized Representative may recommend to the City that payment be withheld from, or Liquidated Damages be assessed against, a Contractor's Payment Request, stating the reasons for such recommendation. The Engineer's certification for payment shall constitute a representation to the City that the Work has progressed to the point indicated and that, to the best of the Engineer's knowledge, information and belief, the Work is in conformity with the Contract Documents and the Contractor is entitled to payment in the amount certified.

106.08 Review of Submittals. The Engineer shall review and approve or take other appropriate action upon the Contractor's submittals within the required time for the purpose of checking for conformity with the Contract Documents. Such review and approval shall not relieve Contractor of its duty to strictly conform to the Contract Documents.

106.09 Preparation of Change Orders. The Engineer shall prepare all Bulletins and Change Orders, including a cost estimate and supporting documentation and data. Once executed, a Change Order shall constitute the full and complete satisfaction for all claims of all direct and indirect costs, overhead costs of all kinds, inefficiency costs, acceleration costs, the cumulative impact of the Change Order and other Change Orders executed prior to it, the impact of the Change Order on unchanged work and interest related thereto, which has been or may be incurred by Contractor in conjunction with the change in scope and/or project extension set forth in the Change Order.

106.10 Final Inspections. The Engineer shall conduct inspections to determine the date of Contract Completion and shall receive, review and forward to the appropriate Person all Project record submittals required by the Contract Documents. Such inspection shall not constitute acceptance of the Work, nor shall it relieve Contractor from its duty to correct defective or non-confirming work not noted during the inspection.

106.11 Claims Services. The Engineer shall render analyses, written recommendations, or decisions, within the time specified, on all claims, disputes, or other matters in question between the Contractor and the City and shall provide information or services to the City until final disposition of all such claims, disputes, and matters. If Engineer does not approve a Contractor claim or fails to act within the required time, Contractor's claim shall be considered to be denied.

106.12 Project Rules and Hours. The Engineer shall consult with the Authorized Representative to obtain full knowledge of all City rules, regulations or requirements affecting the Project. The Engineer shall establish the regular working hours with the Contractors, subject to approval of the Engineer.

106.13 Construction Schedule. The Engineer shall review the Construction Schedule together with a schedule of submittals which is coordinated with the Construction Schedule in accordance with 109.05 through 109.09. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of 105.02 may be invoked.

ITEM 107 THE CONTRACTOR

- 107.01 Construction Procedures**
- 107.02 Cutting, Fitting and Patching**
- 107.03 Excavation**
- 107.04 Borrow and Waste Areas**
- 107.05 Construction and Demolition Debris**
- 107.06 Manufacturer's Recommendations**
- 107.07 Construction Supervision**
- 107.08 Protection of Project, Property and Utilities**
- 107.09 Load Restrictions**
- 107.10 Materials and Equipment**
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- 107.12 Labor**
- 107.13 Maintenance of Utilities**
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- 107.16 Work Stoppage Due to Hazardous Materials**
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- 107.20 Meeting Spaces**
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- 107.23 Hoists and Elevators**
- 107.24 Electricity**
- 107.25 Temporary Facilities**
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- 107.28 NPDES General Permit**
- 107.29 Building Permits**
- 107.30 Other Permits**
- 107.31 Inspection, Testing, and Approval**
- 107.32 Uncovering the Work**
- 107.33 Correction of the Work**
- 107.34 Interruption of Existing Services**
- 107.35 Clean Up**
- 107.36 Explosives and Blasting**
- 107.37 Emergency**
- 107.38 Royalties and Patents**

107.01 Construction Procedures. The Contractor shall be responsible for and have control over all construction means, methods, manners, techniques, sequences and procedures for all portions of the Contractor's Work and shall be responsible for any injury or damage which may result from the Contractor's Work or from improper construction, installation, maintenance or operation to the fullest extent permitted by law. Unless otherwise specified in the Contract Documents, the Contractor shall be responsible for properly and accurately laying out all lines, levels, elevations, grades and measurements for all the Work required by the Contract Documents and for the preservation of all related stakes and markers.

107.02 Cutting, Fitting and Patching. The Contractor shall do any cutting, fitting or patching required for the Contractor's Work and shall not endanger the Project by cutting, excavating or otherwise altering the Project, or any part of it. If Contractor requires sleeves, the Contractor shall furnish and coordinate the installation of the sleeves. The Contractor shall be responsible for the exact location and size of all holes and openings required to be formed or built for the Work, to permit coordination with any Work performed by other Persons on the Project. The Contractor shall allow sufficient time for installation of any Work performed by other Persons before covering or closing the applicable portion of the Project. Patching shall match and blend with the existing or adjacent surface. Any patching required because of Defective or ill-timed Work shall be done by and at the expense of the Contractor.

107.03 Excavation. The Contractor shall not cut away any Structure or dig under any foundation or into any wall, or any other part of the Project, without the written approval of the Engineer. Unless otherwise specified in the Contract Documents, the Contractor, prior to starting excavation or trenching, shall give notice at least two business Days in advance to the Owners of underground utilities registered with the Ohio Underground Utility Protection Services (OUPS) at www.oups.org, or by phone at (800) 362-2764 and the Owners of underground utilities shown on the Drawings and Specifications who are not registered members of OUPS. The Owner of an underground utility is required within forty-eight hours of notice, excluding Saturdays, Sundays and legal holidays, to stake, mark or otherwise designate the location of its utilities in the construction area together with its approximate depth. If any underground utility Owner fails to timely perform, the Contractor shall immediately notify the Engineer and contact the Owner of the underground utility. If any underground utility must be moved or adjusted, the Contractor shall notify the Owner of the underground utility in a timely manner so that the Work will not be delayed. Unless otherwise provided in the Contract Documents, any movement or adjustment of any underground utility or utility appurtenances, including without limitation electrical and gas meters, water and gas valves and light standards within the Project site is made by the Owner of the utility at the utility Owner's expense. In performing any excavation or trenching, the Contractor shall exercise caution and implement appropriate safety precautions to avoid property damage and personal injury. The Contractor shall backfill any excavation with the material specified and approved by the Engineer. The right to construct or reconstruct any utility service in the street or right of way or to grant permits for same, at any time, is hereby expressly reserved to the City and the Contractor shall not be entitled to any damages for the digging up of the street or Right-of-Way in accordance with such a permit. Any Person wishing to make an opening in the street must secure a permit from the City. The Contractor shall allow Persons bearing such permits, and only those Persons, to make openings in the street or Right-of-Way. When required by the Engineer, the Contractor shall make all necessary repairs due to such openings under the same conditions as the Work. Any adjustment of the Contract price or of the time for Contract Completion resulting from any such opening or repair may be made by Change Order. When the Work includes construction of underground lines and Structures, the Contractor shall make temporary restoration of street surfaces immediately upon completion of the underground lines and Structures, shall remove surplus excavated Materials and shall grade the street and put it into a safe and passable condition. The Contractor shall immediately refill any settlement in or adjacent to trenches for such construction to the proper grade.

107.04 Borrow and Waste Areas. A Change Order may be issued in accordance with 117.01 to 117.12 to permit the Contractor to use natural Materials found on the site of the Project.

Whenever Materials are to be borrowed or wasted in borrow or Waste Areas or, if allowed by the Contract Documents, wasted on the Project site, the Contractor shall prior to beginning borrow or wasting operations, obtain the Engineer's written approval of a detailed operation plan that addresses the following concerns:

- (a) Control of drainage water;
- (b) Cleanup, shaping, and restoration of disturbed areas;
- (c) Disposal of regulated Materials;
- (d) Avoidance of regulated areas;
- (e) Excavation and filling of waste and Borrow Areas;
- (f) Saving of topsoil;
- (g) Measures to minimize sediment runoff, including keeping sediment and other contaminants from leaving the Project site and from entering streams, lakes, or reservoirs by using methods provided in the Contract Documents.

The Contractor shall use the current versions of ODOT's *Sediment and Erosion Control Handbook* and the *Location and Design Manual, Volume 2, Drainage Design* to design and plot a sedimentation and erosion control plan on Project plan sheets and ensure the plan complies with all current provisions of ORC, Chapter 6111 and the NPDES permit. The Contractor shall not waste material and discharge dredge or fill Materials into the "Waters of the United States" or an isolated wetland without the required permits from U.S. Army Corps of Engineers (404 Permit) and the Ohio EPA (401 Permit). The Contractor shall have the proposed borrow and Waste Areas reviewed by a qualified environmental consultant approved by the City and have the environmental consultant certify that the proposed borrow and waste operations will not impact the "Waters of the United States" or an isolated wetland. If consultant certification is not provided, the Contractor shall obtain the 404/401 Permits necessary to perform the operations as proposed and have the environmental consultant certify that the Work conforms to the requirements of the permits. The Contractor shall provide copies of all documentation submitted to obtain the appropriate permits and copies of the permits to the Engineer. The Contractor shall not waste or borrow material from a cultural resource site or a site eligible for the national Register of Historic Places. For sites found to have historic or prehistoric human remains, the Contractor shall comply with the requirements of Sections 2909.05 and 2927.11, ORC. If the Contract Documents require a cultural resource investigation, a qualified environmental consultant approved by the City for cultural resource investigation shall be used to review and certify that the waste or Borrow Area:

- (a) does not impact a cultural resource;
- (b) is not a cultural resource;
- (c) is not eligible for the national Register of Historic Places; or
- (d) does not consist of historic or prehistoric human remains.

If burning is permitted under the OAC-3745-19 and Section 1503.18, ORC, the Contractor shall submit a copy of the Ohio EPA permit and the Ohio DNR permit to the Engineer and copies

of all information used to obtain the permit. All damage to surrounding property resulting from the instability of borrow and Waste Areas, the removal of borrow Materials, the placement of waste Materials, or the hauling of material to and from these areas is the sole responsibility of the Contractor. Prior to the disposal of waste Materials outside the Project site, the Contractor shall submit to the City an executed copy of the Contract or permission statement from the property Owner. The Contract or permission statement must indicate that the waste Materials are not the property of the City, that the City is not a party to the Contract or permission statement and that the Contractor and property Owner will hold the City harmless from claims that may arise from their Contract or permission statement. Restoration of all borrow and Waste Areas includes cleanup, shaping, replacement of topsoil, and establishment of vegetative cover by seeding and mulching according to the Contract Documents. The Contractor shall ensure that the restored area is well drained unless approval is given by the Engineer to convert a pit area into a pond or lake, in which case the Contractor shall confine restoration measures to the disturbed areas above the anticipated normal water level, and that any proposed waste location is not within the FEMA mapped one hundred year floodplain. If the proposed waste location is within the FEMA mapped one hundred year flood plain, the Contractor shall submit written approval from the local floodplain coordinator for the site. The floodplain coordinator contacts for each county are available through the Ohio DNR, Division of Water, (614) 265-6750. No extension of time or additional compensation will be paid for any delays due to not having the written permit(s) to waste in a floodplain.

107.05 Construction and Demolition Debris. OAC-3745-37, OAC-3745-400, and Chapter 3714 ORC, regulate the use and disposal of construction and demolition debris. The Contractor shall notify the local Board of Health or the local Ohio EPA office seven Days before placing clean hard fill off the Project site or Right-of-Way and submit copies of this notification to the Engineer. The Contractor shall dispose of debris containing wood, road metal, or plaster at a licensed construction and demolition debris site. The disposal of brush, trees, stumps, tree trimmings, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter is restricted. If allowed by the Contract Documents, the Contractor may waste brush, trees, stumps, tree trimming, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter within the Project site or the Right-of-Way. Otherwise, the Contractor shall submit a plan and any required permits to legally dispose of these Materials off the Project site or Right-of-Way to the Engineer and shall provide all documents submitted to obtain this permit to the Engineer. If the Project contains garbage or solid and hazardous waste, the Contractor shall comply with applicable laws and any applicable provisions of the Contract document for the removal of these items. When wasting PCC, the Contractor shall mix the PCC with at least thirty percent natural soil to construct an inner core in the Waste Area, cover this inner core with 3 feet of natural soil on the top and eight feet on the side slopes and place and compact the material according to the Contract Documents to prevent future settlement and sliding.

107.06 Manufacturer's Recommendations. The Contractor shall install all Work in accordance with the Contract Documents and any recommendations of the manufacturer, including required temperature and humidity for installation of the various Materials.

107.07 Construction Supervision. The Contractor shall provide continuous supervision at the Project by a competent Superintendent when any Work is being performed, unless waived by the Authorized Representative. The Superintendent shall have responsibility and authority to

act on behalf of the Contractor. All communications to the Superintendent shall be as binding as if given directly to the Contractor. The Contractor shall submit an outline of the qualifications and experience of the Contractor's proposed Superintendent, including references, to the Engineer within ten Days of the Notice to Proceed. The City reserves the right to reject the Contractor's proposed Superintendent. Any such rejection shall be determined by the Authorized Representative. Failure of the Authorized Representative to notify the Contractor of such rejection within thirty Days of receipt of the required information shall constitute notice that the City has no objection. If the City rejects the Contractor's proposed Superintendent, the Contractor shall replace the Superintendent at no additional cost to the City. The Contractor shall not change or terminate the Superintendent without written approval of the Authorized Representative. If the Contractor proposes to change or terminate the Superintendent, the Contractor shall submit to the Engineer a written justification for the change or termination, along with the name and an outline of qualifications experience of the Contractor's proposed new Superintendent, not less than ten Days prior to any change or termination. The procedure provided above shall be applied to evaluate the Contractor's proposed new Superintendent. If in the City's sole discretion, the performance of the Superintendent is unsatisfactory at any time, the City may require that Contractor replace such Superintendent with a Superintendent satisfactory to the City at no additional cost to the City.

107.08 Protection of Project, Property and Utilities. The Contractor shall protect the Work from weather, and shall maintain the Work and all Materials, including Materials delivered to the Contractor by the City, apparatus, fixtures and other items on or adjacent to the Project site free from injury or damage until Final Acceptance. Non-rubber tired vehicles or Equipment shall not be moved on City streets and off road vehicles shall not be used on bases or pavements without the written approval of the Engineer. Work or items likely to be damaged shall be covered or protected at all times to prevent damage. Any Work or item damaged by failure of the Contractor to provide coverage or protection shall be removed and replaced with new Work or a new item, as applicable, at the Contractor's expense. The Contractor shall perform the Work within the site of the Project and any applicable easement or Right-of-Way. Any adjacent property, including without limitation roads, walks, shrubbery, plants, trees or turf, damaged during the Contractor's Work shall be properly repaired or replaced at the Contractor's expense. Unless otherwise specified in the Contract Documents, the Contractor shall protect the Project and existing or adjacent property and utilities from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take precautions to prevent injury or damage to individuals or property. When mailboxes, road or street name signs and supports are within the Project site, the Contractor shall remove and erect them in a temporary location during construction in a manner satisfactory to the Engineer. After completion of the Work, the Contractor shall erect the mailboxes, road or street name signs and supports in a permanent location in accordance with the Drawings unless otherwise required by Change Order. Removal, temporary erection and permanent erection shall be in accordance with United States postal regulations. When cornerstones, monuments and property corner pins are encountered in the performance of the Work, and monument covers are not listed in the Bid, the City will supply them and supervise their precise location and installation, and the Contractor will furnish all the labor, Materials and Equipment required for such installations. 105.02 may be invoked for the cost to the City for repair, re-evaluation of location and replacement of any cornerstone, monument or property corner pin within the Project, damaged, destroyed or made inaccessible during the progress of the Work by the Contractor. Existing surface or overhead Structures or utility lines are not necessarily shown on the Drawings and the locations of those shown are approximations. The Contractor shall make such investigations as are necessary to determine the extent to which existing surface or overhead Structures may interfere with the

performance of the Work. Any sizes, locations, and depths for such Structures are approximations and the Contractor shall make such investigation or exploration as may be necessary to determine the actual sizes, locations and depths. The Contractor shall field locate all existing utilities before setting line and grade. Unless otherwise specified in the Contract Documents, the Contractor shall remove all snow and ice as may be required for access to and performance of the Work.

107.09 Load Restrictions. The Contractor shall not load, nor permit any part of the Project to be loaded, in any manner that will endanger the Project, or any portion thereof, nor shall the Contractor subject any part of the Project or existing or adjacent property to stress or pressure that will endanger the Project or property. The Contractor shall provide all temporary bracing, shoring and other structural support required for safety of the Project and proper execution of the Work, including without limitation all necessary support and protection of the property of any utility. The Contractor shall comply with all legal load restrictions in the hauling of Materials on public roads and shall operate Equipment of a weight or so loaded as to not cause damage to Structures, Roadway, or other construction. A special permit will not relieve the Contractor of sole liability for damage which may result from the moving of Equipment or Materials. The Contractor shall not haul on concrete pavement, base or Structures before the expiration of the curing period.

107.10 Materials and Equipment. The Contractor shall provide only new Materials and Equipment of the quality specified in the Contract Documents. The Contractor shall immediately remove Materials or Equipment not conforming to the requirements of the Contract Documents. The Contractor shall not incorporate Materials or Equipment, the defects of which have been corrected without written approval from the Engineer. If the City is to furnish any Materials, the City shall deliver them in accordance with the Contract Documents. The Contractor shall coordinate and schedule sufficient time for any such delivery. The Contractor shall provide domestically produced steel as required by law including Sections 153.011 and 5525.21, ORC, and Federal laws and regulations, if applicable. The Contractor shall furnish documentation to the Engineer evidencing the domestic origin of applicable steel and iron products before they are incorporated into the Project. Steel and iron products without a traceable, documented domestic origin will be treated as non-domestic products. The City may reject any item or material provided by a Contractor in violation of this requirement. The Contractor shall notify the Engineer of proposed sources of Materials prior to delivery. The Engineer may approve Materials at the source of supply before delivery. If the proposed source of supply cannot produce the specified Materials, the Contractor shall furnish Materials from Alternate sources without adjustment of the Contract price or the time for Contract Completion.

107.11 Storage. Only the material and Equipment which are to be used directly in the Work shall be brought to or stored at the Project by the Contractor and the Contractor's Subcontractors and Material Suppliers. The Contractor shall be responsible for the proper handling and storage of all material and Equipment brought or delivered to the Project to assure preservation of their quality and fitness for the Project and to facilitate inspection of them. Aggregates shall be transported from any storage site to the Project in tight vehicles so constructed as to prevent loss or segregation of Materials after loading and measuring in order that there may be no inconsistencies in the quantities of Materials intended for incorporation in the Project as loaded, and the quantities as actually received at the site of the Project. After any material or Equipment is no longer required for the Work, the Contractor shall promptly remove

such material and Equipment from the Project. The Contractor's Materials and Equipment shall not be stored in any Right-of-Way unless the location of such storage is approved by the Engineer. The Contractor shall, before storing Materials in gutters, lay suitable drains of sufficient size to carry all the storm water flowing in such gutters. Where the drainage from cross streets or alleys is interfered with or cut off by reason of the nature of the Work, the Contractor shall provide suitable crossings for pedestrians. No material or Equipment shall be stored within 20 feet of any fire hydrant. Private property shall not be used for storage of material and Equipment without the prior written permission of the Owner or lessee of the private property, and if requested by the Engineer, the Contractor shall provide a copy of the written permission to the Engineer. The Contractor shall restore all storage sites to their original conditions. The Contractor's material and Equipment shall not cause damage to the Project or adjacent property and shall not endanger any individual at, or in the vicinity of, the Project. Any injury to any individual or damage to property resulting from the Contractor's material or Equipment shall be the responsibility of the Contractor.

107.12 Labor. The Contractor shall maintain a sufficient workforce to timely perform the Work and enforce good discipline and order among the Contractor's employees and the employees of the Contractor's Subcontractors and Material Suppliers. The Contractor shall not permit employment of individuals not skilled in tasks assigned to them. The Contractor shall dismiss from the Project any individual employed by the Contractor or the Contractor's Subcontractors and Material Suppliers who is found by the Authorized Representative, pursuant to a recommendation from the Engineer, to be incompetent, guilty of misconduct, or detrimental to the Project. The Contractor shall employ all legal efforts to minimize the likelihood or effect of any strike, Work stoppage or other labor disturbance. Informational pickets shall not justify any Work stoppage.

107.13 Maintenance of Utilities. The Contractor shall at all times provide and maintain access to fire hydrants, water valves, water service boxes, gas valves, gas service boxes, manholes and other similar appurtenances. During the course of construction, the Contractor shall be solely responsible to notify any utility or other service when such utility or service is encountered. The Contractor shall protect all above ground utilities, Structures and appurtenances and shall replace any damaged portions thereof. The Contractor shall protect all below ground utilities, Structures and appurtenances that may be accurately located by removing manhole covers, valve box covers, and other access point coverings with reasonable effort using hand tools for such removal and shall replace any damaged portions thereof.

107.14 Maintenance of Traffic. Vehicular and pedestrian public traffic shall be maintained during the Project whether it is traffic through the Project or only cross traffic at intersections, unless otherwise provided in the Contract Documents. The Contractor shall make all repairs to roads necessary to maintain traffic to the satisfaction of the Engineer. If there are locations on the Project where Sewer or water line construction only is called for and a part of the existing pavement will remain in place, traffic shall be maintained and ingress and egress to all public and private entrances shall be provided. The Contractor shall provide all necessary flaggers. The Contractor shall provide and maintain access to adjacent property including by constructing necessary temporary walks, driveways, Bridges, crossings, and Roadways. The Contractor shall notify the applicable fire and police department whenever a street or alley, or a portion of a street or alley is about to be closed to traffic and shall provide notice when such street or alley or portion thereof is to be opened. In the event of the complete closure of any street,

alley or private drive, the City shall give notification to the occupants of all premises affected by the closure. The Contractor shall promptly notify the Engineer of all unforeseen effects of the Project on traffic. Unless the Contract Documents provide otherwise, all traffic control devices shall be furnished, erected, maintained and removed by the Contractor in accordance with the OMUTCD.

107.15 Safety Precautions. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of individuals on or adjacent to the Project and shall comply with all applicable provisions of federal, State and municipal safety laws, regulations, and building codes to prevent injury to individuals on or adjacent to the Project. The Contractor shall comply with the rules, regulations and orders of OSHA. The Contractor shall be responsible for any fine or cost incurred as a result of any violation or alleged violation of such rules, regulations or orders. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of the Project, including without limitations all Materials and Equipment incorporated or to be incorporated in the Project. Prior to the start of any Work, the Engineer shall meet with the Contractor and other applicable Person to coordinate the Contractor's methods and Equipment for protecting the Project, other property and individuals from damage or injury, in accordance with applicable regulations. The Engineer's efforts at coordination shall not relieve the Contractor of any responsibility for safety or ensure the Engineer to become responsible for safety. Methods and Equipment for protecting the Project, other property and individuals shall be subject to inspection and approval of the appropriate authority having jurisdiction over the Project site.

107.16 Work Stoppage Due to Hazardous Materials. In the event the Contractor, except a licensed abatement Contractor, encounters Materials reasonably believed to contain asbestos, polychlorinated biphenyl (PCB) or other hazardous waste or material, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Authorized Representative and the Engineer in writing. A licensed abatement Contractor shall report the condition to the Authorized Representative and the Engineer in writing and shall remove the waste or material or render it harmless. The Work in the affected area shall be resumed upon written notice from the Engineer that the waste or material has been removed or rendered harmless. The term "rendered harmless" shall mean that the level of exposure is less than any applicable exposure standards set forth by OSHA or other applicable regulations. Hazardous Materials to be used at the Project shall be identified by a MSDS. The applicable MSDS shall be prepared by the Contractor and submitted to the Engineer prior to a hazardous material being brought to the Project site. The Contractor shall maintain all applicable MSDS on site whenever Work is in preparation or progress.

107.17 Vehicle Damage Claims. When a Person reports damage to a vehicle, whether orally or in writing, to the Contractor, the Contractor shall file a written report, including copies of applicable police reports, with the Authorized Representative within three Days.

107.18 Fire Hydrants. The Contractor shall make any necessary arrangements with the City Department of Water for any use of fire hydrants in connection with the Work and shall pay for all water used from the hydrants. Permits from the Department of Water for use of fire hydrants shall be provided to the Engineer upon request.

107.19 Engineer Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain in a clean condition the following temporary facilities, Equipment and services for use by the Engineer:

- (a) If space is available near the Project, 2 separate office spaces, both of which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;
- (b) If space is not available near the Project, a standard width job trailer shall be provided, which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;
- (c) Each office space shall be equipped with at least 1 desk, 1 desk chair and 2 side chairs and reasonable circulation space;
- (d) Each office space shall have 1 four-drawer filing cabinet or equivalent;
- (e) A plan rack and 4 by 8 foot plan table shall be provided in 1 office space;
- (f) Each office space shall have at least 1 telephone in service;
- (g) Use of a facsimile and copy machine shall be provided for use either in one of the office spaces or in an adjacent office space;
- (h) One office space shall have a computer to the City's criteria with electronic mail capabilities.

107.20 Meeting Spaces. Unless otherwise specified in the Contract Documents, the Contractor shall provide adequate space, Equipment and furnishings to conduct progress and coordination meetings for the Project. The meeting area shall be furnished with an appropriate meeting table and an appropriate number of folding or stacking chairs to adequately seat all participants at the meetings.

107.21 Temporary Heat. Unless otherwise specified in the Contract Documents, the Contractor shall provide temporary heat necessary so that the Work shall proceed expeditiously during inclement weather, and to protect the Contractor's Work and Materials from damage. From a date of partial occupancy, the City is responsible for the cost of providing heat for the occupied portion of the Project.

107.22 Water. Unless otherwise specified in the Contract Documents, the Contractor shall provide all water necessary for the Contractor's Work. From a date of partial occupancy, the City is responsible for the cost of water consumed for the occupied portion of the Project.

107.23 Hoists and Elevators. The Contractor shall provide and maintain adequate hoisting and elevator facilities as required for the Contractor's Work in coordination with the Engineer. If electric service requirements of hoisting or elevator facilities differ from that available at the Project site, the Contractor requiring use of such hoisting or elevator facilities shall make

and pay for all necessary connections. Unless otherwise specified in the Contract Documents, the Contractor requiring use of hoisting or elevator facilities, after the Project is enclosed, shall be responsible for transporting individuals and Materials as required for the Contractor's Work.

107.24 Electricity. Unless otherwise specified in the Contract Documents, the Contractor shall make all arrangements for temporary light and power services and shall pay all charges, both for service installation and removal, if required, and for energy consumed until Final Acceptance of the Project. Unless otherwise specified in the Contract Documents, the Contractor requiring any electrical service requirements relating to temporary hoists, cranes, welding Equipment or elevators shall subcontract with a licensed Contractor for such service requirements and shall be responsible for all costs of such services. From a date of partial occupancy, the City is responsible for the cost of energy consumed for the occupied portion of the Project.

107.25 Temporary Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide, and maintain in a clean condition, adequate and approved sanitary facilities for use by all Persons at the Project in coordination with the Engineer.

107.26 Drainage. The Contractor shall be responsible for all temporary drainage necessary for the Contractor's Work and shall employ pumps, trenches, drains, sumps or other necessary elements as required to afford satisfactory working conditions for the protection, execution and completion of the Project.

107.27 Environmental Protection. The Contractor shall comply with all applicable federal, State and local laws and regulations relating to pollution of the environment and shall take precautions to prevent pollution of water with fuels, oils, bitumens, calcium chloride, sediments and other Materials. When the work area is located in or adjacent to streams and other watercourses, the area shall be separated from the main stream by a dike or barrier to keep sediment from entering the stream. The Contractor shall take care during the construction and removal of such barriers to minimize siltation of the stream and watercourse. Control of ground water and water in excavations shall be accomplished in a manner that will prevent degradation of the quality of any surface water. Wells and well points shall be installed with suitable screens and filters where necessary to prevent the continuous pumping of fines. The discharge of sediment laden water from pumping shall be performed in a manner to prevent degradation of streams, watercourses, lakes, ponds, or other areas of water impoundment. Such prevention may require, without limitation, the use of ditch check dams, sediment traps, sediment basins, sediment pits, filters, filtration bags or other control devices and methods necessary to prevent adverse effects to surface waters as provided in Chapter 3745-1-04 OAC. The cost of constructing and maintaining these measures shall be borne by the Contractor. Water from aggregate washing or other operations containing sediment shall be treated by filtration, settling basins or other measures sufficient to reduce the sediment concentration to not more than that of the stream, watercourse, lake, pond or the area of water impoundment. The Contractor shall not cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to become airborne or cause or permit the Project to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne. The Engineer may require necessary measures to prevent particulate matter from becoming airborne including without limitation the paving or frequent cleaning of roads, driveways and parking lots,

the application of dust-free surfaces, the application of water and the planting and maintenance of vegetative ground cover. When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from the Project or Equipment in such manner and amount as to cause a nuisance or to violate any regulation, the Engineer may require that the Project or Equipment in which processing, handling and storage are done be tightly closed and ventilated in such a way that all air and gases and air or gas-borne material leaving the Project or Equipment are treated by removal or destruction of air contaminants be discharged to the open air.

107.28 NPDES General Permit. The Contractor shall secure any required NPDES general permit by submitting a notice of intent application form to the Ohio EPA at least forty-five Days prior to the start of construction. When required by law, the Contractor shall prepare and certify a storm water pollution prevention plan and process the required notice of termination prior to completion of the Project. The Contractor shall comply with all requirements and conditions of any NPDES general permit, including, but not limited to, implementing and maintaining the control measures specified in the storm water pollution prevention plan, maintaining records of construction activities, and removing Materials no longer required and taking proper action if there is a reportable quantity spill.

107.29 Building Permits. Unless otherwise specified in the Contract Documents, the Contractor shall secure the required general building permits. The Contractor shall schedule and attend all intermediate and Final Inspections required for any permit certification. The Contractor shall schedule inspection for occupancy permits with the appropriate local fire authority and State Fire Marshal. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any inspection.

107.30 Other Permits. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay the fees for any permit, license or tap in required by State or local authorities having jurisdiction over the Project, except the NPDES permit and the general building permits secured by the Engineer in accordance with 107.29. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any related inspection.

107.31 Inspection, Testing and Approval. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay for any inspection, testing or approval required by the Contract Documents, laws, ordinance, rules, regulations or orders of any public authority having jurisdiction over the Project. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for such inspection, testing or approval. The Contractor shall provide an original report of the inspection, testing or approval to the Engineer for approval. If, after the commencement of the Work, the Engineer determines that any portion of the Work requires special inspection, testing or approval, in addition to any inspection, testing or approval provided for or required by the Contract Documents, in order to insure conformance to the Contract Documents, the Engineer may instruct the Contractor in writing to order such special inspection, testing, or approval, or the Engineer may make the arrangements for same. If such special inspection, testing or approval reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall pay all costs associated with such special inspection, testing or approval. If such special inspection, testing or approval reveals that the Work is in compliance with the Contract Documents, the

Contractor will be paid, by appropriate Change Order, for all costs associated with such special inspection, testing or approval. Neither the observations of the Engineer in the administration of the Contract, nor any inspections, tests or approvals by Persons other than the Contractor shall relieve the Contractor from the Contractor's obligation to perform the Work in conformity with the Contract Documents.

107.32 Uncovering the Work. If any Work is covered contrary to the requirements of the Contract Documents or contrary to the written request of the Engineer, such Work must, if required by the Engineer in writing, be uncovered for observation and replaced, if not in conformity with the Contract Documents, and recovered at the Contractor's expense. If any Work has been covered in accordance with the Contract Documents and is Work which the Engineer had not requested the opportunity to observe prior to covering, the Engineer may request that such Work be uncovered by the Contractor. If such Work is found not to be in conformity with the Contract Documents, the Contractor shall pay all costs of uncovering, correcting, replacing, and recovering the Work. If such Work is found to be in conformity with the Contract Documents, a Change Order will be processed to pay the Contractor for the cost of uncovering, correcting, replacing, and recovering the Work, subject to final approval by the City Commission.

107.33 Correction of the Work. The Engineer shall notify the Contractor in writing if any Work is found by the Engineer to be Defective, whether observed before or after Contract Completion. The Engineer shall specify in the written notice the time within which the Contractor shall correct the Defective Work. The Contractor shall bear all costs of correcting such Defective Work, including the cost of any consequential damages. If the Contractor fails to correct any Defective Work within the time fixed in the written notice, the City may correct such Work and obtain recovery of all costs, including without limitation any consequential damages, and all attorneys' and consultants' fees, from the Contractor or the Contractor's Surety.

107.34 Interruption of Existing Services. Whenever it becomes necessary to interrupt existing services in use by the City or its residents, such as Sewer, water, gas, and steam lines, electric or telephone and cable service, the Contractor shall continue the Work on a non-stop twenty-four hour per Day basis until the Work is completed and the service restored, or at such Alternate time required by the Authorized Representative. Before beginning such Work, the Contractor shall apply in writing to and receive approval in writing from the Authorized Representative and the Person with appropriate jurisdiction over the Project, to establish a time when interruption of the service will cause a minimum of interference with the activities of the City, its tenants, if any, and the public.

107.35 Clean Up. During the progress of the Work, the Contractor shall be responsible for the removal and off-site disposal of all waste, excess Materials and rubbish, including without limitation layout stakes, sediment control devices and temporary Structures, attributable to the Work to an appropriate disposal site. Temporary on-site storage of waste, excess Materials and rubbish may be permitted as designated by the Engineer. Unless otherwise provided in the Contract Documents, the Contractor shall perform daily broom cleaning in the area of the Contractor's Work and shall, at the end of each working Day or upon notice from the Engineer, remove all waste Materials and rubbish from the Project. The Contractor shall, as required for the Project or upon notice from the Engineer, clean and remove any waste Materials or rubbish from areas adjacent to the Project. The Contractor shall, as required for the Project or upon

notice from the Engineer, take all necessary actions to minimize and clean dust and mud from the Project and adjacent property in accordance with City ordinances and regulations. If the Contractor fails to clean up during the progress of the Work, the provisions of 105.02 may be invoked. If the Contractor fails to maintain the areas adjacent to the Project clean and free of dust, mud, waste, excess Materials and rubbish, upon written notice from the Engineer, the Authorized Representative shall direct the local jurisdiction having responsibility for the area to clean the area or shall employ City employees or another Person to clean the area. The cost of cleaning the area adjacent to the Project shall be deducted from the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative shall be final, subject to proceedings in accordance with 118.01 through 118.11.

107.36 Explosives and Blasting. Blasting will not be permitted and explosives may not be brought onto or kept on the site of the Project, except with prior written approval of the Authorized Representative and any other authorities having jurisdiction, including without limitation the City's Fire Department. All blasting and all purchasing, storing and handling of explosives shall be done as prescribed in any applicable federal, State or City statutes, ordinances or regulations by Persons experienced in such Work. The Contractor shall carry appropriate liability insurance and shall be responsible for any injuries to individuals or damage to property resulting from any blasting operation. The Contractor shall provide a copy of the policy of such insurance to the Engineer prior to bringing any explosives to the Project and to the Authorized Representative upon request. The Contractor shall take all necessary precautions to protect the Project, existing or adjacent property, water lines, and other underground Structures from blasting. Where there is danger to Structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats. The Contractor shall notify all Owners of adjacent or utility property which may be affected of any intention to use explosives at least eight hours before blasting is commenced. Any inspection of use of explosives by the Engineer does not in any way reduce the responsibility of the Contractor or its Surety for damages that may be caused by such use.

107.37 Emergency. In the event of an emergency affecting the safety of the Project, other property, or individuals, the Contractor, without special instruction or authorization, shall act to prevent any threatened damage, injury, or loss. The Contractor shall give the Engineer and the Authorized Representative prompt written notice if the Contractor believes that any significant change in the Work or variation from the Contract Documents has been caused by any emergency or action taken in response to an emergency. If the Engineer recommends that a change in the Contract Documents be made because of any emergency or action taken in response to an emergency, and the Authorized Representative approves, a Change Order will be processed, subject to final approval by the City Commission, if applicable.

107.38 Royalties and Patents. The Contractor shall pay all royalties and license fees and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents and if, to the knowledge of the Engineer, use of the specified item is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Engineer in the Contract Documents. If the Contractor has reason to believe that use of the specified item is subject to

patent or copyright protection, the Contractor shall immediately notify the Authorized Representative.

ITEM 108 - SUBCONTRACTORS AND MATERIAL SUPPLIERS

108.01 Approval by City

108.02 Replacement

108.03 Contractor's Responsibility

108.04 Warranty and Guarantee

108.05 Prompt Payment

108.06 Prompt Payment Reduction and Interest

108.07 Affidavit of Claim

108.08 Claims Against Contract Bond

108.09 Assignment of Contract

108.01 Approval by City. Within ten Days of the Notice to Proceed, the Contractor shall list the Contractor's proposed Subcontractors and Material Suppliers on forms approved by the Authorized Representative and submit such forms to the Engineer for approval by the Authorized Representative. The City reserves the right to reject any Subcontractor or Material Supplier for any reason, in its sole discretion. Failure of the Engineer to notify the Contractor of rejection within ten Days of receipt of the forms shall constitute notice that the City has no objection. If the City rejects any Subcontractor or Material Supplier, the Contractor shall replace the Subcontractor or Material Supplier at no additional cost to the City.

108.02 Replacement. The Contractor shall not replace any Subcontractor or Material Supplier after execution of the Contract Form without written approval of the Authorized Representative. The Contractor shall submit to the Engineer amended approval forms and a written justification for the change of the Contractor's Subcontractors or Material Suppliers. The Contractor shall submit to the Engineer amended forms whenever any listed information changes for the Contractor's Subcontractors or Material Suppliers. The City may withhold approval of any such proposed replacement for any reason, in its sole discretion.

The City may require the Contractor to replace any Subcontractor or Material Supplier previously approved at no additional cost to the City if the Contractor is in default because of the Subcontractor's or Material Supplier's performance.

108.03 Contractor's Responsibility. The Contractor shall be fully responsible for all acts and omissions of the Contractor's Subcontractors and Material Suppliers and shall be responsible for scheduling and coordinating the Work of the Contractor's Subcontractors and Material Suppliers. Interference, disruption, hindrance, delay or impact attributable to the Contractor's Subcontractors or Material Suppliers shall be deemed to be interference, disruption, hindrance, delay or impact within the control and responsibility of the Contractor. The Contractor shall require that each of the Contractor's Subcontractors have a competent supervisor at the Project whenever Work is being performed by the Subcontractor. The Contractor agrees to bind the Contractor's Subcontractor and Material Supplier to the terms of the Contract Documents, so far as applicable to the Work of such Subcontractor or Material Supplier, and shall not agree to any provisions which seek to bind the City to terms inconsistent with or at variance from the terms of the Contract Documents. Contractor shall require the City to be named as an intended third-party beneficiary of all contracts between Contractor and Subcontractors and Material Suppliers such that the City will be entitled to enforce any rights thereunder to its benefit.

108.04 Warranty and Guarantee. The Contractor shall require each Subcontractor and Material Supplier to fully warrant and Guarantee, for the benefit of the City, the effectiveness, fitness for the purpose intended, quality and merchantability of any Work performed or item provided or installed by such Subcontractor or Material Supplier.

108.05 Prompt Payment. If a Subcontractor or Material Supplier requests payment in time to allow the Contractor to include the request in the Contractor's Contractor Payment Request, the Contractor shall pay within ten Days after receipt of payment from the City:

(a) To a Subcontractor an amount equal to percent of completion allowed by the City for the Subcontractor's Work;

(b) To a Material Supplier an amount equal to all or a portion of the Material Supplier's request for Materials furnished.

108.06 Prompt Payment Reduction and Interest. The Contractor may reduce the amount to be paid to a Subcontractor or Material Supplier pursuant to 108.05 by the amount of any retainage withheld from the Contractor and may withhold amounts necessary to resolve disputed liens or claims involving the Work of the Subcontractor or Material Supplier. If the Contractor fails to comply with the provisions of 108.05, the Contractor shall pay to the applicable Subcontractor or Material Supplier eighteen percent interest on any unpaid amount beginning on the eleventh Day after receipt of payment from the City.

108.07 Affidavit of Claim. In order to establish lien rights, Subcontractors and Material Suppliers not in privity of Contract with the Contractor must serve a notice of furnishing on the Contractor whose Contract is the Contract under which the Subcontractor or Material Supplier is performing. The notice of furnishing must be served upon the Contractor within twenty-one Days of performing the Work or furnishing the Materials. Subcontractors and Material Suppliers not in privity of Contract with the Contractor must, at the time of filing a Claim Affidavit with the Authorized Representative, provide a copy of the notice of furnishing and proof that it was received by the Contractor. In order to establish lien rights, a claimant must file a Claim Affidavit with the Authorized Representative, within one hundred twenty Days from the date of the last Work or furnishing of Materials. In order to receive priority over similar claims, the claimant must file a copy of the claim with the Montgomery County Recorder's office within thirty Days of serving the Authorized Representative. All claimants who serve the Authorized Representative, and file with the Montgomery County Recorder within thirty Days, have no priority among themselves and share in the funds prorata. Claimants, who file with the Authorized Representative, but not with the Montgomery County Recorder, are paid only if there are sufficient funds left after paying those claimants who file with the Montgomery County Recorder. The Authorized Representative shall notify the Contractor of the receipt of the claim within five Days of receiving the Claim Affidavit. A copy of the Claim Affidavit and a statement advising the Contractor of the Contractor's right to dispute the claim will accompany the notice. The Contractor shall have twenty Days to dispute the claim. If the Contractor does not notify the Authorized Representative in writing of an intention to dispute the claim within twenty Days after receipt of the Claim Affidavit, the Contractor is deemed to have assented to its correctness. The City shall detain the amount stated in the Claim Affidavit from subsequent Contractor Payment Requests and deposit said amount in an escrow

account in accordance with a general escrow agreement between the City and a bank. The escrow agent shall hold the deposit and any interest earned thereon until receipt of notice from the Authorized Representative specifying an amount to be released and the Person to whom the amount is to be released. The City reserves the right to pay a Claim Affidavit which is not timely disputed.

108.08 Claims Against Contract Bond. Laborers, Subcontractors or Material Suppliers who have furnished or delivered labor or Materials to the Project may, at any time after performing the labor or delivering the Materials, but not later than ninety Days after Final Acceptance of the Project, by the City, furnish the Surety a statement of the amount due. After furnishing the statement, laborers, Subcontractors or Material Suppliers must wait sixty Days to bring a suit for the amount due. If the Surety has not paid the claim at the expiration of sixty Days, laborers, Subcontractors or Material Suppliers may bring suit for amounts not paid, but must bring the suit within one year of Final Acceptance of the Project, by the City.

108.09 Assignment of Contract. The Contractor shall not sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of any right, title or interest therein, without written consent of the Authorized Representative. No sale, transfer, assignment or other disposition of the Contract shall in any case release the Contractor of liability under the Contract and the Contract Bond.

ITEM 109 CONSTRUCTION PHASE SCHEDULING

- 109.01 Compliance with Schedule**
- 109.02 Responsibility of Contractor**
- 109.03 Preceding Work**
- 109.04 Coordination with City**
- 109.05 Construction Schedule**
- 109.06 Schedule Information**
- 109.07 Construction Schedule Requirements**
- 109.08 Use of Schedule and Float**
- 109.09 Approval and Acceptance Schedule**
- 109.10 Weekly Contractor Reports**
- 109.11 Monthly Progress Reports**
- 109.12 Time Recovery Plan**
- 109.13 Project Meetings**

109.01 Compliance with Schedule. The Contractor shall complete portions of the Work in such order and time as provided in the current Construction Schedule.

109.02 Responsibility of Contractor. The Contractor shall afford other Persons on the Project reasonable opportunity for the introduction and storage of Materials and Equipment and execution of Work and shall properly connect and coordinate the Contractor's Work with the Work of other Persons on the Project. The Contractor shall perform the Work so as not to interfere with, disturb, hinder, delay, or impact the Work of other Persons on the Project. If the Contractor, or any of the Contractor's Subcontractors or Material Suppliers, causes damage or injury to the property or Work of any other Person on the Project, or by failure to perform the Work with due diligence, delays, interferes with, hinders, disrupts or impacts any other Person on the Project, who suffers damage, injury or expense thereby, the Contractor shall be responsible to the other Person for such damage, injury or expense. Claims, disputes or actions between the Contractor and other Persons on the Project concerning such damages, injury or expense shall not delay completion of the Work which shall be continued by the parties to any such claim dispute or action. The Contractor shall coordinate the Work with the activities and responsibilities of other Persons on the Project, the Engineer and the City to complete the Project in accordance with the Contract Documents. In the event the Contractor fails to prosecute the Work in accordance with the Project Schedule, the Engineer may recommend that the provisions of 105.02 be invoked.

109.03 Preceding Work. If any part of the Contractor's Work is preceded by the Work of another Person, the Contractor shall inspect such preceding Work before commencing any Work, and report in writing to the Engineer any defects which render the preceding work unsuitable as related to the Contractor's work. Failure of the Contractor to make such inspection and report in writing shall constitute an acceptance of the preceding work as fit and proper for the reception of the Contractor's work, except for latent defects which such an inspection would fail to disclose.

109.04 Coordination with City. The Contractor shall supervise and coordinate the Work in conformity with any coordination from the Engineer and the Authorized Representative, as provided in the Contract Documents. The Contractor shall give reasonable notice to the Engineer

when the Engineer's presence is required for special consultations, decisions or recommendations, as required by the Contract Documents. The Contractor shall consult with the Engineer and the Authorized Representative to obtain full knowledge of all rules, regulations or requirements affecting the Project. The Contractor shall establish the regular working hours, subject to approval by the Engineer and the Authorized Representative. Night working hours and working hours on Sundays and holidays are not permitted without the prior written consent of the Engineer and the Authorized Representative. Such consent will not be provided unless the Contractor has given at least forty-eight hours' notice in writing to the Engineer. The Contractor shall cooperate with the Engineer and the Authorized Representative so as not to interfere with, disturb, hinder or delay the responsibilities of the Engineer and the City.

109.05 Construction Schedule. The Contractor shall prepare the Construction Schedule for the Project and a schedule of submittals which is coordinated with the Construction Schedule within thirty Days of the date of the Notice to Proceed or such longer period as mutually agreed between the Engineer and the Contractor in writing upon timely written request by the Contractor. The Contractor shall, within seven Days of the date of the Notice to Proceed, furnish to the Engineer a preliminary Construction Schedule for the prosecution of Work on the Project. The Engineer shall, within seven Days of receipt of the Contractor's preliminary Construction Schedule, provide comments on the preliminary Construction Schedule to the Contractor. The Contractor shall, within five Days of receipt of the comments, prepare a revised Construction Schedule to incorporate those comments and submit the revised Construction Schedule to the Engineer together with all information requested and required by the Engineer. The Engineer shall submit 4 copies of the revised Construction Schedule, together with any recommendation thereon in writing, to the Authorized Representative within three Days of receipt. The Construction Schedule shall not exceed the time limits specified in the Contract Documents and the Notice to Proceed, shall provide for reasonable, efficient and economical execution of the Work and shall be coordinated with the Work of all other Persons or the entire Project to the extent required by the Contract Documents. The Construction Schedule shall be used to plan, organize, and execute the Work, record and report actual performance and progress and show how the Contractor Plans to coordinate all Work to Contract Completion. In preparing the Construction Schedule the Contractor shall use critical path scheduling methods and shall provide without limitation, the information listed in 109.06, unless waived by the Authorized Representative in writing upon the written recommendation of the Engineer.

109.06 Schedule Information. In accordance with 109.05, the Contractor shall provide the following information:

- (a) A graphic presentation of the sequence of the Work for the Project which includes, without limitation, the Contractor's resource loading curve in the media and format required by the Engineer;
- (b) Identification of each phase of the Work and any milestone completion dates;
- (c) Identification of activities and durations for all shop drawing and other submittal review and approval, fabrication and review of mock-up Work, product review and procurement, fabrication, shop inspection and delivery including, without limitation, lead time, coordination drawing delivery, Punch List, Punch List corrections, Project close-out requirements, Contract Completion, and occupancy or utilization requirements;

- (d) Identification of disruptions and shutdowns due to other operations, facilities and functions, if any;
- (e) Identification of the critical path of the Work;
- (f) Identification of crew size and total resource hours for each activity in the Construction Schedule;
- (g) The Contractor's signature and date thereof on the Construction Schedule.

109.07 Construction Schedule Requirements. The Engineer shall provide complete Specifications for the paper and electronic formats of the Construction Schedule. The Contractor shall develop the Construction Schedule using commercially available Personal computer software acceptable to the Engineer, in graphic and tabular form. Final copies shall be provided in color and in such size as is appropriate for the level of detail and shall clearly and legibly show all relevant information. The Contractor shall provide monthly updates of the Construction Schedule and shall update the Construction Schedule if a time recovery plan is approved in accordance with 109.12, in electronic and paper formats, to the Engineer in graphic and tabular form. All base line and updated schedules shall be submitted electronically to the Engineer, in graphic and tabular form. The Contractor shall provide clear graphics, legends and other necessary data, including without limitation, milestones, constraints and items required by the Project and the Engineer. Unless waived by the Authorized Representative in writing upon written recommendation of the Engineer, each baseline and updated schedule shall show the Project name and Contract and contain lines for signatures and dates of signature for all Contractors involved in the Project. Each baseline and updated schedule shall provide activity identification and a description for each activity broken down to a maximum fifteen Day duration, responsibility of each applicable Contractor, the Contractor's resources and crew size for each activity, early start dates, early finish dates, late start dates, late finish dates, predecessor and successor activities for each activity, free float, total float and percentage completion. Each baseline and updated schedule shall identify the logic relationship between all activities and shall show all submittal dates, coordination drawing preparation, Working Drawing submittals and mark-up review and approval durations. Together with each updated schedule, the Contractor shall provide a list of all changes to the previously approved base line Construction Schedule or the previous updated Construction Schedule, including without limitation logic, float and actual start and finish dates of activities.

109.08 Use of Schedule and Float. The Construction Schedule and the Project Schedule, if applicable, shall be used as a tool for scheduling and reporting sequenced progress of the Work using early start dates and early finish dates. Free float and total float are resources of the Project and the use of float associated with an activity is not permitted without the concurrence of the Engineer, and other Contractors, if any.

109.09 Approval and Acceptance Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature or any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation. Immediately after the Contractor has signed the Construction Schedule, the Engineer shall submit it and the

schedule of submittals to the Authorized Representative or return them to the Contractor with recommendations for revision. In the absence of a Construction Schedule approved by the Contractor and accepted by the Authorized Representative, the City may withhold payment from the Contractor in accordance with 114.08 and 114.09. Alternatively, the City, in its sole discretion, may backcharge the Contractor in accordance with 105.02, reassign scheduling responsibility or suspend or terminate the Contract in accordance with 119.01 through 119.04.

109.10 Weekly Contractor Reports. Unless otherwise specified by the Contract Documents, the Contractor shall, on a bi-weekly basis, prepare and submit to the Engineer a written report describing activities begun or finished during the preceding week, work in progress, expected completion of the Work, a Projection of all activities to be started or finished in the upcoming two weeks including without limitation the Contractor's workforce crew size with respect to each activity of Contractor, and total resource hours associated with such Work and any other information requested by the Engineer.

109.11 Monthly Progress Reports. Unless otherwise specified in the Contract Documents, the Engineer shall provide monthly progress reports to the Authorized Representative, which shall include recommendations for adjusting the Construction Schedule or the Project Schedule, as applicable, to meet milestone completion dates and Contract Completion dates.

109.12 Time Recovery Plan. When it is apparent to the Engineer that critical path activities, scheduled milestone completion dates, or Contract Completion dates will not be met, the Engineer shall submit to the Contractor a time recovery plan to avoid or minimize any delay. A time recovery plan may include, without limitation, increasing the Contractor's workforce in such quantities as will eliminate the backlog of Work, increasing the number of working hours per shift, shifts per workday, workdays per week, the amount of construction Equipment, or any combination thereof, rescheduling of activities to achieve maximum practical concurrency of work efforts and, if appropriate, time extensions. If the Contractor approves the time recovery plan within ten Days of receipt, a revised Construction Schedule shall be prepared by the Contractor and signed and accepted in accordance with 109.11 and, if applicable, a revised Project Schedule shall be prepared by the Engineer and approved and signed by the Contractors in accordance with 109.10. If the Contractor fails to approve a time recovery plan within ten Days of receipt, the Contractor shall immediately provide an Alternate time recovery plan to the Engineer in writing, for review and acceptance in accordance with 109.11 and, if applicable, 109.10.

109.13 Project Meetings. The Contractor and all appropriate Subcontractors shall attend Project meetings as requested by the Engineer. The purpose of the Project meetings may include, without limitation, review of progress in the Work, discussion of anticipated progress, and review of critical operations and existing and potential problems and safety matters. The Contractor shall be represented at every Project meeting by a Person authorized with signature authority to make decisions regarding possible modification of the Contract Documents. The Engineer shall notify the Contractor of the time and place of each Project meeting. The Contractor shall have any of the Contractor's Subcontractors and Material Suppliers attend a Project meeting as deemed advisable by the Contractor or as requested by the Engineer. The Engineer or the Engineer's designated representative shall prepare a written report of each Project meeting and distribute such report to the Authorized Representative and the Contractor. The Engineer or the Engineer's designated representative, as applicable, shall not delegate the duty to prepare a

written report of each Project meeting. If any Person objects to anything in a report of a Project meeting, the Person shall notify the Engineer, the Authorized Representative and any other affected Person in writing explaining the objection. The Engineer shall attach any objection made to a report of a Project meeting and any response thereto to the report.

ITEM 110 - WORKING DRAWINGS AND SAMPLES

110.01 Requirement to Provide

110.02 Samples, Tests, Cited Specifications

110.03 Source Sampling and Testing

110.04 Form of Submittals

110.05 Variation from Contract Documents

110.06 Contractor's Review

110.07 Engineer's Review

110.08 Risk of Nonpayment

110.09 Manufacturer's Statement

110.01 Requirement to Provide. Working Drawings, Samples and other submittals, including without limitation stress sheets, erection Plans, falsework Plans, cofferdam Plans, bending diagrams for reinforcing steel, formwork, Plans, and tunneling Plans, shall be provided by the Contractor for any item required by the Contract Documents but not fully described in the Drawings and Specifications, unless waived by the Engineer, and shall include, without limitation:

(a) Construction of the various parts, method of jointery, type of material, grade, quality and thickness of material, alloy of material, profiles of all sections, reinforcement, anchorage, type and grade of finish;

(b) Capacities, types of Materials and performance charts that are pertinent to the Materials and performance charts that are pertinent to the Work. Wiring diagrams, control diagrams, schematic diagrams, working and erection dimensions, arrangement and Specifications;

(c) Notwithstanding any measurements in Drawings or Specifications, where the Work involves repair, renovation, extension or alteration of, or addition to, an existing Structure, the Contractor shall make such measurements of the existing Structure as may be required to accurately attach the Work to the Structure.

110.02 Samples, Tests, Cited Specifications. Unless otherwise provided in the Contract Documents, the City shall test Samples of Materials in accordance with AASHTO, ASTM, AWWA or methods on file in the office of the Director at the expense of the City. Samples will be taken by a qualified representative of the City. References included in these Specifications to AASHTO, ASTM, AWWA, or federal Specifications shall be to the test method, sampling method or specification in effect upon the date of the notice to Bidders for the Contract. Copies of all test results will be furnished to the Contractor. The Contractor shall cooperate fully in the sampling and inspection of Materials and shall notify the Engineer immediately upon the arrival of Materials to be used in the Work. The City reserves the right to retest all Materials and Equipment that have been stored prior to incorporation of those Materials into the Project and to reject all Materials and Equipment which, when retested, do not meet the requirements of the Contract Documents. The Contractor, in all cases, shall furnish the required Samples without charge. Transports and distributors hauling bituminous material shall be equipped with an approved submerged bituminous Materials sampling device.

110.03 Source Sampling and Testing. The Engineer may undertake the sampling and testing of Materials at the source of supply. If source sampling and testing is undertaken:

- (a) The Contractor shall cooperate and assist the Engineer, including without limitation in compliance with applicable inspection, sampling and test requirements, and shall provide all necessary documentation;
- (b) The Contractor shall provide full entry at all times to the parts of the source as may concern the manufacture or production of the Materials being sampled and tested;
- (c) If required by the Engineer, the Contractor shall arrange for an approved building for the use of the inspection which building shall be located conveniently near the source and independent of any building used by the Materials producer;
- (d) The Contractor shall provide and maintain adequate safety measures at the plant at all times;
- (e) The City reserves the right to retest all Materials that were tested at the source prior to the incorporation of those Materials into the Project and to reject all Materials which, when retested, do not meet the requirements of the Contract Documents.

110.04 Form of Submittals. The Contractor shall provide a submittal letter and shall stamp and submit the working Drawings or other submittals to the Engineer in accordance with a schedule established by the Engineer and the Contractor. Unless otherwise specified in the Contract Documents, the Contractor shall submit 3 prints of all working Drawings and 4 copies of any other submittal. Only 1 print copy of all working Drawings will be returned to the Contractor by the Engineer. If the Contractor requires more than 1 copy, additional copies must be provided to the Engineer at the time of the original submission. The Engineer will not produce copies of the working Drawings. The data shown on the working Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, Materials and similar data to show the Engineer the Materials and Equipment which the Contractor proposes to provide. Each sample shall be identified clearly as to material, supplier, and pertinent data such as catalog numbers and the use for which intended and other uses as the Engineer may require to enable the Engineer to intelligently review the submittal. All working Drawings shall indicate the applicable plan sheet and Specifications.

110.05 Variation from Contract Documents. If the working Drawings or other submittals show variations from the requirements of the Contract Documents, the Contractor shall make specific mention of such variations in the Contractor's letter of submittal to the Engineer. If the variation is acceptable to the Engineer, the Engineer shall recommend acceptance of the variation to the Authorized Representative in writing. Upon written approval of the Authorized Representative, the variation shall be incorporated into the Contract Documents. The Contractor shall not be relieved of any responsibility for deviations from the requirements of the Contract Documents by the Engineer's review of working Drawings, Samples or other submittals.

110.06 Contractor's Review. All working Drawings, Samples and other submittals shall be reviewed and stamped by the Contractor prior to submittal to the Engineer. If it is apparent to the Engineer that the Contractor has not reviewed the submittals, or has conducted an incomplete

review, the Engineer shall reject the submittals. The Contractor shall field verify conditions as necessary and make corrections of dimensions, location of various items, encroachments of Work or variations from the requirements of the Contract Documents. If required by the Contract Documents or applicable law, the Contractor shall have the working Drawings or other submittals prepared by Persons possessing expertise and experience in an appropriate trade or profession or by a licensed Engineer, landscape architect, or other design professional.

110.07 Engineer's Review. The Engineer shall review and approve or disapprove working Drawings, Samples or other submittals within fifteen Days of receipt or in accordance with the approved submittal schedule or such other period of time as is mutually agreed by the Engineer and the Contractor. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of working Drawings, Samples or other submittals until approved, which resubmission shall be acted upon by the Engineer with fifteen Days of receipt or such other period of time as is mutually agreed by the Engineer and the Contractor. When resubmitting submittals, the Contractor shall direct the Engineer's attention to any revisions made by noting such revisions on the resubmitted submittal. All costs incurred by the Engineer, the City or other Persons due to the failure of the initial submittal to substantially meet the requirements of the Contract Documents, or due to excessive resubmittals, for attendant delay, interference, hindrance, disruption or impact of the Project, shall be paid by the Contractor. Resubmittals in excess of two may be deemed excessive by the City. The Engineer's review and approval of working Drawings, Samples and other submittals is to determine if the items covered by such submittals will, after installation and incorporation into the Work, conform to the Contract Documents and be compatible with the design concept of the Project as a functioning whole. The Engineer's review and approval shall not extend to means, methods, manners, techniques, sequences, procedure of construction or to safety precautions or programs incident thereto. The Engineer's review and approval of a separate item will not indicate approval of the assembly in which the item functions.

110.08 Risk of Nonpayment. No portion of the Work requiring a Working Drawing, sample or other submittal shall be commenced until the submittal, has been reviewed and approved by the Engineer. Any Work commenced by the Contractor prior to final approval of the Working Drawing, sample or other submittal by the Engineer shall be performed by the Contractor under risk that no payment will be approved or made by the City for such Work.

110.09 Manufacturer's Statement. Working Drawings on all Equipment shall include the following written statement from the manufacturer of the Equipment:

"This Equipment submitted for approval shall perform as specified when installed by the Contractor in the arrangement shown on this drawing and in the Contract Documents and in conjunction with all other accessories such as flues, breachings, piping, controls and Equipment not furnished by this manufacturer but required as an accessory or supplement to this Equipment, providing that the accessory or supplementary items perform as specified and are installed as shown in the Contract Documents."

ITEM 111 PREVAILING WAGE RATES

111.01 Prevailing Wages

111.02 Prevailing Wage Determination

111.03 Fines and Penalties

111.04 Wage Schedule

111.05 Payroll Reports

111.01 Prevailing Wages. The Contractor shall pay the prevailing wage rates of the Project locality, as determined by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour bureau, or the U.S. Department of Labor to laborers and mechanics performing Work on the Project, as applicable. The Contractor shall comply with the provisions, duties, obligations, and is subject to the remedies and penalties of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act, as applicable.

111.02 Prevailing Wage Determination. The Contract Documents include pages setting forth the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour Bureau, or the U.S. Department of Labor for the Project, as applicable. The City shall, within seven business Days after receipt of a notice of a change in the prevailing rates, notify the Contractor of the change. The Contractor shall make the necessary adjustment in the prevailing wage rate and shall pay any wage increase during the term of the Contract.

111.03 Fines and Penalties. Whoever violates Section 4115.08 or 4115.09, ORC, shall be fined pursuant to the applicable provisions of the Ohio Revised Code. Whoever violates division (C) of Section 4115.071, or Section 4115.10 or 4115.11, ORC is guilty of a misdemeanor of the second degree for a first offense. For each subsequent offense such Person is guilty of a misdemeanor of the first degree. Fines and penalties under the Davis-Bacon Act shall be as determined by the U.S. Department of Labor and in accordance with applicable law.

111.04 Wage Schedule. Within ten Days of the date of the Notice to Proceed, the Contractor shall provide the City's prevailing wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

111.05 Payroll Reports. The Contractor shall submit weekly payroll reports with each Contractor Payment Request, which reports shall be certified by the Contractor that the payroll is correct and complete and the wage rates shown are not less than those required by the Contract. The Contractor shall be responsible for submitting all payroll reports of the Contractor's Subcontractors. The payroll report shall indicate the week covered and shall include a list containing the name, address and social security number of each employee of the Contractor and the Contractor's Subcontractors paid for the Work. The payroll report shall list the number of hours each employee worked each Day on the Project during the reporting period, the total hours each week on the Project, the employee's hourly rate of pay, job classification, fringe benefits and all deductions from wages and net pay. The payroll report shall also list each fringe benefit and state if it is paid as cash to the employee or to a named plan. The Contractor and the Contractor's

Subcontractors shall also submit apprenticeship agreements for all apprentices utilized on the Project.

ITEM 112 INSURANCE

112.01 Contractor's Liability Insurance

112.02 Policy Limits

112.03 Explosion, Collapsed and Underground Insurance

112.04 Builder's Risk Insurance

112.05 Coverage Amount

112.06 Railroad Protective Insurance

112.07 Insurance Policy Requirements

112.08 Renewal Certificates

112.09 Waivers of Subrogation

112.01 Contractor's Liability Insurance. The Contractor shall purchase and maintain such liability and other insurance as will protect the Contractor from claims described below which may arise out of or result from the Contractor's performance or obligations under the Contract Documents, whether due to action or inaction by the Contractor, a Subcontractor, any Person directly or indirectly employed by the Contractor or a Subcontractor or any Person for whom the Contractor or a Subcontractor is responsible, or by any Person for whose acts the Contractor or a Subcontractor may be liable:

- (a) Claims under workers' compensation, occupational sickness or disease, disability benefit and other similar employee benefit acts;
- (b) Claims for damages because of bodily injury, disease, illness, death or Personal injury, and other claims usually covered by bodily injury liability insurance;
- (c) Claims for damages because of injury to or destruction of property and other claims usually covered by property damage liability insurance.

The Contractor shall comply with all provisions of the Ohio Workers Compensation Act and all rules of the Ohio Bureau of Workers' Compensation. In addition, if a portion of the Work is performed from a barge or a ship or requires unloading Materials from a barge or a ship on a navigable waterway of the United States, the Contractor shall arrange coverage for that portion of the Work under the Longshore and Harborworkers' Compensation Act, 33 U.S.C. Section 901, et seq., and the Jones Act, 5 U.S.C. Section 751, et seq. and shall provide proof of such coverage to the City. Comprehensive Automobile Liability Insurance shall cover owned, non-owned and hired vehicles.

112.02 Policy Limits. A Commercial General Liability policy and Business Automobile Liability policy shall be maintained to provide insurance as described below. An Umbrella or Excess Liability policy may be used in combination with the Commercial General Liability and business Automobile insurance to meet such limits:

- (a) Policy Limits Commercial General Liability**
 - \$2,000,000 General Aggregate
 - \$2,000,000 Products/Completed Operations Aggregate
 - \$1,000,000 Occurrence Limit
 - \$1,000,000 Personal and Advertising Injury Limit
 - \$100,000 Fire Legal Liability Limit
 - \$10,000 Medical Payments
- (b) Policy Limits Comprehensive Automobile Liability**
 - \$1,000,000 Bodily Injury & Property Damage Occurrence Limit

Contracts in the amount of one hundred thousand dollars or less shall require coverage in the amount of not less than two million dollars general aggregate and one million dollars per occurrence. Contracts in excess of one hundred thousand dollars, but not more than five million dollars shall require coverage in the amount of not less than three million dollars general aggregate and per occurrence. Contracts exceeding the amount of five million dollars shall require coverage in an amount to be determined by the Authorized Representative but in no case less than five million dollars general aggregate and per occurrence. Such policies shall be endorsed to provide that the General Aggregate Limit applies separately to each of the insured Contractor's Projects. By requiring such insurance and insurance limits herein, the City does not represent that coverage and limits will necessarily be adequate to protect the Contractor, and such coverage and limits shall not be deemed as a limitation on the Contractor's liability under the indemnities granted to the City.

112.03 Explosion, Collapsed and Underground Insurance. For any demolition, excavating, tunneling, shoring or similar operations, the Contractor shall purchase and maintain Explosion, Collapse and Underground (XCU) coverage with a limit of liability equal to such limit as specified in 112.02. In addition, if blasting is to be performed, the Contractor shall purchase and maintain XCU coverage providing a minimum Aggregate Limit of 5,000,000 dollars and Each Occurrence Limit of 1,000,000 dollars.

112.031 Pollution Liability Insurance. If required by the Contract Documents, Contractor shall purchase and maintain pollution liability insurance with a limit for any one incident of not less than \$1,000,000 and an aggregate limit of not less than \$2,000,000.

112.032 Completed Operations Insurance. Contractor shall purchase and maintain completed operations coverage to cover such claims for bodily injury or property damage arising out of the Contractor's completed operations, which coverage shall be maintained for no less than five (5) years following final payment.

112.04 Builder's Risk Insurance. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain, during the progress of the Work and until the execution of the Certificate of Contract Completion by the Authorized Representative, a builder's risk insurance policy to cover all Work in the course of construction including falsework, temporary buildings and Structures and Materials used in the construction process, stored on or off site, or while in transit. The amount of coverage shall equal the total completed value of the Project (including the value of permanent fixtures and decorations). Such insurance shall be on a special cause of loss form, which provides coverage on an open perils basis insuring against the direct physical loss of or damage to covered property including flood and earthquake. It shall also include debris removal and demolition occasioned by enforcement of any applicable legal requirement, and shall cover reasonable compensation for the City's services and expenses required to limit further loss. Coverage must include provision to pay the reasonable extra costs of expediting temporary and permanent repairs to, or permanent replacement of, damaged property. This shall include overtime wages and the extra cost of "express" or other means for rapidly transporting Materials, Equipment and supplies necessary to such repair or replacement. The builder's risk policy shall protect both the Contractor and the City from loss and provide coverage for Materials in transit or stored off site and identified for the Project. Coverage for other perils may be required if specified in the Special Provisions.

112.05 Coverage Amount. Unless otherwise specified in the Contract Documents, the builder's risk policy shall be written in the amount equal to one hundred percent of the Contract price, including landscaping, paving and other sitework. The builder's risk policy shall specifically permit and allow for partial occupancy by the City prior to Final Acceptance of the Project by the City.

112.06 Railroad Protective Insurance. Where the Contract requires railroad Protective Insurance and no specific Bid item is provided in the Proposal for the payment of the premium therefore, the cost of such insurance shall be included in the various other Bid items in the Contract.

112.07 Insurance Policy Requirements. Each policy of insurance required to be purchased and maintained by the Contractor shall be obtained from an insurance company authorized by the Ohio Department of Insurance to do business in the State and shall name the City as an additional insured or loss payee, as applicable; provided, however, that such designation shall not cause any claim between the Contractor and the City to be waived except as set forth in 112.09. Each policy and the respective certificate of insurance shall expressly provide that no less than thirty Days prior written notice shall be given to the City in the event of cancellation, non-renewal, expiration or material alteration of the coverage contained in such policy or evidenced by such certificate of insurance. Each policy shall provide that the City shall be covered notwithstanding any action, omission or negligence of the Contractor. Each policy shall be primary and non-contributory. Each policy must include contractual liability insurance covering the Contractor's indemnity obligations. The Contractor shall furnish the City, when requested, a certified copy of any insurance or additional insured or loss payee endorsement required to be purchased or maintained by the Contract Documents. In no event shall any failure of the City to demand a certified copy of any required insurance or endorsement be construed as a waiver of the obligation of the Contractor to obtain insurance required to be purchased or maintained by the Contract Documents. Except for its completed operations insurance, the Contractor shall maintain all insurance in the required amounts, without interruption, from the date

of the execution of the Contract Form until the date of approval of the Certificate of Contract Completion by the Authorized Representative. The Contractor shall require all Subcontractors to provide Workers' Compensation, CGL, and Automobile Liability insurance with the same minimum limits specified herein, unless the Owner agrees to a lesser amount and require the City be named as an additional insured and/or loss payee under such policies. Failure to maintain the required insurance during the time specified shall be cause for termination of the Contract. If the Contractor fails to purchase and maintain, or require to be purchased and maintained, any insurance required under these Specifications, the Owner may, but shall not be obligated to, upon three (3) days written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor upon demand. Insurance policies required to be purchased and maintained by the Contractor may include a reasonable loss deductible and exclusions, which shall be the responsibility of the Contractor to pay in the event of loss. The prompt repair or reconstruction of the Work as a result of an insured loss or damage shall be the Contractor's responsibility and shall be accomplished at no additional cost to the City.

112.08 Renewal Certificates. If the Contractor provides certificates of insurance showing expiration prior to the date of final completion, the Contractor shall provide new certificates to the City showing continuing coverage prior to expiration.

112.09 Waivers of Subrogation. The City and the Contractor waive all rights against each other for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to Item 112 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the City as fiduciary.

ITEM 113 INDEMNIFICATION

113.01 Indemnification for Injury or Damage

113.02 Indemnification for Patent or Copyright Use

113.01 Indemnification for Injury, Damage or Breach of Contract. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the City, the Engineer, any participating railroad or railway company, any property Owner or lessee of adjacent property, or utilities and any private Person providing financing for the Project, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities, from and against all claims, damages, losses, and expenses, direct, indirect or consequential, including but not limited to all fees and charges of design professionals, attorneys, and other professionals and all court, arbitration, or other dispute resolution costs, arising out of or resulting from any claim or action, legal or equitable, caused or alleged to have been caused by the Contractor's performance of the Work or any breach of the Contractor's obligations under the Contract Documents, including but not limited to the breach of any warranty provided in the Contract Documents.

In the event of any such injury, including death, or loss or damage, or claims therefore, the Contractor shall give prompt notice thereof to the Engineer and the Authorized Representative. This provision is intended to be, and shall be construed, as consistent with, and not in conflict with, Section 2305.31 ORC, to the fullest extent permitted. The indemnification obligations of the Contractor under this 113.01 shall not extend to the liability of the Engineer, the Engineer's officials, consultants, agents, representatives or employees for negligent preparation or approval of Drawings, specification, Change Orders, opinions, and any other responsibility of the Engineer, except to the extent covered by the Contractor's insurance.

113.02 Indemnification for Patent or Copyright Use. To the fullest extent permitted by law, the Contractor shall indemnify, hold harmless and defend the City and the Engineer, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities from and against all claims, damages, losses and expenses arising out of the Contractor's infringement of patent rights or copyrights.

ITEM 114 CONTRACTOR PAYMENT

- 114.01 Contract Cost Breakdown**
- 114.02 Contractor Payment Request**
- 114.03 Payment Date**
- 114.04 Labor Payments**
- 114.05 Material Payments**
- 114.06 Retainage**
- 114.07 Retainage Reduction with Consent of Surety**
- 114.08 Payments Withheld**
- 114.09 Payments Detained**
- 114.10 Measurement of Quantities**
- 114.11 Final Payment Request**
- 114.12 Final Payment Date**
- 114.13 Waiver of City's Claims**
- 114.14 Waiver of Contractor's Claims**

114.01 Contract Cost Breakdown. The Contractor shall submit to the Engineer a full, accurate and detailed estimate (the Contract Cost Breakdown) of the various kinds of labor to be performed and material to be furnished, with separate amounts shown for labor and Materials for each branch of Work, following the preferred titles and sequences of sections in the format used by the Engineer in developing the Specifications. The grand total shown on the Contract Cost Breakdown must equal the total Contract price. The City reserves the right to use the approved Contract Cost Breakdown to determine the cost or credit resulting from any change in the Work. The first item should be actual aggregate cost of Contract Bond, insurance, permits and tests required for the Work. The amounts for labor and material shall accurately reflect the cost for each item. Separate items shall not be shown for overhead or profit, but shall be included in the totals for labor and Materials. Whenever the material allocation exceeds fifty-five percent of the Contract price, the Contractor shall provide, upon request, sufficient information to support such higher percentage. Subcontract Work shall show amounts for labor and Materials. Fringe benefits shall be shown as a part of labor costs. When more than one major Structure is included in the Contract, the Contract Cost Breakdown shall be subdivided accordingly if requested by the Engineer, with cost details for each Structure shown separately. A line item shall be included for commissioning, Punch List Work, Project record document submittals, delivery of inventory and specified training. The Contract Cost Breakdown will be returned to the Contractor for resubmittal if it does not meet the requirements set forth above or contains insufficient items or details of the Work. No payment will be made without an approved Contract Cost Breakdown.

114.02 Contractor Payment Request. The Contractor shall submit monthly to the Engineer an itemized Payment Request for Work performed based upon the Contract Cost Breakdown on a form satisfactory to the Authorized Representative. The Contractor Payment Request shall be supported by documentation substantiating the Contractor's right to payment. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.03 Payment Date. Payment of an approved Payment Request shall be made within thirty Days from the date of approval by the Engineer. The City reserves the right to require proof of the renewal of required insurance as a condition precedent to payment. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and the Authorized Representative.

114.04 Labor Payments. Partial payments to the Contractor for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety percent of the amount invoiced through the Payment Request which shows the total Contract Completion at fifty percent or greater. After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved.

114.05 Material Payments. Through the Payment Request which shows total Contract Completion at fifty percent or greater, the City shall pay to the Contractor a sum at the rate of ninety percent of the invoice cost, not to exceed the applicable Bid amount in a Unit Price or lump sum Contract, for material delivered on the site of the Project, or other point in the vicinity of the Project, or other storage site approved by the Engineer, provided the Contractor provides the following information with the Payment Request:

- (a) A list of the fabricated Materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost;
- (b) A certification of Materials stored off site, prepared by the Contractor and signed by the Engineer to evidence that the Materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project. All costs incurred by the Engineer to visit a storage site, other than the areas adjacent to the Project, shall be paid by the Contractor.

After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for Materials furnished under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved. When payment is allowed on account of material delivered on the site of the Project or in the vicinity thereof or under the possession and control of the Contractor but not yet incorporated therein, such material shall become the property of the City, but if such material is stolen, destroyed, or damaged by casualty before being used, the Contractor will be required to replace it at the Contractor's expense. Any such material not ultimately incorporated into the Project may, at the option of the City, be retained by the City or returned to the Contractor for credit to the City of a proportionate amount. Completed line items concealed, underground and buried and not subject to final Punch List may be paid for at the rate of one hundred percent. Such completed line items subject to a final Punch List requiring testing or start-up shall be paid at the rate of ninety-eight percent.

114.06 Retainage. The City will not deposit retainage in any escrow account and will not pay interest on retainage. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract. Payment of retainage to the Contractor shall not be due until thirty Days after approval of a final Contractor Payment Request by the City and execution of the Certificate of Contract Completion by the City. Any reduction or release of retainage, or portion thereof, shall not be a waiver of the City's right to retainage in connection with other payments to the Contractor, or any other right or remedy the City has under the Contract Documents, at law or in equity.

114.07 Retainage Reduction with Consent of Surety. Upon consent by the Contractor's Surety, the City may reduce the amount of funds retained for the faithful performance of Work by fifty percent of the amount of funds required to be retained, provided the Contractor's Surety remains responsible for all damages that may be caused due to default by the Contractor, including without limitation, the following:

- (a) Completion of the Work;
- (b) All interference, disruption, hindrance, delay and impact claims;
- (c) All Liquidated Damages; and
- (d) All additional expenses incurred by the City.

114.08 Payments Withheld. The Engineer shall have the authority to recommend to the City that payments be withheld from, or Liquidated Damages be assessed against and withheld from, a Payment Request, stating the reasons for such recommendation. The City reserves the right to decline to approve any Contractor Payment Request or part thereof, or because of subsequent evidence or inspection, may nullify any previous Payment Request, in whole or in part, to such extent as may be necessary in the Authorized Representative's opinion to protect the City from loss because of:

- (a) Defective Work not remedied;
- (b) Damage caused by the Contractor;
- (c) Failure to comply with the requirements of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act as applicable; and/or
- (d) Liquidated Damages.
- (e) Other damages the City has incurred or is expected to incur due to Contractor's fault.

If a basis for withholding payment is removed, payment shall be made for the amount withheld because of the basis.

114.09 Payments Detained. Whenever the City receives a Claim Affidavit, the Authorized Representative shall detain the stated amount from the Contractor's subsequent Payment Requests unless the Contractor provides a release and waiver of lien with a Payment

Request. The release and waiver of lien shall be executed by the Person supplying labor, Materials or services on a Project, which has or may have a right of claim against the Contractor's proceeds. If the City detains an amount as set forth above, such action shall not be construed as conferring any right on such Subcontractor or Material Supplier, nor as enlarging or altering the application or effect of the existing lien law.

114.10 Measurement of Quantities. For all Contracts, except lump sum Contracts, after an item of the Work is completed and before final payment is made by the City, the Engineer will determine the quantities of various items of Work performed as the basis for final payment. The Contractor, in case of Unit Price items, will be paid as provided in 103.19. After issuance of a Certificate of Contract Completion in accordance with 115.05, the Engineer shall prepare a final estimate for payment based on the actual quantities of completed Work and deducting there from all previous payments made to the Contractor. Any prior estimate is subject to correction in the final estimate.

114.11 Final Payment Request. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and to final payment, shall provide all documents required pursuant to 115.06 for approval by the Engineer with the Contractor's final Payment Request.

114.12 Final Payment Date. Payment of the final Payment Request shall be made within thirty Days from the date of approval by the Engineer unless the City has reason to withhold amounts pursuant to the terms of this Agreement. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

114.13 Waiver of City's Claims. The making of final payment by the City shall constitute a waiver of claims by the City except those relating to unresolved claims of the Contractor or the City and those arising after Contract Completion including, without limitation, the following:

- (a) Defective or nonconforming Work;
- (b) Error by Contractor;
- (c) Outstanding liens, claims, security interests, or other encumbrances arising out of the Contract Documents and unsettled;
- (d) Failure of the Contractor to comply with any warranties or Guarantees required by the Contract Documents;
- (e) audits performed by the City after final payment;
- (f) any claims, damages, losses, or expenses for indemnification under Item 113;
- (g) Inadvertent overpayment by the City.

114.14 Waiver of Contractor's Claims. The acceptance of final payment by the Contractor shall constitute a waiver of all claims against the City except those that the Contractor has previously made in writing in accordance with 118.01 through 118.11 and which remain unresolved at the time of final payment. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62 ORC, to the fullest extent permitted.

ITEM 115 FINAL INSPECTION AND ACCEPTANCE

- 115.01 Contractor's Request**
- 115.02 Engineer's Punch List**
- 115.03 Completion and Correction of Punch List Items.**
- 115.04 Deferred Items**
- 115.05 Certificate of Contract Completion**
- 115.06 Project Record Document Submittals**
- 115.07 Record Drawings**
- 115.08 Guarantee**
- 115.09 Warranty**
- 115.10 Exercise of Guarantee or Warranty**
- 115.11 Final Cleaning**
- 115.12 Final Cleaning Remedies**
- 115.13 Work After Final Cleaning**

115.01 Contractor's Request. When the Work or a designated portion thereof, is nearly complete, the Contractor shall submit a request for a Final Inspection of the Work ("the "Final Inspection") to the Engineer in writing.

115.02 Engineer's Punch List. The Engineer shall, within seven Days of receipt of the request for Final Inspection, notify the Contractor of acceptance or rejection of the request for Final Inspection, stating reasons for any rejection. Upon acceptance of the Contractor's request, the Engineer shall conduct the Final Inspection to determine whether the Work or the designated portion thereof, is in conformity with the Contract Documents. The Engineer shall notify the Contractor and the Authorized Representative of the scheduled time of the Final Inspection. Within three Days of the Final Inspection, the Engineer shall notify the Contractor of any items of Work remaining in a Defective, incomplete or unacceptable condition. The list of such items shall be known as the Engineer's Punch List.

115.03 Completion and Correction of Punch List Items. Within fourteen Days of receipt of the notice required by 115.02, the Contractor shall complete and correct all items on the Engineer's Punch List. If the Contractor does not complete the items on the Engineer's Punch List within fourteen Days of receipt of the notice, the provisions of 105.02 may be invoked. If the Work on the Engineer's Punch List cannot be completed within fourteen Days of receipt of the notice, the Contractor shall justify to the reasonable satisfaction of the Engineer the reasons the items cannot be so completed, and the Contractor shall propose, for approval of the Engineer, a time when such items will be completed. If the Contractor fails to timely correct the items on the Punch List, the City, in its discretion, may perform the Work by itself or others and the cost thereof shall be charged against the Contractor. If the balance of the Contract price is insufficient, the Contractor and/or its surety will pay the Owner the balance on demand. The Contractor's warranties and obligations under the Contract Documents shall remain in full force and effect and cover any remedial work even if performed by others. Failure of the Engineer to include any items on the Engineer's Punch List shall not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents. If multiple inspections of items on the Engineer's Punch List are required due to the Contractor's failure to properly and timely complete

them, the Contractor shall be responsible for any additional costs incurred by the Contractor, other Persons, the Engineer and the City resulting from any attendant delay.

115.04 Deferred Items. With the approval of the Engineer, when upon Final Inspection, items of Work cannot be completed because of seasonal conditions, such as bituminous paving or landscaping, or if the Authorized Representative agrees that a particular item need not be completed until a subsequent date, the Authorized Representative may release payment to the Contractor less twice the cost of completing the remaining Work as determined in the sole discretion of the Authorized Representative.

115.05 Certificate of Contract Completion. When all items on the Engineer's Punch List have been corrected to the satisfaction of the Engineer and the provisions of 115.06 through 115.14 have been fulfilled, the Engineer shall process a Certificate of Contract Completion for execution by the Authorized Representative. The City reserves the right of Final Acceptance of the Project.

115.06 Project Record Document Submittals. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion, release of retainage and final payment, shall provide all Project record documents to the Engineer for approval, which may include, without limitation:

- (a) Certificate of occupancy, if required;
- (b) Any inspection certificates required such as pressure piping, elevator, boiler, electrical, plumbing or piping purification;
- (c) Letter of Approval for fire suppression system, if required;
- (d) Any operating and maintenance manuals, which shall be organized into suitable sets of manageable size. Indexed data shall be bound in individual binders, with pocket folders for folded sheet information and appropriate identification shall be marked on the front and the spine of each binder;
- (e) Neatly and accurately marked sets of As-built Drawings and other Contract Documents reflecting the actual construction of the Project;
- (f) Reproducible detailed Drawings reflecting the exact location of any concealed utilities, mechanical or electrical systems and components;
- (g) Assignment to the City of all warranties and guaranties, including the most recent address and telephone number of any Subcontractors, Material Suppliers, or manufacturers;
- (h) An affidavit from the Contractor to certify that all Subcontractors and Material Suppliers have been paid in full for all Work performed or Materials furnished for the Project and an affidavit from each Subcontractor and Material Supplier that the Subcontractor or Material Supplier has been paid in full for all Work performed or Materials furnished for the Project;
- (i) Final certified payroll reports;

(j) Affidavit to certify that the Contractor and an affidavit from each Subcontractor to certify that the Subcontractor has complied with all requirements of Sections 4115.03 to 4115.22, ORC, or the Davis-Bacon Act, as applicable.

115.07 Record Drawings. Unless otherwise provided in the supplemental Specifications or Special Provisions, upon completion of the Work on Projects administered by the Water Engineering Manager of the City's Department of Water or administered by the Chief Engineer of the Department of Aviation, the Contractor shall organize the As-built Drawings into manageable sets, bind the sets with durable paper cover sheets, certify to the accuracy of the As-built Drawings by signature thereon, and deliver the As-built Drawings to the Engineer. The Engineer shall revise the original Contract drawing tracings or computer files with the information contained on the As-built Drawings provided by the Contractor and create the Record Drawings. The City may thereafter use the As-built Drawings for any purpose relating to the Project including, without limitation, additions to or completion of the Project.

115.08 Guarantee. The Contractor shall provide a Guarantee to the City that all Work is in conformity with the Contract Documents and free from defects in workmanship, Materials and Equipment for full period permitted under Ohio law. The Contract Bond shall remain in effect for the full Guaranty period, unless the Contractor shall provide a Maintenance Bond in form and substance and from a Surety satisfactory to the City. The Guarantee time period shall commence on the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee time period for any incomplete or uncorrected Work at the time of Partial Occupancy or Use, if any, shall commence with the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee provided in this 115.08 shall be in addition to, and not in limitation of, any other Guarantee, Warranty or remedy provided by law or by the Contract Documents.

115.09 Warranty. The Contractor shall, prior to installing material or Equipment which is subject to a Warranty, provide a copy of the Warranty to the Engineer for review and approval.

115.10 Exercise of Guarantee or Warranty. If defects in workmanship, material or Equipment become apparent within the applicable Guarantee or Warranty period, the Authorized Representative shall notify the Contractor in writing and provide a copy of the notice to the Engineer. Within ten Days of receipt of the notice, the Contractor shall visit the Project in the company of a representative of the City to determine the extent of all defects and shall promptly repair or replace the defects, including all adjacent property damaged as a result of such defects or as a result of remedying the defects. If the repair or replacement is considered by the Authorized Representative to be an emergency, the Authorized Representative may require the Contractor to visit the Project within one Day of receipt of the notice. The Contractor shall be fully responsible for the cost of and all expenses associated with temporary Materials or Equipment required during the repair or replacement of the defects, including without limitation labor, permits and other incidentals. If the Contractor does not promptly repair or replace the defects, the City may repair or replace the defects and charge the cost thereof plus any Consultant and attorney fees incurred by the City in enforcing its Guaranty or warranty rights to the Contractor or the Contractor's Surety. Work which is repaired or replaced by the Contractor shall be inspected and

accepted by a representative of the City and shall be Guaranteed by the Contractor for the remainder of the original Guarantee time period.

115.11 Final Cleaning. At the completion of the Work, the Contractor shall restore all property not designated for alteration by the Contract Documents to as near its original condition as practicable and clean the site of the Project and adjacent property of all dust, mud, waste Materials, and rubbish attributable to the Work and shall remove any temporary controls required pursuant to the storm water pollution prevention plan and permit.

115.12 Final Cleaning Remedies. Final cleaning shall be done to the satisfaction of the Engineer and the Authorized Representative. If the Contractor fails to clean up at completion of the Work, the provision of 105.02 may be invoked. If a dispute arises as to responsibility for final cleaning, the Engineer may employ City employees or engage a qualified cleaning company, to perform the clean up and deduct the cost from amounts due to the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative on the responsibility for such cost shall be final, subject to 118.01 through 118.11.

115.13 Work After Final Cleaning. If any Work is performed after a final cleaning by the Contractor, the Contractor shall clean any affected area again as provided in 115.11 and 115.12 so that upon Contract Completion, the Project shall be left ready for occupancy or utilization by the City.

ITEM 116 TIME

116.01 Time of Essence

116.02 Time Extensions

116.03 Critical Path

116.04 Extension Sole Remedy

116.05 Time for Contract Completion

116.06 Liquidated Damages

116.01 Time of Essence. Time is of the essence to the Contract Documents and all obligations thereunder. By executing the Contract Form, the Contractor acknowledges that the time for Contract Completion is, and by signing the Construction Schedule and Project Schedule, if applicable, that any specified milestone completion dates are, reasonable taking into consideration the usual weather and other conditions prevailing in the locality of the Project. The Contractor agrees that the Notice to Proceed shall establish the date for commencement of the Work. The Contractor agrees that the City has entered into, or may enter into, agreements or representations for use of all or part of the Project based upon the Contractor achieving Final Acceptance within the time for Contract Completion. The Contractor agrees that the Work will be prosecuted in a reasonable, efficient and economical sequence, in cooperation with the Engineer and in the order and time as provided in the current Construction Schedule and Project Schedule, if applicable. The Contractor shall perform the Work so as not to interfere with, disrupt, hinder, delay or impact the Work of other Persons on the Project and of such other Persons' Subcontractors and Material Suppliers. The Contractor agrees that the possibility that the Contractor may be subject to interference, disruption, hindrance, delay or impact in the progress of the Work from any and all causes is within the contemplation of the Contractor and the City and that the sole remedy for such interference, disruption, hindrance, delay or impact shall be an extension of time granted pursuant to 116.02, except where the Contractor establishes such interference, disruption, hindrance, delay, or impact was proximately caused by an improper action or failure to act by the Owner, in which case the Contractor may be entitled to additional compensation.

116.02 Time Extensions. If the Contractor is interfered with, disrupted, hindered, delayed or impacted at any time in the progress of the Work by any of the following causes, the time for Contract Completion shall be extended for such reasonable time which the Authorized Representative determines, in consultation with the Engineer, has been caused by the interference, disruption, hindrance, delay, or impact in the Work:

- (a) Due to suspension of the Work for which the Contractor is not responsible; unusually severe weather conditions not normally prevailing in the particular season; labor dispute, excluding informational pickets; fire; or flood; or
- (b) Due to any unforeseeable cause beyond the control and without fault or negligence of the Contractor;
- (c) The Contractor shall request any extension of time pursuant to 117.01 through 117.11.

116.03 Critical Path. Notwithstanding any other provision of the Contract Documents, time extensions will depend upon the extent to which the Work on the critical path of the Construction Schedule is affected, or if the Project involves multiple Contractors the extent to which Work on the critical path of the Project Schedule is affected. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements so interfered with, disrupted, hindered or delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages.

116.04 Extension Sole Remedy. Any extension of time granted pursuant to 116.02 shall be the sole remedy which may be provided by the City, unless Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. . It is within the contemplation of the Contractor and the City that the Contractor may accelerate its performance to meet the Construction Schedule and that such acceleration is solely within the discretion of the Contractor.

116.05 Time for Contract Completion. The Contractor shall diligently prosecute the Work and shall complete all Work so that Final Acceptance occurs on or before the number of consecutive Days set forth in the Contract Documents following the date set forth in the Notice to Proceed, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents. The period of time established by the preceding sentence is referred to herein as the time for Contract Completion. Each applicable portion of the Work shall be completed upon the respective milestone completion date unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

116.06 Liquidated Damages. Upon failure to complete all Work within the time for Contract Completion, the City shall be entitled to retain or recover from the Contractor, as Liquidated Damages, and not as a penalty, the applicable amount set forth in the following table for each and every Day thereafter until Contract Completion, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

LIQUIDATED DAMAGES	Contract
Contract Amount	Completion
\$0 to \$50,000	\$150
more than \$50,000 to \$150,000	\$250
more than \$150,000 to \$500,000	\$500
more than \$500,000 to \$2,000,000	\$1,000
more than \$2,000,000 to \$5,000,000	\$2,000
more than \$5,000,000 to \$10,000,000	\$2,500
more than \$10,000,000	\$3,000

The amount of Liquidated Damages is agreed upon by and between the Contractor and the City because of the impracticability and extreme difficulty of ascertaining the actual amount of damage the City, its taxpayers and the public would sustain. Liquidated Damages only replace the City's actual damages for delays, are not the City's exclusive remedy for breach by the Contractor and are not to be construed in any way as a limitation of any other rights or remedies available to the City under the Contract Documents or otherwise. If a delay of the critical path in

completion of the Project occurs which is caused by the City and the Contractor concurrently, the applicable Liquidated Damages shall be apportioned, and the specific number of Days for which the City is solely responsible for shall be deducted from the total number of Days of the concurrent delay used in calculating the Liquidated Damages and the Contractor shall pay Liquidated Damages for the remaining number of Days of delay. In addition to the amounts specified above, the City may charge the Contractor for all inspection regardless of any time extension.

ITEM 117 - CHANGES IN THE WORK

- 117.01 Change Order**
- 117.02 Payment of Change Order**
- 117.03 Requirement to Perform Changed Work**
- 117.04 Change Order Price Determination**
- 117.05 Change Order Procedures**
- 117.06 Change Order Process**
- 117.07 Paperwork Consolidation**
- 117.08 Change Order Numbering System**
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117.01 Change Order. The City Commission or the Authorized Representative, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, including without limitation revisions resulting from an extension granted in accordance with 116.04. To the extent the time for Contract Completion or the Contract price is affected, the Contract may be adjusted by Change Order in accordance with 117.01 through 117.12. The Contractor shall proportionately increase the amount of the Contract Bond whenever the Contract price is increased. If notice of any change affecting the Contract is required by the provision of any Contract Bond, the giving of any such notice shall be the Contractor's responsibility, and the amount of each applicable Contract Bond shall be adjusted accordingly.

117.02 Payment of Change Order. The Contractor shall not proceed with any change in the Work without the required written Change Order. If the Contractor believes that any item is not Work required by the Contract Documents or reasonably inferred therefrom to produce the intended results, the Contractor shall obtain a Change Order before proceeding with such item. Except as provided in 118.01 through 118.11, failure to obtain such a Change Order shall constitute a waiver by the Contractor of any claim for additional compensation for such item. The Contractor understands and agrees that agreement to a Change Order is final and without reservation of any rights.

117.03 Requirement to Perform Changed Work. If the Contractor does not agree to, or fails or refuses to sign, a Change Order, the Contractor shall perform any Work related to the Change Order as required by the Authorized Representative in accordance with 117.04; provided, however, the Contractor may seek compensation and time extension in accordance with 117.04 and 117.10 through 117.12, as applicable, and 118.01 through 118.11 for any such Work performed. The City reserves the right to cancel or modify any Change Order authorization.

117.04 Change Order Price Determination. The maximum cost or credit resulting from a change in the Work shall be determined as provided in 117.04 through 117.10. Proposals which do not set forth all information required by 117.05 and 117.10 will not be considered or accepted under any circumstances. A Unit Price Proposal shall only be valid when incorporated into the Contract by Change Order; provided, however, that Unit Price Work set forth on the Bid, included

in the Contract price and which does not exceed the scheduled quantities on the Bid may be performed and paid for without a Change Order. The amounts allowed for overhead and profit are all-inclusive, include all Contractor Project costs relating to field and home office operations, and no additional or other amounts for overhead or profit shall be allowed. The maximum cost or credit as determined by 117.10 includes all compensation for direct, indirect, and cumulative impact costs and no additional or other amounts for impact costs shall be allowed. The Contractor shall not assign any portion of the Work to another whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead or profit. If no agreement can be reached between the Contractor and the City as to the cost or credit resulting from a change in the Work or the Contractor fails or refuses to sign a Change Order, the cost or credit shall be determined by the Authorized Representative, upon the recommendation of the Engineer. The Contractor shall proceed with the Change Order Work when so required by the Authorized Representative in writing. The Contractor may dispute the Authorized Representative's determination of the cost or credit by filing a claim in accordance with 118.01 through 118.11. The City reserves the right to require certified payrolls for labor costs and certified invoices for material costs, together with any other documentation the City deems in its sole discretion to be useful in analyzing the Contractor's claim and reserves the right to audit the records of the Contractor and the Contractor's Subcontractors and Material Suppliers. Failure by the Contractor to provide all requested documentation within 10 days shall constitute an irrevocable waive of Contractor's claim.

117.05 Change Order Procedures. The Contractor must be certain to comply with the applicable procedures or payment may be delayed or denied. The Engineer has responsibility for:

- (a) Preparing, reviewing, recommending, coordinating, monitoring and processing a Change Order and related documents;
- (b) Reviewing the Contractor's pricing within the stated time period, verifying the pricing complies with the pricing guidelines set forth in 117.10 and negotiating pricing, if necessary, to an amount acceptable to the City;
- (c) If the change is to have a not-to-exceed price based on performing the Work on a time and material basis or other cost-plus basis, monitoring the Contractor's progress toward completing the revised portion of the Work and requiring that the Contractor prepare daily records of additional labor, Materials and Equipment required along with a certification from the Contractor that the records are accurate and appropriate for the revised Work. The Engineer shall review these daily records and sign them, but solely for the purposes of signifying that the records are an accurate accounting of the items described therein, and provide a signed copy of the daily records to the Authorized Representative. The signed daily records are also to be attached to the Change Order. If the changed Work should cost less than the maximum amount noted on the Change Order, the Engineer is also responsible for preparing a deduct Change Order for the cost difference;
- (d) Reviewing and resolving the Contractor's request for an extension of time related to a Change Order in accordance with 116.01 through 116.06 and 117.12;
- (e) Confirming that the City concurs with the change and has available funds or a written commitment for funding the Change Order;

(f) Monitoring the overall Change Order process for timeliness and follow up.

The Contractor has responsibility for:

(a) Responding to requests for pricing within the stated time period;

(b) Preparing all necessary Proposals in sufficient detail for intelligent review with pricing and schedule impact, including those of all affected Subcontractors and Material Suppliers according to the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiating pricing, if necessary;

(c) If the change is proposed to have a not-to-exceed price based on performing the Work on a time and material basis or other cost plus basis, furnishing and certifying detailed records of all labor, Materials and Equipment provided. If the changed Work should cost less than the maximum amount noted on the Change Order, the Contractor is also responsible for executing a deduct Change Order prepared for the cost difference;

(d) Proceeding with the Work upon receipt of a fully signed Change Order;

(e) If the Contractor performs Work without the appropriate, required Change Order, the Contractor does so at the Contractor's own risk that payment for such Work may not be approved or made, unless the City has required the Contractor to perform the Work in accordance with 117.03 and 117.04;

(f) Providing the changed Work in a timely manner and as authorized by the Change Order, all in accordance with the requirements of the Contract Documents; and

(g) Timely providing to Engineer and the Authorized Representative all requested backup documentation.

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

(a) Prepare an estimate of the cost of the changed Work and verify with the Authorized Representative that the change is ordered and that funds are available in the amount of the estimate for the Work;

(b) Prepare a detailed scope of Work in Bulletin form, including any necessary Drawings;

(c) Submit the Bulletin to the Authorized Representative for approval, along with a justification letter indicating the reason for the change in the Work;

(d) Upon receipt of approval by the Authorized Representative, release the Bulletin to the Contractor with a date specified for the Contractor to return a Proposal. If the Contractor fails to respond to the Engineer within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer, the Contractor shall be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(e) Review the Contractor's Proposal, verifying that pricing complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiate the price if required to obtain a price less than the maximum established by the pricing guidelines or different from the amount calculated using Unit Prices where appropriate. Within seven Days of receipt of the Contractor's Proposal, the Engineer shall notify the Contractor whether the Proposal is acceptable in form or advise the Contractor in writing of the reasons for disapproval. If negotiation of the price is necessary, any failure of the Contractor to respond appropriately and within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer shall cause the Contractor to be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(f) Determine the basis for pricing the Work and confirm whether the Work is for a fixed price, or for a not-to-exceed price based on performing the Work on a time and material basis, or other cost-plus basis. Verify that any Subcontractor and Material Supplier pricing is included and complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable. Review any requested time extension with the Authorized Representative to be determined according to 116.01 through 116.06 and 117.12 and obtain written recommendation of approval of the Change Order from the Engineer and the applicable Director if other than the Engineer. Sign and obtain the Contractor's signature on the Change Order;

(g) Submit the Proposal to the Authorized Representative or the City Commission, as applicable, for approval along with the written recommendation of approval or disapproval of the Proposal of the City Engineer and other City Department head, if applicable;

(h) Deliver multiple copies of the signed Change Order package to the Authorized Representative for signing and any necessary fund certification. Upon signing by the Authorized Representative, the Authorized Representative shall return copies of the executed Change Order to the Contractor and the Engineer. The Contractor may bill for Work covered by the Change Order only after this final step.

117.07 Paperwork Consolidation. Related transactions occurring at or about the same time shall, whenever possible, be consolidated into the same Bulletin or Change Order, or both. Add and deduct items may be included on the same Change Order, as well as items with different reasons for changed Work so long as the reason and pricing for each item is separately stated.

117.08 Change Order Numbering System. Unless otherwise provided in the Contract Documents, the Engineer shall assign a number to each change which shall be stated on the Bulletin, starting with number 001. All Contractors affected by the change will be recorded under the same number. The Engineer will establish and maintain a Change Order log to track all activities related to Change Order processing and taking care not to duplicate or reuse any Change Order number throughout the Project.

117.09 Project Contingency Funds. Project Contingency Funds shall be reserved to pay costs resulting from Change Orders, unanticipated job conditions, to comply with rulings regarding building and other codes, to pay costs related to errors and omissions in Contract Documents, and to pay the cost of settlements and judgments related to the Project. Change

Orders for which there are sufficient moneys in the Contract price including the Project Contingency Funds must be approved by the Engineer and the Authorized Representative. Change Orders which would increase the Contract price must be approved by the City Commission.

117.10 Change Order Pricing Guidelines. For each change, the Contractor shall furnish a detailed, written Proposal itemized according to these pricing guidelines. Any Subcontractor or Material Supplier pricing shall also be itemized according to these pricing guidelines. Where Unit Prices were included in the Bid and the Contract price, the Engineer may also require incorporation of such Unit Prices or preparation of an Alternate Proposal incorporating such Unit Prices. These pricing guidelines are intended to establish the maximum amount which the City will pay for any Change Order, including without limitation all amounts for interference with, delay, hindrance, disruption or impact of the Work. A Change Order may provide that the City may pay less than the amount established by these pricing guidelines if such amount is negotiated by the Engineer in accordance with 117.06 or is determined in accordance with 118.01 through 118.11. As provided in 114.01 the Contract Cost Breakdown may be used by the City to determine any cost or credit. In order to expedite the review and approval process, all Proposals shall be prepared in the categories and in the order listed below. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62, ORC to the fullest extent permitted. The pricing guidelines are:

- (a) **LABOR** - All field labor shall be priced at the current base rate, excluding fringe benefits, of the prevailing wage in the Project locality. The Proposal and documentation is to include number of hours and rate of pay for each classification of worker. If the Contractor pays an employee a base rate exceeding prevailing wage, the Contractor shall submit certified payroll records that substantiate that rate. Any Contractor performing Work on a time and material basis or the cost-plus basis Work shall submit certified payroll records for all employees performing that Work;
- (b) **FRINGES** - All established payroll taxes, assessments and fringe benefits on the labor. This may include, without limitation, FICA, Federal and State Unemployment, Health and Welfare, pension Funds, Workers' Compensation and Apprentice Fund. Each of the fringes is to be a separate line item. The Contractor shall submit documentation supporting the calculation of the amounts for each fringe for each worker classification;
- (c) **EQUIPMENT RENTALS** - All charges for certain non-owned heavy or specialized Equipment at up to one hundred percent of the documented rental cost. No rental charges will be allowed for hand tools, minor Equipment, simple scaffolds, etc. Downtime due to repairs, maintenance and weather delays will not be allowed. The Contractor shall submit copies of actual paid invoices to substantiate rental costs;
- (d) **OWNED EQUIPMENT** - All charges for certain owned, heavy or specialized Equipment at up to one hundred percent of the cost listed by the Associated Equipment Dealers Green book rental rates and Specifications for construction Equipment. No recovery will be allowed for hand tools, minor Equipment, simple scaffolds, etc. The longest period of time that the Equipment is to be required for the Work will be the basis for the pricing. Downtime due to repairs, maintenance and weather delays will not be allowed;

(e) TRUCKING - A reasonable delivery charge or per-mile trucking charge for delivery of required Materials or Equipment. Charges for use of a pick-up truck will not be allowed;

(f) OVERHEAD - Overhead on items in 117.10 (a)-(d) up to ten percent, which shall include all costs required to schedule and coordinate the Work. Overhead includes, without limitation, telephone, telephone charges, facsimile, electronic mail, telegrams, postage, photos, photocopying, hand tools, simple scaffolds (1 level high), tool breakage, tool repairs, tool replacement, tool blades, tool bits, home office estimating and expediting, home office clerical and accounting support, home office labor (management, supervision, engineering), all other home office expense, legal services, travel and parking expenses; provided, however, shop or engineering labor, which shall not be subject to prevailing wage rates, for steel Fabricators, sheet metal Fabricators and sprinkler system Fabricators will be allowed under 117.10 (a)-(d);

(g) MATERIALS - All Materials purchased by the Contractor and incorporated into the changed Work, showing costs, quantities, or Unit Prices of all items, as appropriate. Reimbursement of material costs shall only be allowed in the amount of the Contractor's actual cost, including any and all discounts, rebates or related credits. One-third of the cost of reusable Materials for each use, such as formwork lumber, shoring or temporary enclosures;

(h) PROFIT - Profit on items in 117.10 (a)-(g) up to ten percent;

(i) SUBCONTRACTOR - The reasonable cost of all labor and material provided by a Subcontractor whose pricing is included and which complies with these pricing guidelines;

(j) CONTRACTOR MARK-UP ON SUBCONTRACTOR - Mark-up on items in 117.10 (i) up to five percent or 2,500 dollars, whichever is less;

(k) MISCELLANEOUS - The following items are allowable as the cost of the Work, with no overhead or profit:

.1 Any additional bond or insurance premium specifically incurred as a result of the Change Order;

.2 Fees for permits, licenses, inspections, test, etc.; and

(l) Costs which will not be reimbursed for Change Order Work include the following:

.1 Overnight lodging, travel and food;

.2 Employee Profit Sharing Plans - regardless of how defined or described, the Contractor will pay these charges from Contractor profit and will not be reimbursed; and

.3 Voluntary Employee Deductions - examples are United Way and U.S. Savings Bonds.

(m) State sales tax shall be allowed on items as described in 104.18.

117.11 Differing Site Conditions. Subject to 103.06, during the progress of the Work, if subsurface or concealed conditions are encountered at the site differing materially from those indicated in the Contract Documents or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall promptly notify the Engineer in writing of the specific differing conditions before they are disturbed or the affected Work is performed and if such notice is not possible, in no event later than 2 Business Days after Contractor first observed the conditions. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with the 117.01 through 117.12, as applicable. The City may decline to issue a Change Order if the notice required by this 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by this 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extensions for the related subsurface or concealed physical condition.

117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the critical path of the Construction Schedule or if the Project involves multiple Contractors of the Project Schedule as determined pursuant to 109.06 and 109.05, respectively. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law. The Contractor shall not be entitled to any time extensions for delays caused by Contractor, its subcontractors, suppliers, normal weather conditions for the time of year and locality, or abnormal weather conditions that do not affect the critical path.

ITEM 118 DISPUTE RESOLUTION PROCEDURE

118.01 Notice and Claim Requirements

118.02 Filing of Notice

118.03 Filing of Claim

118.04 Claim Response

118.05 Claim Review and Decision

118.06 Appeal to Board of Review

118.07 Alternate Dispute Resolution

118.08 Delegation

118.09 Auditing of Claims

118.10 False Certification of Claims

118.11 Performance and Payment

118.01 Notice and Claim Requirements. Whenever the Contractor intends to seek additional time or compensation or mitigation of Liquidated Damages, whether due to delay, extra Work, additional time or Work, breach of Contract, or other causes arising out of or related to the Contract or the Project, the Contractor shall follow the procedures set forth in 118.01 through 118.11. The Contractor acknowledges and agrees that the Owner may delay, interfere with, and/or disrupt the Work of the Contractor, and such actions do not constitute a material breach of contract by the Owner, since the Contractor is entitled to additional compensation by properly submitting and pursuing a Claim as permitted by these Specifications. To the fullest extent permitted by law, failure by the Contractor to follow the procedures in 118.01 through 118.11 is a waiver of any claim for additional time or compensation or for mitigation of Liquidated Damages. Compliance with all applicable procedures in 118.01 through 118.11 is a condition precedent to the filing by the Contractor of any litigation related to the Contract or the Project.

118.02 Filing of Notice. Unless a shorter notice period is provided elsewhere in this Agreement, the Contractor shall file notice of any claim with the Engineer, in writing, no more than ten Days after the initial occurrence of the events, which are the basis of the claim. To the fullest extent permitted by law, failure of the Contractor to timely and completely provide such notice shall constitute a waiver by the Contractor of any claim for additional time or compensation or for mitigation of Liquidated Damages. Every such written notice shall provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and opportunity for mitigation:

- (a) Nature of claim and estimated amount of the claim, including all costs for interference, disruption, hindrance, delay and any impact, which amount shall be calculated in accordance with the pricing guidelines set forth in 117.10, shall be based upon the Contractor's experience and shall be a fair and reasonably accurate assessment of the damages suffered or anticipated by the Contractor, as applicable;
- (b) Specific number of Days of extension requested and specific number of Days for remobilization requested;
- (c) Identification of Persons and events responsible for causing the claim, including without limitation the date or anticipated date, as applicable of the commencement of any interference, disruption, hindrance, delay or impact;

- (d) Identification of activities on the Construction Schedule and the Project Schedule, if applicable, which will or may be affected by the claim or new activities which will or may be created and the relationship with existing activities;
- (e) Anticipated impacts and anticipated duration of any interference, disruption, hindrance, delay or impact and any remobilization period; and
- (f) Recommended action to avoid or minimize any interference, disruption, hindrance, delay or impact.

118.03 Filing of Claim. With respect to every claim submitted, the Contractor shall file three copies of its claim with the Engineer not more than thirty Days after the notice required by 118.02 and, in all events prior to Contract Completion. The Contractor's claim shall detail the amounts claimed and provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and any remaining opportunity for mitigation. If the Contractor is unable to calculate any amount claimed in detail, the Contractor shall use its best efforts to provide a reasonable estimate of such amount:

- (a) A narrative of the event, or combination of events, claimed as resulting in interference, disruption, hindrance, delay or impact to the Contractor, including the start date of the event or events and the actual, or anticipated, finish date;
- (b) A quantification of the planned Work items and the changed scope of Work items claimed as having been impacted;
- (c) A time impact analysis, consistent with standard critical path methodology for scheduling, demonstrating the impact to the Contractor's scheduled activities;
- (d) Copies of the Contractor's daily log for each Day of impact;
- (e) Copies of relevant correspondence and other information regarding or supporting Contractor entitlement;
- (f) Copies of Contractor payroll records for labor impacts claimed by Contractor and any Subcontractor affected by the event or events;
- (g) Copies of invoices for material impacts claimed by the Contractor and any Subcontractor affected by the event or events;
- (h) Copies of Equipment records, or rental invoices, for any Equipment impacts claimed by the Contractor or any Subcontractor affected by the event or events;
- (i) Copies of the most recent Contractor's income statement, including segregated general and administrative expenses for the most recent reporting period, and for the period of the Contract, if available, and similar information for any Subcontractor claim included;
- (j) A copy of Contractor's original coded bid takeoff and estimating records that formed the basis of Contractor's bid;

(k) Contractor's coded Job Cost Report with a key to the coding;

(l) A statement, signed by an authorized representative of the Contractor, certifying that the claims are made in good faith, the supporting data is accurate and complete to the best of the Contractor's knowledge and belief and the amount requested accurately reflects the Contract adjustment for which the Contractor believes the City is liable in accordance with the Contract Documents, in particular the pricing guidelines set forth 117.10.

The City may request documents and information from the Contractor in addition to those listed in this 118.03, as the City determines necessary to evaluate and comment upon the Claim. Upon receipt of such request from the Owner, the Contractor shall provide all requested documents and information within ten (10) days. The Contractor shall provide the requested documents in the formats requested, which include both paper and electronic copies. If requested by the City, the electronic copies shall be provided in native computer language. The Contractor's provision of the requested documents to the City in the format requested by the City shall be a condition precedent to any further proceeding under the Contract Documents. Failure to provide the requested documents shall be a material breach of the Contract, and the Contractor shall indemnify the City for all of the City's costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the Contractor's failure to comply with this provision. If the Contractor fails to provide the requested documents, the Contractor shall be deemed to have irrevocably waived its claim.

118.04 Claim Response. Immediately upon receipt of any claim submitted by the Contractor in accordance with 118.03, the Engineer shall deliver 2 copies to the Authorized Representative. Upon submission of the claim by the Contractor, the Engineer shall convene a meeting with the Contractor and any applicable Subcontractors and Material Suppliers to review and discuss the claim. The Engineer shall review the Contractor's claims with all attendees and discuss any questions regarding the nature or content of the required items. Any items deemed deficient shall be corrected by the Contractor before the Engineer will commence review in accordance with 118.05. The Engineer shall document the timeliness of notice provided under paragraph 118.02 and the actual date of corrected submission of the claim.

118.05 Claim Review and Decision. Upon corrected submission of the claim and all requested documentation by the Contractor, the Engineer shall review the claim and prepare a written analysis of its content. The analysis may include a narrative of the examination of the facts giving rise to the claim, relevant Contract Documents and language therein, an analysis of claimed additional labor, Materials and Equipment for the scope of the Work items described and an analysis of any time extension for any interference, disruption, hindrance, impact or delay claimed (including the calculation of any concurrent delays affecting entitlement) and shall include confirmation of the calculation of claimed labor, Materials and Equipment as conforming to the pricing guidelines set forth in 117.10 and a concluding recommendation regarding Contractor entitlement to, and the appropriateness and reasonableness of, all or any part of, the claimed costs and time extension. The Engineer may include copies of contemporaneous documentation supporting any recommendation regarding the sufficiency or inadequacy of the Contractor's claim, the Contractor's performance or the rebuttal of the claim. The Engineer shall prepare and submit the claim analysis to the Authorized Representative within thirty Days of the corrected

submission of the claim. The Authorized Representative shall examine the Contractor's claim, and the analysis of the claim submitted by the Engineer. The Authorized Representative shall approve or deny all or any part of, the Contractor's claim and forward a written decision to the Contractor and the Engineer within thirty Days after receipt of the Engineer's claim analysis. The decision of the Authorized Representative shall be final and conclusive, unless the Contractor appeals the decision to the Board of Review in accordance with 118.06. In the event either the Engineer or the Authorized Representative fail to act in accordance with the foregoing schedule, the claim shall be deemed denied.

118.06 Appeal to Board of Review. The Contractor may appeal the decision of the Authorized Representative to the Board of Review by written notice to the Authorized Representative within ten Days of receipt of the Authorized Representative's decision or, in the absence of a decision, within 10 days of the expiration of the time set forth in 118.05. Failure by the Contractor to provide notice of an appeal within the said 10-day period shall result in the Engineer's decision becoming final and binding upon the Contractor. The Board of Review shall meet within thirty Days of receipt of the notice by the Authorized Representative. The Contractor shall be given an opportunity to present the claim at the meeting. The purpose of the meeting shall be to settle the issues in dispute. The Board of Review shall render a decision on the claim within thirty Days of the meeting unless a mutual agreement is made between the Contractor and the Board of Review to extend the time for decision. The decision of the Board of Review shall be final and conclusive, unless the Contractor provides written notice to the Authorized Representative of the Contractor's intention to file litigation within ten Days of receipt of the decision. The filing of an appeal and the provision of notice of intention to file litigation are each a condition precedent to the filing of any litigation related to the Project or the Contract by the Contractor and any failure by the Contractor to timely fulfill them will preclude the Contractor from filing any such litigation.

118.07 Alternate Dispute Resolution. If, upon consideration of a claim, the Contractor and the City mutually agree in writing, the dispute resolution procedure may be waived, or the claim may be referred to a form of Alternative Dispute Resolution, including a procedure to equitably share the costs of the Alternative Dispute Resolution.

118.08 Delegation. No provision shall prevent the Board of Review or the Authorized Representative from delegating the duties or authorities of the Board of Review or the Authorized Representative to any third Person selected at the discretion of the Board of Review or Authorized Representative, as applicable.

118.09 Auditing of Claims. All claims by the Contractor shall be subject to audit at any time following the filing of such claim, whether or not such claim is part of litigation pending in the courts of this State. The audit may be performed by employees of the City or by a consultant engaged by the City. The audit may begin on ten Days' notice to the Contractor, Subcontractor or Material Supplier, as applicable. The Contractor, Subcontractor or Material Supplier shall use its best efforts to cooperate with the audit. Failure of the Contractor, Subcontractor or Material Supplier to maintain and retain sufficient records to allow the City to verify the claim shall constitute a waiver of any portion of such claim that cannot be verified. Without limiting the foregoing, and as a minimum, the Contractor, Subcontractor or Material Supplier shall make available to the City the following documents:

- (a) Daily time sheets and foreperson's daily reports;
- (b) Union agreements, if any and employer agreements;
- (c) Insurance, welfare, fringes and benefits records;
- (d) Payroll register;
- (e) Earnings records;
- (f) Payroll tax returns;
- (g) Material invoices, purchase orders, Subcontractor Contracts and all material and supply acquisition Contracts;
- (h) Material cost distribution worksheets;
- (i) Equipment records (list of Contractor Equipment, rates, etc.);
- (j) Vendor rental agreements, and Subcontractor invoices;
- (k) Subcontractor payment certificates;
- (l) Canceled checks (payroll and vendors);
- (m) Job cost reports;
- (n) Job payroll ledger;
- (o) General ledger, general journal, (if used) and all subsidiary ledgers and journals together with all supporting documentation pertinent to entries made in these ledgers and journals;
- (p) Cash disbursements journal;
- (q) Financial statements for all years reflecting operations on the Project;
- (r) Income tax returns for all years reflecting operations on the Project;
- (s) Depreciation records on all Equipment utilized whether such records are maintained by the Contractor involved, its accountant, or others;
- (t) If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating Equipment, all such other source documents;
- (u) All documents which reflect the Contractor's actual profit and overhead, or the calculation of overhead multipliers, during the years the Project was being performed and for each of the five years prior to the commencement of this Project;

(v) All documents related to the preparation of the Contractor's Bid, including the contemporaneous final calculations on which the Bid was based;

(w) All documents which relate to each and every claim together with all documents which support or negate the amount of damages as to each claim;

(x) Worksheets used to prepare the claim establishing the cost components for items of the claim including, but not limited to, labor, fringes, benefits and insurance, Materials, Equipment, Subcontractors, and all documents which establish the time periods, individuals involved, the hours and rate of pay for the individuals; and

(y) All other documents required by the City in its discretion to intelligently review the claim.

118.10 False Certification of Claims. The Contractor shall not knowingly present or cause to be presented to the Owner a false or fraudulent Claim. "Knowingly" shall have the same meaning as in Section 3729(b) USC of the Federal False Claims Act. If the Contractor knowingly presents or causes to be presented a false or fraudulent Claim, then the Contractor shall be liable to the Owner for the same civil penalty and damages as the United States Government would be entitled to recover under such Section 3729(a) USC and shall also indemnify and hold the City harmless from all costs and expenses, including the City's attorneys' and consultants' fees and expenses incurred in investigating and defending against such Claim and in pursuing the collection of such penalty, damages, and fees and expenses. If any Contractor falsely certifies all or any part of a claim, the portion of the claim so certified shall be denied. If any Contractor is found to have falsely certified all or any part of any claim, that fact may be used to support a finding of ineligibility in future Bids for the award of any City Contract.

118.11 Performance and Payment. The Contractor shall proceed with performance of the Work during any dispute resolution process, unless otherwise agreed by the Contractor and the Authorized Representative in writing. The City shall continue to make payment of any undisputed amounts in accordance with the Contract Documents pending final resolution of a claim, unless otherwise agreed by the Contractor and the Authorized Representative in writing. If the Contractor accepts the decision of the Authorized Representative or the City Commission and foregoes litigation of the claim, any payment to be made, credit to be provided or extension of time to be granted pursuant to the decision shall be evidenced by a Change Order package consisting of a completed Change Order form signed by the Contractor, the Engineer and the Authorized Representative, a copy of the approval of the City Commission and any necessary supporting documentation and any payment shall be made pursuant to a Payment Request in accordance with 114.02 and 114.03 or 114.10 through 114.13, as applicable.

118.12 Settlement Offers. If the Contractor initiates a Claim, the City may make settlement offers to settle the Claim at any time up to the date of the trial. Such settlement offers shall be subject to Rule 408 (Compromise and Offers of Compromise) of the Ohio Rules of Evidence. If at any stage of the litigation, including any appeals, the Contractor's Claim is dismissed or found to be without merit, or if the damages awarded to the Contractor on its Claim do not exceed the City's last settlement offer, the Contractor shall be liable to the City and shall reimburse the City for all of the City's attorneys' fees and expenses, and arising out of or related to such Claim since the date of such last settlement offer.

ITEM 119 CONTRACT TERMINATION

119.01 Notice to Surety

119.02 Suspension of Work

119.03 Termination for Convenience

119.04 Termination for Cause

119.05 Contractor Bankruptcy

119.01 Notice to Surety. The Authorized Representative shall provide notice to the Contractor's Surety of any Suspension or Termination pursuant to 119.01 through 119.05; provided, however, the failure to provide such notice shall not release the Surety from any of its obligations.

119.02 Suspension of Work. If, in the judgment of the Authorized Representative, the Contractor is causing undue risk of damage to any part of the Project or adjacent area, the Authorized Representative may suspend the Work temporarily, either wholly or in part, for such period until, in the judgment of the Authorized Representative, the safe and proper prosecution of the Work may be resumed. The Authorized Representative may also suspend the Work either in whole or in part for a specified number of Days on account of public necessity, adverse weather conditions, or other similar reasons which are beyond the control of the Contractor. In case of such a suspension, an extension of time, if appropriate, may be allowed as provided in the Contract Documents but no payment will be made to the Contractor for any expense or damages resulting therefrom, except where Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. Any failure of the Authorized Representative to suspend the Work shall not relieve the Contractor of the Contractor's responsibility to perform the Work safely and in accordance with the Contract Documents. The Contractor shall, upon receipt of notice of suspension, cease Work on the suspended activities and take all necessary or appropriate steps to limit disbursements and minimize costs with respect thereto. The Contractor shall furnish a report to the Authorized Representative, within five Days of receipt of the notice of suspension, describing the status of the Work, including without limitation, results accomplished, conclusions resulting therefrom, and such other information as the Authorized Representative may require. In the event of suspension, the Contractor shall be entitled to payment of compensation due under the Contract Documents, upon submission of a proper invoice, for the Work performed prior to receipt of notice of suspension, which shall be payable based upon the Contract Cost Breakdown.

119.03 Termination for Convenience. The City may, at any time upon seven Days written notice to the Contractor, terminate the Contract in whole or in part for the City's convenience and without cause. Upon receipt of the notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Authorized Representative, proceed with performance of the following duties:

(a) Cease operation as specified in the notice;

(b) Place no further orders and enter into no further subcontracts for Materials, labor, services or facilities except as necessary to complete continued portions of the Project;

- (c) Terminate all subcontracts and orders to the extent they relate to the Work terminated;
- (d) Proceed to complete the performance of any Work not terminated; and
- (e) Take actions that may be necessary, or that the Authorized Representative may require, for the protection and preservation of the terminated Work.

Upon termination for convenience, the Contractor shall be paid in accordance with the Contract Cost Breakdown for Work completed, including any amount retained, and the value of Materials ordered and delivered, less any salvage credit the Contractor may receive for them. All Materials, Equipment, facilities and supplies at the Project site, or stored off site, for which the Contractor has been compensated, shall become property of the City. The Contractor may submit evidence of any reasonable expenses directly attributable to the termination of the Work for consideration by the City. The Contractor shall not be entitled to any profit or overhead for Work not performed and in no event shall the Contractor's compensation exceed the total Contract price. Any dispute as to the sum then payable to the Contractor shall be resolved in accordance with the provisions of 118.01 through 118.11.

119.04 Termination for Cause. If the City determines that the Contractor has failed to prosecute the Work with the necessary force or in a timely manner; failed to make payments to Subcontractors or Suppliers pursuant to the agreements between the Contractor and Subcontractors or Suppliers; disregards any applicable laws, statutes, ordinances, codes, rules, regulations, or lawful orders of a public authority; has refused to remedy any Defective Work; or is otherwise in substantial breach of the Contract Documents, the Authorized Representative shall notify the Contractor and the Contractor's Surety of such failure or refusal. The Contractor shall begin to cure such failure or refusal within two Business Days of receipt of the notice. If the Contractor fails to continuously and diligently pursue and cure such failure or refusal within twenty Days of receipt of the notice, the City may, without prejudice to any of its other rights or remedies, terminate the Contract and employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, and may remove Defective Work. If the Contractor is so terminated, the Contractor's Surety may be given the option to engage another Contractor to perform the Contract, with the approval of the Authorized Representative. If the Contractor's Surety does not commence performance of the Contract within ten Days of the date on which the Contract was terminated, the City may complete the Work by such means as the Authorized Representative deems appropriate. The City may take possession of and use all Materials, facilities, and Equipment at the Project site or stored off site for which the City has paid. If the Contract is so terminated, the Contractor shall not be entitled to any further payment. If the City completes the Work and if the cost of completing the Work exceeds the balance of the Contract price, including compensation for all direct and consequential damages incurred by the Engineer and/or the City as a result of the termination, such excess shall be paid by the Contractor or the Contractor's Surety. If the Contractor's Surety performs the Work, the provisions of the Contract Documents shall govern the Surety's performance, with the Surety being substituted for the Contractor in all such provisions including, without limitation, provisions for payment for the Work and provisions about the right of the City to complete the Work. Upon a final determination, by a court of competent jurisdiction, that the termination pursuant to 119.04 was improper, the termination shall be deemed a termination for convenience pursuant to 119.03.

119.05 Contractor Bankruptcy. If the Contractor files a voluntary petition in bankruptcy or has an involuntary petition in bankruptcy filed against the Contractor, or if the Contractor makes

a general assignment for the benefit of creditors, or if a receiver is appointed for all or a substantial part of the Contractor's business or property, the Authorized Representative shall serve written notice on the Contractor and the Contractor's Surety stating that any failure of the Contractor to provide adequate assurances of continued performance will be considered a rejection of the Contract, which shall result in termination of the Contract for cause. In such event, Surety shall be immediately responsible for timely and property completion of the Work. Such termination of the Contract need not be evidenced by an order of any court rejecting the Contract. Upon a final determination, by a court having jurisdiction, that the termination was improper, the termination will be deemed to be a termination for convenience pursuant to 119.03.

ITEM 120 - AUDITS AND RECORDS

120.01 Examination

120.02 Termination and Disputes

120.03 Non-Disclosure by Contractor

120.04 Interest

120.01 Examination. The City shall have the right to examine all books, records, documents and other data of the Contractor and of the Contractor's Subcontractors and Material Suppliers related to the Bidding, pricing, or performance of the Work, including without limitation for the purpose of evaluating any Proposal or claim. Such Materials shall be made available at the office of the Contractor, Subcontractor, or Material Supplier, as applicable, at all reasonable times for inspection, audit and reproduction until the expiration of seven years after the date of Final Acceptance of the Project by the City. To the extent that the Contractor, Subcontractor, or Material Supplier, as applicable, informs the City in writing that any documents copied by the City are trade secrets, the City shall treat such documents as trade secrets of the Contractor, Subcontractor, or Material Supplier, as applicable. In the event, any dispute arises with any other Person about whether such other Person should be given access to the documents, the Contractor, Subcontractor, or Material Supplier, as applicable, agrees to indemnify the City against all costs, expenses and damages, including without limitation attorneys' fees, incurred or paid by reason of such dispute. The right of inspection, audit, and reproduction shall extend to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and Projections used therein.

120.02 Termination and Disputes. If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to the City for a period of seven years from the date of any applicable final settlement or payment, as applicable. Records which relate to disputes, litigation, or settlement of claims arising out of the performance of the Work shall be made available until such dispute, litigation or settlement has been finally decided or settled.

120.03 Non-Disclosure by Contractor. The Contractor shall not disclose, at any time during or after the Work, either directly or indirectly, any confidential records, knowledge or information which the Contractor may acquire about the Project or the City, except as may be required by law or order of a court of competent jurisdiction.

120.04 Interest. Moneys owed to the Contractor by the City pursuant to the terms of the Contract Documents, which are not paid when due shall accrue straight interest at the rate paid by the STAR Account, from the date the moneys become due until the moneys are paid. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract.

CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING MODIFICATIONS

The City of Dayton Construction and Material Specifications Modifications for Online Bidding are hereby modified by this Contract as follows:

1. The definition of Authorized Representative contained in Section 102 shall be removed and replaced with the following:
Authorized Representative: The Authorized Representative for the Contract is the Director of the City of Dayton, Department of Public Works, or duly authorized designee.
2. The definition of Engineer in Section 102 shall be removed and replaced with the following:
Engineer: The Engineer for the Contract the Chief Engineer – Division of Civil Engineering, Department of Public Works or duly authorized designee.
3. Section 103.36 is hereby removed and replaced with the following:
103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for at least 10% of the full amount of the Base Bid plus any Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.
4. Section 106.13 is hereby removed and replaced with the following:
106.13 Construction Schedule. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of Section 105.02 may be invoked.
5. Section 107.19 is hereby removed.

6. Sections 109.05, 109.06, 109.07, 109.08, 109.09, 109.10, 109.11, and 109.12 are hereby removed and replaced with the following:

109.05 Construction Schedule. The Contractor shall prepare a preliminary Construction Schedule within 30-days of the issuance of a Notice to Proceed. The Contractor shall submit the preliminary Construction Schedule in the form of a Gantt Chart. A Gantt Chart consists of a table of project task information and a bar chart that graphically displays the project schedule, depicting progress in relation to time and often used in planning and tracking projects. The Engineer within seven Days of receipt of the preliminary Construction Schedule shall provide written comments to the Contractor. Within 5 days of receipt of the Engineer's comments, the Contractor shall incorporate the comments and submit a revised Construction Schedule to the Engineer. The Contractor shall update the Construction Schedule every thirty days. The table associated with the Gantt Chart shall be formatted in accordance with the following tables as a minimum:

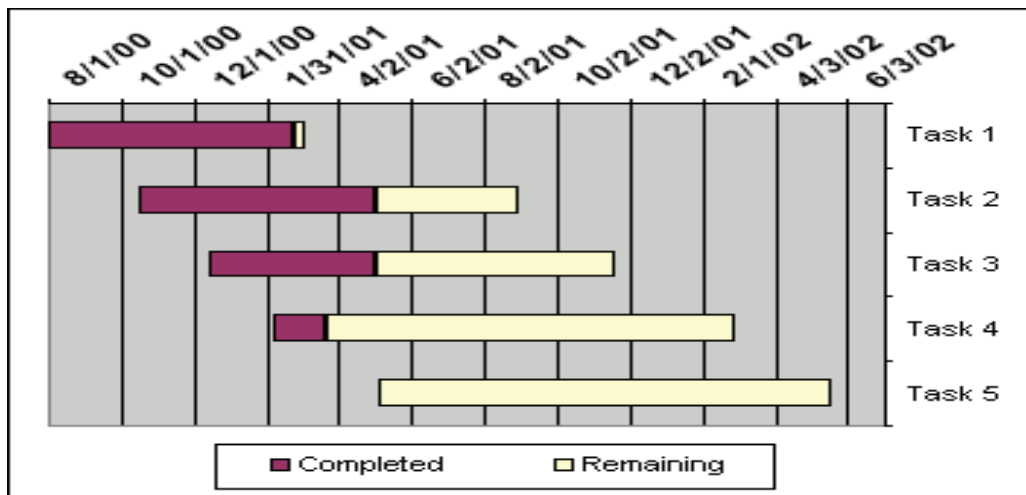
Sample Gantt Chart Table

Task ID	Task Description/ Name	Resource Performing Task	Duration of Task (days)	Start Date	Completion Date	Status
1	Submittals	GC	30	5/15	6/15	Done
2	Mobilize/Setup	GC	10	6/1	6/11	10%
3	Site Clearing	Subcontractor	15	6/12	6/27	0%
Etc.	Etc.	Etc.	Etc.	Etc.	Etc.	Etc.

Note: Table entries are for illustration purposes only.

1. Task ID: Sequential identifier for task (number, alphabetical, alpha-numeric).
2. Task Description/ Name: Brief description or name of major task items.
3. Resource Performing Task: Individuals or company responsible for completion of task and/or with the majority of the work in the task.
4. Duration of Task: Number of days estimated to complete task.
5. Start/Completion dates: Projected dates.
6. Status: Percent completed, description of status, etc.

Sample Graphical Representation of Gantt Chart



109.06 Approval and Acceptance of Contractor Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature on any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation.

7. Sections 114.01, 114.02, 114.04, 114.05, and 114.07 are hereby removed and replaced by the following:

114.01 Contractor Payment Request. After confirming the quantities of work performed with the Engineer, the Contractor shall submit monthly to the Engineer an itemized Payment Request, showing the quantities of work performed. The Contractor shall sign the Payment Request thereby certifying that the quantities are correct and the work has been done in accordance with the Contract, and that it constitutes the total amount of work performed during the period. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.02 Partial Payment. The City shall pay the Contractor an amount equivalent to 90% of the amount listed in each Payment Request within 30 days of the date each Payment Request is executed by the Contractor and approved by the Engineer. After the Contract is 50% complete, as determined by the Engineer, the retainage shall be reduced and the City shall pay 95% of the amount listed in each remaining Payment Request. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and Authorized Representative. Payments due and not paid within such thirty day period shall accrue interest from the date that payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

8. Section 117.06 is hereby removed and replaced with the following:

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

1. Prepare a written request to the Contractor detailing the changes to be made.
2. Reach a written agreement with the Contractor concerning the cost of the Change Order using Unit Prices or the Pricing Guidelines set forth in Section 117.10, whichever the Engineer determines in his or her discretion is applicable.
3. If the cost of the agreed Change Order is less than the available Project Contingency Funds, the Change Order agreement need only be signed by the Engineer.
4. If the cost of the agreed Change Order exceeds the available Project Contingency Funds then the Change Order must be approved by the City Commission and signed by the City Manager. The Contractor may bill for Work covered by the Change Order only after the Change Order is properly executed in accordance with this Section.

9. Section 117.12 is hereby removed and replaced with the following:
117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the Critical Path of the Construction Schedule. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law.



May 24, 2024

Mr. Andrew Marks, PE
City of Dayton
101 West Third Street
Dayton, Ohio 45402

Telephone (937) 333-3857

**RE: Pre-Renovation Asbestos Inspection of East Patrol Operations-North, 417 East Helena Street, Dayton, Ohio. April 5, 16, and 24, 2024.
Helix Project No. 7277.**

Dear Mr. Marks:

The City of Dayton recently contracted with Helix Environmental, Inc. to perform a limited pre-renovation asbestos-containing materials inspection of the East Patrol Operations-North Building at 417 East Helena Street in Dayton, Ohio. The inspection was necessary to determine if asbestos-containing building materials or other hazardous materials are present in the renovation areas so that plans could be made to remove them in accordance with current regulatory requirements prior to the planned renovation project. This letter report summarizes the results of the inspection on May 30, 2023 and June 20, 2023, and the return inspections on April 5, 16, and 24, 2024 and the analytical results of samples collected on those days. The inspection was limited to accessible suspect materials in the building.

INSPECTION AND ANALYTICAL PROCEDURES

On May 30, 2023 and June 20, 2023, Mr. Ralph Froehlich, CIH, CSP, QEP and Mr. Benjamin Froehlich, IH with Helix Environmental, Inc. performed an initial limited bulk sampling for asbestos in the potential renovation areas at the Police Department Exercise Room at 417 East Helena Street, Dayton, Ohio. Mr. Ralph Froehlich, CIH, CSP, QEP and Mr. Benjamin Froehlich, IH with Helix Environmental, Inc. returned to the site to do a more thorough pre-renovation inspection of the building on April 5, 16, and 24, 2024. Mr. Ralph A. Froehlich is a Certified Industrial Hygienist with more than thirty years experience in the fields of occupational and environmental health, and is certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Certification Nos. ES3074 and PD60148,

respectively). Mr. Benjamin Froehlich has over ten years experience in the fields of occupational and environmental health and is also certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Cert. Nos. ES34739 and PD60827, respectively).

Helix Environmental, Inc. collected an additional forty-five (45) bulk samples of suspect asbestos-containing building materials in the renovation areas. Helix Environmental, Inc. previously collected twenty-nine (29) bulk samples of suspect asbestos-containing building materials in the renovation areas.

Asbestos sampling locations were determined in a statistically random manner for surfacing materials, or randomly distributed manner for thermal system insulation that is representative of the homogeneous area. Miscellaneous and non-friable materials were sampled in a manner sufficient to determine whether the sampled materials contain more than 1% asbestos if they were not assumed to contain asbestos. Bulk samples of the suspect materials were collected using cleaned hand tools and packaged in labeled zip-lock plastic bags. The sample bags were placed into a larger zip-lock bag, with the original sample data/chain-of-custody and analytical request forms. Helix Environmental, Inc. retained copies of these forms.

Asbestos bulk samples were shipped by overnight courier to SanAir Technologies Laboratory, Inc., North Chesterfield, Virginia, a National Voluntary Laboratory Accreditation Program (NVLAP) and Ohio Certified Professional accredited environmental laboratory.

Asbestos bulk samples were analyzed via Polarized Light Microscopy (PLM) with dispersion staining in accordance with the U.S. Environmental Protection Agency's Interim Methods for the Determination of Asbestos in Bulk Insulation Samples (EPA-600/R-93/116). Under this method, the limit of detection for asbestos is about 1 percent by area. Samples containing smaller concentrations of asbestos are not reliably detected by this technique. Polarized light microscopes equipped with 10X eyepieces, 10X and 40X objective lenses and dispersion staining lenses were used to identify fibers present in the samples. This method has a reporting limit of 1%. Some samples were reanalyzed by EPA PLM 400 with point counting. This method has a reporting limit of 0.25%.

Asbestos air samples were analyzed by Phase Contrast Microscopy in accordance with the NIOSH 7400 Method.

SanAir Technologies Laboratory, Inc. maintains accreditation from the American Industrial Hygiene Association as an environmental microbiology laboratory and has received accreditation through successful participation in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos. AIHA-accredited laboratories are scrutinized on a regular basis to ensure that personnel, equipment, facilities and data are maintained. In addition, AIHA-accredited laboratories have well-developed assurance/quality control programs to ensure that analytical results accurately reflect conditions present during the sampling periods.

APPLICABLE STANDARDS

Asbestos

The U. S. Environmental Protection Agency (EPA) has established regulations that apply to friable and potentially friable materials with asbestos content in excess of one percent, as determined by PLM. These regulations establish required notification, removal techniques, and disposal of regulated asbestos-containing materials. "Friable" means that a suspect material can be reduced to a powder by hand pressure when dry and denotes a material that is capable of releasing significant amounts of asbestos fibers to the air. Potentially friable materials are those that may release asbestos fibers to the air if they are extensively damaged during demolition operations, and include Category I Nonfriable materials in poor condition and Category II Nonfriable materials. Category I Nonfriable materials include bituminous roofing materials, resilient flooring materials, and gaskets, where the asbestos is mixed in a resilient matrix. Category I Nonfriable materials may be left in buildings when they are demolished by conventional methods, if the materials are not in poor condition. The Ohio EPA has established equivalent regulations for Ohio.

The Occupational Safety and Health Administration (OSHA) has promulgated an eight-hour Time-Weighted Average (TWA) Permissible Exposure Limit of 0.1 fibers/cc for airborne asbestos exposures while working in and around asbestos-containing materials (29 CFR 1910.1001, 29 CFR 1926.1101). A 30-minute Excursion Limit of 1.0 fibers/cc is also included with the standards. Asbestos-containing materials are defined as those that contain more than 1% asbestos. These regulations include complex requirements for asbestos abatement, dividing the work with and around asbestos into four classes, with varying requirements for each class. OSHA also requires building and facility owners to maintain records of information concerning the presence, location and

quantity of asbestos-containing material (ACM) and presumed asbestos-containing material (PACM) installed in their building or facility (29 CFR 1910.1001(j)(2)(ii)).

EPA has established clearance criteria of 0.01 fibers/cc by PCM analyses for small-scale asbestos abatement projects in schools (40 CFR 763.91). In addition, EPA has established clearance criteria of 70 asbestos structures/mm² by Transmission Electron Microscopy (TEM) analyses. However, this clearance criteria is only required for large asbestos abatement projects in schools.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an airborne eight-hour TWA Threshold Limit Value of 0.1 fibers/cc (2024 *TLVs and BEIs*). ACGIH TLVs denote concentrations and conditions to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH) identifies asbestos as an occupational carcinogen, and recommends that occupational exposures be “limited to the lowest feasible concentration” (NIOSH *Pocket Guide to Chemical Hazards*, 2007).

Ohio EPA has established additional regulations for asbestos abatement, including a certification program for asbestos supervisors, workers, hazard evaluation specialists, project designers, and air monitoring technicians. Ohio EPA regulations also require contractors to be licensed, and require 10 working day advance notifications for asbestos abatement in amounts over 50 linear feet (LF) or 50 square feet (SF) of friable asbestos-containing material (Ohio Administrative Code 3745-22).

ANALYTICAL RESULTS

TABLE 1: CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7200-05-30-02 23029600-002	26,000 SF	1	Drywall, Drywall / 1st Floor, Bicycle Garage, Southwest Area, At Soffit, 12' Ht.	Non-Friable	No Asbestos Detected
		2	Drywall, Joint Compound / 1st Floor, Bicycle Garage, SW Area, At Soffit, 12' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-04 23029600-004	-	1	Drywall, Drywall / 1st Floor, Bicycle Garage, Northwest Area, West Wall, Above Duct, 11' Ht.	Non-Friable	No Asbestos Detected
		2	Drywall, Joint Compound / 1st Floor, Bicycle Garage, Northwest Area, W. Wall, Above Duct, 11' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-23 24019666-023 24019871-001		1	Drywall, Drywall / 1st Floor, East Office Area, South Central Hallway, Above Ceiling Tile, 9' Ht.	Non-Friable	No Asbestos Detected
		2	Drywall, Joint Compound / 1st Floor, East Office Area, South Central Hallway, Above Ceiling Tile, 9' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected; 0.25% Chrysotile Asbestos Detected by Point Count
7277-04-05-23 24019666-023 24019871-002		1	Drywall, Drywall / 1st Floor, East Office Area, East Central Hallway, Central Area, North Wall, Above Ceiling Tile, 9' Ht.	Non-Friable	No Asbestos Detected
		2	Drywall, Drywall / 1st Floor, East Office Area, East Central Hallway, Central Area, North Wall, Above Ceiling Tile, 9' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected; 0.5% Chrysotile Asbestos Detected by Point Count

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
>1% Asbestos
>1% Asbestos

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7277-04-16-03 24021509-003 24022276-001	26,000 SF	1	Drywall, Drywall/1st Floor, Bomb Squad Room, West Wall, Above Ceiling Tile, 12' Ht.	Non-Friable	No Asbestos Detected
		2	Drywall, Joint Compound/1st Floor, Bomb Squad Room, West Wall, Above Ceiling Tile, 12' Ht.	Non-Friable	2% Chrysotile Asbestos Detected; 0.75% Chrysotile Asbestos Detected by Point Count
7200-05-30-08 23029600-008	8,200 SF	1	9" x 9" Tan Streaked Floor Tile, Floor Tile/ 1st Floor, Bicycle Garage, Southwest Area, On Floor, 0' Ht.	Non-Friable	5% Chrysotile Asbestos Detected
		2	9" x 9" Tan Streaked Floor Tile, Black Mastic/ 1st Floor, Bicycle Garage, Southwest Area, On Floor, 0' Ht.	Non-Friable	2% Chrysotile Asbestos Detected
7200-05-30-09 23029600-009	8,200 SF	1	9" x 9" Red Streaked Floor Tile, Floor Tile/ 1st Floor, Gymnasium, East Central Area, On Floor, 0' Ht.	Non-Friable	5% Chrysotile Asbestos Detected
		2	9" x 9" Red Streaked Floor Tile, Black Mastic/ 1st Floor, Gymnasium, East Central Area, On Floor, 0' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
 >1% Asbestos
 >1% Asbestos

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7200-06-20-03 23033565-003	1,000 SF	1	12" x 12" Aqua Mottled Floor Tile, Floor Tile/ 1st Floor, Northeast Roll Call Supply Room, Northwest Area, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
		2	12" x 12" Aqua Mottled Floor Tile, Black Mastic/ 1st Floor, Northeast Roll Call Supply Room, Northwest Area, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
7200-06-20-04 23033565-004	-	1	12" x 12" Aqua Mottled Floor Tile, Floor Tile/ 1st Floor, Southeast Office, Southeast Storage Room, North Central Area, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
		2	12" x 12" Aqua Mottled Floor Tile, Black Mastic/ 1st Floor, Southeast Office, Southeast Storage Room, North Central Area, On Floor, 0' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected
7200-06-20-05 23033565-005	270 SF	1	12" x 12" Light Blue Mottled Floor Tile, Floor Tile/ 1st Floor, Men's Locker Room, Bathroom, Northeast Central Area, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
		2	12" x 12" Light Blue Mottled Floor Tile, Black Mastic/ 1st Floor, Men's Locker Room, Bathroom, Northeast Central Area, On Floor, 0' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected
7200-06-20-06 23033565-006	-	1	12" x 12" Light Blue Mottled Floor Tile, Floor Tile/ 1st Floor, Men's Locker Room, Northeast Area, At Entrance, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
		2	12" x 12" Light Blue Mottled Floor Tile, Black Mastic/ 1st Floor, Men's Locker Room, Northeast Area, At Entrance, On Floor, 0' Ht.	Non-Friable	<1% Chrysotile Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
>1% Asbestos
>1% Asbestos

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7277-04-16-06 24021509-006	400 SF	1	Canvas Jacket / 1st Floor, Evidence Garage, Northeast Hallway, East Area, On Old HVAC Unit, 8' Ht.	Non-Friable	No Asbestos Detected
		2	White Sealant / 1st Floor, Evidence Garage, Northeast Hallway, East Area, On Old HVAC Unit, 8' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-07 24021509-007 24021899-001	-	1	Canvas Jacket / 1st Floor, Evidence Garage, Northeast Hallway, East Area, On Old HVAC Unit, 9' Ht.	Non-Friable	No Asbestos Detected
		2	White Sealant / 1st Floor, Evidence Garage, Northeast Hallway, East Area, On Old HVAC Unit, 9' Ht.	Non-Friable	3% Chrysotile Asbestos Detected; 0.4% Chrysotile Asbestos Detected by Point Count with Gravimetric Reduction
7277-04-16-04 24021509-004	1 SF	1	Black Insulation Sealant / 1st Floor, Evidence Garage, South Walk-in Cooler, Southeast Corner, Behind Coils, 8' Ht.	Non-Friable	10% Chrysotile Asbestos Detected
7277-04-16-05 24021509-005	-	1	Black Insulation Sealant / 1st Floor, Evidence Garage, South Walk-in Cooler, Southeast Corner, Behind Coils, 8' Ht.	Non-Friable	10% Chrysotile Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7277-04-16-14 24021509-014 24021899-002	20 SF	1	Grey Exterior Caulk/ Exterior, North Side West Garage Door Frame, East Side, 4' Ht.	Non-Friable	2% Chrysotile Asbestos Detected; 2.2% Chrysotile Asbestos Detected by Point Count with Gravimetric Reduction
7277-04-16-15 24021509-015 24021899-003	-	1	Grey Exterior Caulk/ Exterior, North Side, Northeast Stairwell Door Frame, West Side, 4' Ht.	Non-Friable	2% Chrysotile Asbestos Detected; 3% Chrysotile Asbestos Detected by Point Count with Gravimetric Reduction
Not Sampled. Assumed Asbestos- Containing Material	0.25 SF	1	Electrical Insulation in Safety Switches/ 1st Floor, Northeast Evidence Garage, Northeast Hallway, On Old HVAC Unit, 9' Ht.	Non-Friable	Assumed Cat I Nonfriable Asbestos-
Not Sampled. Assumed Asbestos- Containing Material	0.25 SF	1	Electrical Insulation in Safety Switches/ Exterior, North Side, East Central Area, On HVAC Unit, 2' Ht.	Non-Friable	Assumed Cat I Nonfriable Asbestos-
Not Sampled. Assumed Asbestos- Containing Material	0.75 SF (3)	1	Electrical Insulation in Safety Switches/ Rooftop, On HVAC Units	Non-Friable	Assumed Cat I Nonfriable Asbestos-

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
Not Sampled. Assumed Asbestos- Containing Material	20 SF	1	Electrical Insulation in Circuit Breakers, Safety Switches, and Switch Gear/Basement, Northeast Hallway, North, East, and West Walls	Non-Friable	Assumed to Contain Asbestos
Not Sampled. Assumed Asbestos- Containing Material	14 SF	1	Electrical Insulation in Circuit Breakers, Safety Switches, and Switch Gear/1st Floor, Bicycle Garage, North and East Walls	Non-Friable	Assumed to Contain Asbestos
Not Sampled. Assumed Asbestos- Containing Material	20 SF	1	Fire Door Insulation/ 1st Floor, East Office Area, Northwest Central Area, At Entrance to Evidence Garage	Friable	Assumed to Contain Asbestos
Not Sampled. Assumed Asbestos- Containing Material	18,000 SF	1	Bituminous Roofing/ Main Roof on Building	Non-Friable	Assumed Cat II Nonfriable Asbestos-
Not Sampled. Assumed Asbestos- Containing Material	600 SF	1	Bituminous Roofing/ Southeast Porch Roof	Non-Friable	Assumed Cat II Nonfriable Asbestos-
Not Sampled. Assumed Asbestos- Containing Material	400 SF	1	Bituminous Roofing/ North Central Porch Roof	Non-Friable	Assumed Cat II Nonfriable Asbestos-

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TABLE 2: CONFIRMED NON-ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7200-05-30-14 23029600-014	250 SF	1	2' x 4' Ceiling Tile, Random Holes and Short Fissures / 1st Floor, Bicycle Garage, Northwest Men's Restroom, Northwest Area, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-15 23029600-015	-	1	2' x 4' Ceiling Tile, Random Holes and Short Fissures / 1st Floor, Bicycle Garage, Northwest Women's Restroom, South Central Area, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-22 23029600-022	-	1	2' x 4' Ceiling Tile, Random Holes and Short Fissures / 1st Floor, North Central Hallway, Duffle Bag Storage Area, Southwest Area, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-16 23029600-016	4000 SF	1	2' x 4' Ceiling Tile, Longways Fissures and Holes / 1st Floor, Central Break Room, Center Area, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-23 23029600-023	-	1	2' x 4' Ceiling Tile, Longways Fissures and Holes / 1st Floor, South Central Hallway, North Area, On Ceiling, 8' Ht.	Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7200-05-30-17 23029600-017	1,100 SF	1	2' x 4' Ceiling Tile, Shortways Fissures and Holes/ 1st Floor, West Central Hallway, At Entrance to Break Room, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-18 23029600-018	-	1	2' x 4' Ceiling Tile, Shortways Fissures and Holes/ 1st Floor, Roll Call Room, Southwest Central Area, On Ceiling, 10' Ht.	Friable	No Asbestos Detected
7200-05-30-21 23029600-021	-	1	2' x 4' Ceiling Tile, Shortways Fissures and Holes/ 1st Floor, East Hallway, North Intersection, On Ceiling, 8' Ht.	Friable	No Asbestos Detected
7200-05-30-19 23029600-019	80 SF	1	2' x 4' Ceiling Tile, Shortways Fissures and Holes, Chicken Feet/ 1st Floor, East Hallway, North Intersection, On Ceiling, 9' Ht.	Friable	No Asbestos Detected
7200-05-30-20 23029600-020	-	1	2' x 4' Ceiling Tile, Shortways Fissures and Holes, Chicken Feet/ 1st Floor, East Hallway, Central Area, On Ceiling, 9' Ht.	Friable	No Asbestos Detected
7277-04-16-01 24021509-001	700 SF	1	2' x 4' Ceiling Tile, Plain, Gypsum/ 1st Floor, Bomb Squad Garage, South Central Area, On Ceiling, 12' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-02 24021509-002	-	1	2' x 4' Ceiling Tile, Plain, Gypsum/ 1st Floor, Bomb Squad Garage, Southwest Area, Along West Wall, On Ceiling, 12' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-16-09 24021509-010	160 SF	1	2" x 48" Grey Faux Wood Luxury Vinyl Flooring/ 1st Floor, West Garage, Men's Restroom, Southwest Area, At Entrance, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-10 24021509-009	-	1	2" x 48" Grey Faux Wood Luxury Vinyl Flooring/ 1st Floor, West Garage, Women's Restroom, Northwest Area, On Floor, 0' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-10 23029600-010	110 SF	1	12" x 12" Tan, Faux Wood Floor Tile/ 1st Floor, Gymnasium, East Central Area, On Floor, Above 9" x 9" Floor Tile, 0' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-12 23029600-012	-	1	12" x 12" Tan, Faux Wood Floor Tile/ 1st Floor, Gymnasium, East Central Area, On Floor, Above 9" x 9" Floor Tile, 0' Ht.	Non-Friable	No Asbestos Detected
7200-06-20-01 23033565-001	1,500 SF	1	Tan Carpet Mastic/ 1st Floor, East Central Offices, Sgt. Dine's Office, South Central Area, Under Carpet, 0' Ht.	Non-Friable	No Asbestos Detected
7200-06-20-02 23033565-002	-	1	Tan Carpet Mastic/ 1st Floor, SW Offices, Sgt. Hargrave's Office, SE Area, Under Carpet, 0' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NONASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7200-05-30-05 23029600-005	840 SF	1	Hard Plaster, Drywall/ Basement, Northeast Hallway, West Wall, Northwest Corner, 0.5' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Plaster/ Basement, Northeast Hallway, West Wall, Northwest Corner, 0.5' Ht.	Non-Friable	No Asbestos Detected
		3	Hard Plaster, Skim Coat/ Basement, Northeast Hallway, West Wall, Northwest Corner, 0.5' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-06 23029600-006	-	1	Hard Plaster, Drywall/ Basement, Northeast Hallway, West Wall, Center, 6.5' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Plaster/ Basement, Northeast Hallway, West Wall, Center, 6.5' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat/ Basement, Northeast Hallway, West Wall, Center, 6.5' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-07 23029600-007	-	1	Hard Plaster, Drywall/ Basement, Former Men's Restroom, East Wall, Northeast Corner, 7' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Plaster/ Basement, Former Men's Restroom, East Wall, Northeast Corner, 7' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat/ Basement, Former Men's Restroom, East Wall, Northeast Corner, 7' Ht.	Non-Friable	No Asbestos Detected
7200-05-30-03 23029600-003	22,600 SF	1	Hard Plaster, Plaster/ 1st Floor, Bicycle Garage, Northwest Area, At Duct, On Ceiling, 12' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat/ 1st Floor, Bicycle Garage, Northwest Area, At Duct, On Ceiling, 12' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7200-05-30-13 23029600-013	22,600 SF	1	Hard Plaster, Plaster / 1st Floor, Gymnasium, South Wall, Center, 11' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, Gymnasium, South Wall, Center, 11' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-01 24019666-001		1	Hard Plaster, Plaster / 1st Floor, East Office Area, SE Reception Office, East Wall, Center, Above Ceiling Tile, 8.5' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, SE Reception Office, East Wall, Center, Above Ceiling Tile, 8.5' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-02 24019666-002	-	1	Hard Plaster, Plaster / 1st Floor, East Office Area, Roll Call Room, Northeast Central Area, Above Ceiling Tile, On Ceiling, 12.5' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, Roll Call Room, NE Central Area, Above Ceiling Tile, On Ceiling, 12.5' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-03 24019666-003	-	1	Hard Plaster, Plaster / 1st Floor, East Office Area, Southwest Hallway, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, Southwest Hallway, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-05-04 24019666-004	22,600 SF	1	Hard Plaster, Plaster / 1st Floor, East Office Area, West Central Break Room, West Central Area, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, West Central Break Room, West Central Area, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-05 24019666-005	-	1	Hard Plaster, Plaster / 1st Floor, East Office Area, South Central Hallway, Center, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, South Central Hallway, Center, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-06 24019666-006	-	1	Hard Plaster, Plaster / 1st Floor, East Office Area, East Central Hallway, Center, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected
		2	Hard Plaster, Skim Coat / 1st Floor, East Office Area, East Central Hallway, Center, Above Ceiling Tile, On Ceiling, 13' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-05-07 24019666-007	30 SF 90 LF	1	4" Brown Cove Base, Cove Base / 1st Floor, Southeast Reception Area, North Wall, East Area, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Brown Cove Base, Beige Mastic / 1st Floor, Southeast Reception Area, North Wall, East Area, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-08 24019666-008	-	1	4" Brown Cove Base, Cove Base / 1st Floor, Southeast Reception Area, East Wall, South Area, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Brown Cove Base, Beige Mastic / 1st Floor, Southeast Reception Area, East Wall, South Area, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-09 24019666-009	170 SF 500 LF	1	4" Turquoise Cove Base, Cove Base / 1st Floor, East Office Area, South Hallway, West End, North Wall, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Turquoise Cove Base, Beige Mastic / 1st Floor, East Office Area, South Hallway, West End, North Wall, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-10 24019666-010	-	1	4" Turquoise Cove Base, Cove Base / 1st Floor, East Office Area, West Hallway, North End, West Wall, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Turquoise Cove Base, Beige Mastic / 1st Floor, East Office Area, West Hallway, North End, West Wall, 0' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-05-13 24019666-013	40 SF 120 LF	1	4" Dark Brown Cove Base, Cove Base/ 1st Floor, East Offices, Sgt. Staples Office, Northeast Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Dark Brown Cove Base, Beige Mastic/ 1st Floor, East Offices, Sgt. Staples Office, Northeast Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-14 24019666-014	-	1	4" Dark Brown Cove Base, Cove Base/ 1st Floor, East Offices, Sgt. Staples Office, East Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Dark Brown Cove Base, Beige Mastic/ 1st Floor, East Offices, Sgt. Staples Office, East Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-15 24019666-015	20 SF 60 LF	1	4" Tan Cove Base, Cove Base/ 1st Floor, East Offices, Sgt. Cash Office, Northeast Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Tan Cove Base, Beige Mastic/ 1st Floor, East Offices, Sgt. Cash Office, Northeast Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-16 24019666-016	-	1	4" Tan Cove Base, Cove Base/ 1st Floor, East Offices, Sgt. Cash Office, South Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Tan Cove Base, Beige Mastic/ 1st Floor, East Offices, Sgt. Cash Office, South Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-05-17 24019666-017	150 SF 450 LF	1	4" Blue Cove Base, Cove Base/ 1st Floor, Roll Call Room, Southwest Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Blue Cove Base, Beige Mastic/ 1st Floor, Roll Call Room, Southwest Corner, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-18 24019666-018	-	1	4" Blue Cove Base, Cove Base/ 1st Floor, Break Room, West Wall, North Area, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Blue Cove Base, Beige Mastic/ 1st Floor, Break Room, West Wall, North Area, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-21 24019666-021	40 SF 120 LF	1	4" Light Blue Cove Base, Cove Base/ 1st Floor, Men's Locker Room, Northeast Area, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Light Blue Cove Base, Beige Mastic/ 1st Floor, Men's Locker Room, Northeast Area, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-22 24019666-022	-	1	4" Light Blue Cove Base, Cove Base/ 1st Floor, Men's Locker Room, East Restroom, West Wall At Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Light Blue Cove Base, Beige Mastic/ 1st Floor, Men's Locker Room, East Restroom, West Wall At Entrance, 0' Ht.	Non-Friable	No Asbestos Detected

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-05-19 24019666-019	50 SF 150 LF	1	4" Grey Cove Base, Cove Base/ 1st Floor, Sgt. Gross Office, Southwest Area, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Grey Cove Base, Beige Mastic/ 1st Floor, Sgt. Gross Office, Southwest Area, Behind Entrance, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-20 24019666-020	-	1	4" Grey Cove Base, Cove Base/ 1st Floor, Sgt. Gross Office, East Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Grey Cove Base, Beige Mastic/ 1st Floor, Sgt. Gross Office, East Wall, Center, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-12 24021509-012	22 SF 66 LF	1	4" Dark Grey Cove Base, Cove Base/ 1st Floor, West Garage, Men's Restroom, Southwest Corner, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Dark Grey Cove Base, Beige Mastic/ 1st Floor, West Garage, Men's Restroom, Southwest Corner, 0' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-13 24021509-013	-	1	4" Dark Grey Cove Base, Cove Base/ 1st Floor, West Garage, Women's Restroom, Northwest Corner, 0' Ht.	Non-Friable	No Asbestos Detected
		2	4" Dark Grey Cove Base, Beige Mastic/ 1st Floor, West Garage, Women's Restroom, Northwest Corner, 0' Ht.	Non-Friable	No Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
 >1% Asbestos
 >1% Asbestos

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-16-08 24021509-008	10 SF (2)	1	Grey Vibration Isolator Cloth/ 1st Floor, Evidence Garage, Break Area, Southeast Area, Above Ceiling Tile, 9' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-10 24021509-009	-	1	Grey Vibration Isolator Cloth/ 1st Floor, Evidence Garage, Break Area, Southeast Central Area, Above Ceiling Tile, 9' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-11 24019666-011	5 SF	1	Light Grey Sink Soundproofing/ 1st Floor, Roll Call Room, Southeast Corner, Under Stainless Steel Sink, 2' Ht.	Non-Friable	No Asbestos Detected
7277-04-05-12 24019666-012	-	1	Light Grey Sink Soundproofing/ 1st Floor, Roll Call Room, Southeast Corner, Under Stainless Steel Sink, 2' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-16 24021509-016	20 SF	1	Grey Duct Sealant/ Exterior, North Side, Central Area, In HVAC Cage, On Ductwork, 2' Ht.	Non-Friable	No Asbestos Detected
7277-04-16-17 24021509-017	-		Grey Duct Sealant/ Exterior, North Side, Central Area, In HVAC Cage, On Ductwork, 5' Ht.	Non-Friable	No Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
>1% Asbestos
>1% Asbestos

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS MATERIALS IN RENOVATION AREAS AT 417 EAST HELENA STREET, DAYTON, OHIO, COLLECTED MAY 30 & JUNE 20, 2023, APRIL 5, 16, & 24, 2024. HELIX PROJECT NO. 7277.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	Result (% Asbestos)
7277-04-24-03 24023519-003	1 SF	1	Light Grey Electrical Sealant/ Roof, South Central Area, HVAC Unit, Penetration Housing, 0.5' Ht.	Non-Friable	No Asbestos Detected
7277-04-24-04 24023519-003	-	1	Light Grey Electrical Sealant/ Roof, Southeast Area, HVAC Unit, Penetration Housing, 0.5' Ht.	Non-Friable	No Asbestos Detected
7277-04-24-01 24023519-001	250 SF	1	Grey Roofing Cement/ Roof, South Parapet Wall, Above Entrance, 2' Ht.	Non-Friable	No Asbestos Detected
7277-04-24-02 24023519-002	-	1	Grey Roofing Cement/ Roof, North Parapet Wall, West Central Area, 1' Ht.	Non-Friable	No Asbestos Detected

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL
 OSHA REGULATED ASBESTOS-CONTAINING MATERIAL

>1% Asbestos
 >1% Asbestos
 >1% Asbestos

DISCUSSION AND RECOMMENDATIONS

A total of forty-five (45) additional bulk samples of suspect asbestos-containing materials were collected from the Dayton Police Department East Patrol Building at 417 East Helena Street in Dayton, Ohio. Samples were collected from all accessible suspect asbestos-containing building materials in the potential renovation area with the exception of roofing, fire doors, and electrical insulation materials on energized electrical equipment such as safety switches and insulating materials.

Analytical results confirmed that the following suspect asbestos-containing building materials contain or were assumed to contain more than 1% asbestos:

- 9" x 9" Tan Streaked Floor tile with associated Black Mastic, Throughout Gymnasium, South End on Bicycle Garage, and Throughout the Office Area under carpet and newer floor tile (8,200 SF) and assumed throughout uninspected areas
- 9" x 9" Red Streaked Floor tile with associated Black Mastic, Throughout Gymnasium, South End on Bicycle Garage, and Throughout the Office Area under carpet and newer floor tile (8,200 SF) and assumed throughout uninspected areas
- Black Mastic under 12" x 12" Aqua, Mottled Floor Tile (1000 SF, Throughout East Office Area, Confirmed Asbestos-Containing 9" x 9" Floor Tile Underneath the Aqua Floor Tile)
- Black Mastic under 12" x 12" Light Blue Mottled Floor Tile, 1st Floor, Men's Locker Room (270 SF, Confirmed Asbestos-Containing 9" x 9" Floor Tile or Mastic Underneath the Blue Floor Tile)
- Black Insulation Sealant, 1st Floor, Evidence Garage, On Walk-In Coolers, Sealing Refrigeration Coolant Line Penetrations (1 SF)
- Grey Exterior Caulk, Exterior, Around Door Frames (20 SF, confirmed by point-counting to be between 2.2% - 3% Chrysotile Asbestos)
- Electrical Insulation Materials in switches, switchgears, circuitbreakers (35.25 SF, Assumed to Contain Asbestos)
- Fire Door (20 SF, 1st Floor, Southeast Door to the Evidence Garage, Assumed to Contain Asbestos)
- Bituminous Roofing Materials, Main Roof on Building (18,000 SF, Assumed Category I Non-friable Material)
- Bituminous Roofing Materials, Southeast Porch Roof (600 SF, Assumed Category I Non-friable Material)

- Bituminous Roofing Materials, North Central Porch Roof (400 SF, Assumed Category I Non-friable Material)

Electrical insulation materials were observed inside the building and were assumed to contain asbestos during the inspection. These suspect materials could not be sampled safely since the electrical system was energized. If necessary, all assumed electrical insulation materials must be removed from the renovation area by trained abatement workers prior to renovation. Before disturbing the electrical system components, the electrical system and its components MUST BE FULLY DE-ENERGIZED AND CHECKED TO CONFIRM THAT THE SYSTEM IS DE-ENERGIZED. POTENTIALLY-FATAL ELECTRICAL SHOCKS CAN OCCUR IF CONTACT IS MADE WITH LIVE ELECTRICAL CONDUCTORS. Alternately, Helix Environmental, Inc. can return to the site after the electrical system has been confirmed to be fully de-energized to collect samples of assumed electrical system components. The following assumed asbestos-containing electrical insulation materials were identified in the building:

- Electrical Insulators on Circuit Breakers, Safety Switches and Switch Gear in the Basement Hallway, on the Northeast, East, and West Walls (20 SF)
- Electrical Insulators on Circuit Breakers, Safety Switches and Switch Gear in the 1st Floor Bicycle Garage, on the Northeast and East Walls (14 SF)
- Electrical Insulators on Safety Switches on 1st Floor, Northeast Evidence Garage, Northeast Hallway, Inactive Air Handler (0.25 SF)
- Electrical Insulators on Safety Switches on Rooftop Air Handlers (3, 0.75 SF)
- Electrical Insulators on Safety Switches on Exterior, North Central Area Air Handler (0.25 SF)

Several materials were found to be less than 1%, confirmed using the EPA 400 point counting method.

- Drywall Joint Compound, Throughout the Building (Approximately 2,600 SF, confirmed to be between 0.75% asbestos and non-detectable)
- White Sealant on Canvas Jacket, 1st Floor, Northeast Evidence Garage, Northeast Hallway, On Inactive HVAC Unit (400 SF, confirmed to be between 0.4% asbestos and non-detectable)

Materials with less than 1% asbestos should be removed using wet methods and HEPA filtered vacuum cleaners, according to OSHA regulations. All waste from materials

confirmed to contain less than 1% should also be promptly cleaned and placed in leak-tight containers.

Other sampled suspect materials were found to contain no detectable asbestos. No special asbestos requirements are necessary for their removal and disposal.

Current Federal and State regulations require special asbestos abatement procedures prior to building demolition that will disturb confirmed or assumed friable or potentially-friable asbestos-containing materials. Helix Environmental, Inc. recommends that the identified asbestos-containing materials be removed using a licensed asbestos abatement contractor. Helix Environmental, Inc. also strongly recommends that the abatement work be competitively bid using specifications developed by a licensed Asbestos Project Designer to ensure that the regulatory requirements are met by the contractor and that the work is properly documented in the event of future legal action.

Trained workers and supervisors certified by the Ohio EPA must be used to remove the identified asbestos-containing building materials using special procedures and protective equipment to ensure that the workers are not overexposed to airborne asbestos. Advance notification must be provided to both the Regional Air Pollution Control Agency and the Ohio EPA at least ten working days in advance of the start of abatement on site. The fact that asbestos-containing materials were observed in or on the building should be noted on the demolition notification form along with the name and certification number of the inspectors (Mr. Benjamin Froehlich, Ohio Certification Cert. No. ES34739).

Additional suspect asbestos-containing materials may be hidden in uninspected or inaccessible locations, such as pipe chases, duct chases or wall cavities. If any additional suspect materials are encountered in these locations, they should be kept intact and undisturbed until they can be inspected and sampled by a licensed Asbestos Hazard Evaluation Specialist. Helix Environmental, Inc. will also be happy to return to the site if additional suspect materials are encountered during the renovation.

Other potential environmental issues may also be present in the renovation area, including mercury-containing materials, suspect PCB-containing fluorescent light ballasts, and Freon®-containing refrigerants.

Mercury-containing fluorescent light bulbs in the building have sufficient concentrations of mercury to be considered universal hazardous waste. Batteries associated with emergency lighting may also contain mercury, and are considered to be universal hazardous waste. These universal waste materials should be carefully removed from the building and recycled in accordance with current regulations.

Fluorescent light ballasts were made with PCBs until 1979. Ballasts made after that date are required to be marked with the legend "No PCBs". Given the age of the building, PCB-containing fluorescent light ballasts and other PCB-containing electrical capacitors and transformers may be present in the building, and each ballast, capacitor or transformer should be examined to determine if it is labeled "No PCBs". If necessary, ballasts, capacitors and transformers that are not so labeled should be carefully removed from the building and packaged and labeled for recycling or incineration in accordance with current regulations.

Refrigerated cooling systems in the building, including water coolers, window air-conditioners, and refrigerators, typically contain Freon® refrigerants that must be recovered by licensed refrigerant recycler if removed, in accordance with current regulations. No unauthorized venting of Freon® refrigerants to the atmosphere is permitted under current regulations, since these materials deplete the stratospheric ozone layer (Ozone Depleting Substances). No refrigerants were observed in the elevator renovation areas.

Finally, no significant accumulations of hazardous waste were observed during the building inspection that could require special remediation, although small amounts of maintenance and custodial chemicals including interior paint and oils were observed in the renovation areas. It was assumed that the identified maintenance and custodial chemicals present in the renovation areas will be relocated for use during normal custodial and maintenance operations. If not, then these materials may need to be labeled, packaged and transported to a licensed hazardous waste Treatment, Storage and Disposal site in compliance with federal and state hazardous waste regulations.

The results of this inspection can only reflect the condition of the property at the date and time of the site visit within the limits of the proposed work. There are limitations to asbestos inspections without dismantling or destroying the building or its systems. No inspection was performed in inaccessible locations. Recommendations are based on the professional judgment of the inspectors, and the results of the samples collected and analyzed. Helix Environmental, Inc. and its

Mr. Andrew Marks, PE

May 24, 2024

Page 27

agents are neither responsible nor liable for the non-discovery of any defects in materials, craftsmanship, or other conditions, or any problems that may be discovered or manifest after the site visit date and time. Helix Environmental, Inc. and its agents make no warranty, expressed or implied, and accept no liability for the presence absence of asbestos or other hazardous materials in or on building products, materials, or areas. Helix Environmental, Inc. and its agents assume no responsibility for the cost of repairing, replacing, or removing any undiscovered or unreported condition or defect, or any future condition or defect.

If you have any questions or comments concerning the inspection or analytical results, please call me at (937) 226-0650.

Sincerely,

HELIX ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'R. Froehlich', written over the company name.

Ralph A. Froehlich, CIH, CSP, QEP
President
Attach.

Mr. Andrew Marks, PE

May 24, 2024

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ATTACHMENTS

- **PHOTOGRAPHS**
- **SAMPLE MAPS**
- **ANALYTICAL RESULTS AND SAMPLE DATA SHEETS**



Photo 01- Sample# 7200-05-30-01, No Asbestos in Hard Plaster on Wire Lath



Photo 02- Sample# 7200-05-30-02, No Asbestos in Drywall and Joint Compound



Photo 03- Sample# 7200-05-30-03, No Asbestos in Hard Plaster on Wire Lath



Photo 04- Sample# 7200-05-30-04, No Asbestos in Drywall and Joint Compound



Photo 05- Sample# 7200-05-30-05, No Asbestos in Hard Plaster on Gypsum Lath



Photo 06- Sample# 7200-05-30-07, No Asbestos in Hard Plaster on Gypsum Lath



Photo 07- Sample# 7200-05-30-08, 5% Chrysotile Asbestos in Tan Floor Tile, 2% Chrysotile Asbestos in Black Mastic



Photo 08- Sample# 7200-05-30-09, 5% Chrysotile Asbestos in Tan Floor Tile, <1% Chrysotile Asbestos in Black Mastic



Photo 09- Sample# 7200-05-30-10, No Asbestos Detected in Faux Wood Stick on Floor Tile



Photo 10- Sample# 7200-05-30-11, No Asbestos Detected in Fibrous Debris-Cardboard



Photo 11- Sample# 7200-05-30-12, No Asbestos Detected in Faux Wood Stick on Floor Tile



Photo 12- Sample# 7200-05-30-13, No Asbestos Detected in Hard Plaster on Wire Lath



Photo 13- Sample# 7200-05-30-14, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 14- Sample# 7200-05-30-15, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 15- Sample# 7200-05-30-16, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 16- Sample# 7200-05-30-17, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 17- Sample# 7200-05-30-19, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 18- Sample# 7200-05-30-20, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 19- Sample# 7200-05-30-21, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 20- Sample# 7200-05-30-22, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 21- Sample# 7200-05-30-23, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 22- Sample# 7200-06-20-01, No Asbestos Detected in Tan Carpet Mastic, Asbestos Floor Tile Beneath



Photo 23- Sample# 7200-06-20-02, No Asbestos Detected in Tan Carpet Mastic, Asbestos Floor Tile Beneath



Photo 24- Sample# 7200-06-20-03, No Asbestos Detected in 12"x12" Aqua Floor Tile or Black Mastic, Asbestos Floor Tile Beneath



Photo 25- Sample# 7200-06-20-04, No Asbestos Detected in 12"x12" Aqua Floor Tile, <1% Asbestos in Black Mastic



Photo 26- Sample# 7200-06-20-05, No Asbestos Detected in 12"x12" Blue Floor Tile, <1% Asbestos in Black Mastic, Asbestos Floor Tile Beneath



Photo 27- Sample# 7200-06-20-06, No Asbestos Detected in 12"x12" Blue Floor Tile, <1% Asbestos in Black Mastic, Asbestos Floor Tile Beneath



Photo 28- Confirmed 9" x 9" Asbestos Floor Tile Under Most of the Floors in the Building



Photo 29- Basement, Northeast Hallway, Former Boiler, No Destructive Inspection Performed



Photo 30- Basement, NE Hallway, North Wall, Central Area, All Electrical Insulators are Assumed to Contain Asbestos



Photo 32- 1st Floor, Bicycle Garage, North Wall, NE Corner, All Electrical Insulators are Assumed to Contain Asbestos



Photo 33- Basement, Southeast Tunnel, Uninsulated Ductwork



Photo 34- Basement, Southeast Tunnel, Fiberglass Insulated Hot Water Heater



Photo 31- Basement, NE Hallway, West Wall, North Central Area, All Electrical Insulators are Assumed to Contain Asbestos



Photo 35- 1st Floor, East Office Area, Hard Plaster on Wire Lath above Ceiling Tile Throughout, No Access to Attic



Photo 36- Exterior, South Side, Southeast Area



Photo 37- Sample# 7277-04-05-01, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 38- Sample# 7277-04-05-02, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 39- Sample# 7277-04-05-03, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 40- Sample# 7277-04-05-04, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 41- Sample# 7277-04-05-05, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 42- Sample# 7277-04-05-06, No Asbestos Detected in Hard Plaster and Skim Coat

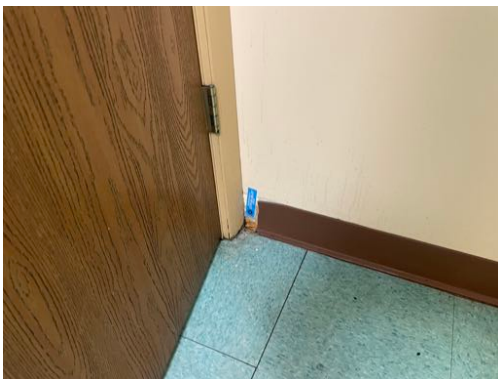


Photo 43- Sample# 7277-04-05-07, No Asbestos Detected in Cove Base and Mastic



Photo 44- Sample# 7277-04-05-08, No Asbestos Detected in Cove Base and Mastic

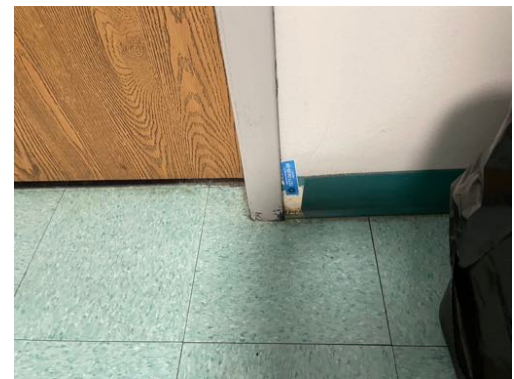


Photo 45- Sample# 7277-04-05-09, No Asbestos Detected in Cove Base and Mastic



Photo 46- Sample# 7277-04-05-10, No Asbestos Detected in Cove Base and Mastic



Photo 47- Sample# 7277-04-05-11, No Asbestos Detected in Sink Soundproofing



Photo 48- Sample# 7277-04-05-12, No Asbestos Detected in Sink Soundproofing

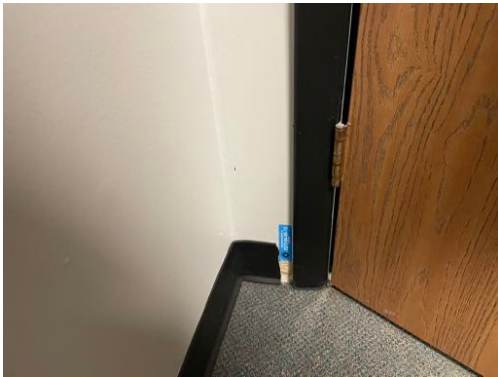


Photo 49- Sample# 7277-04-05-13, No Asbestos Detected in Cove Base and Mastic

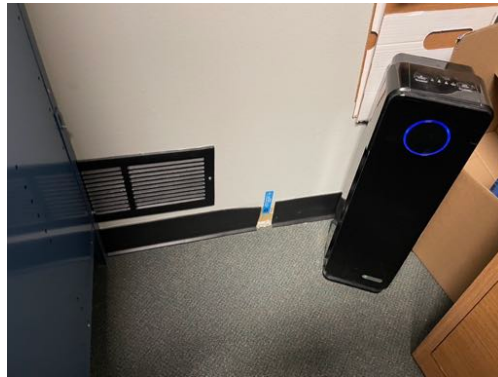


Photo 50- Sample# 7277-04-05-14, No Asbestos Detected in Cove Base and Mastic

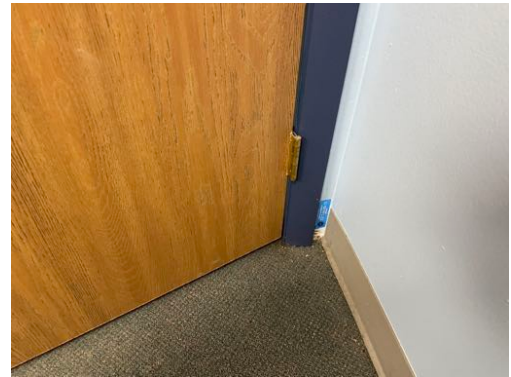


Photo 51- Sample# 7277-04-05-15, No Asbestos Detected in Cove Base and Mastic

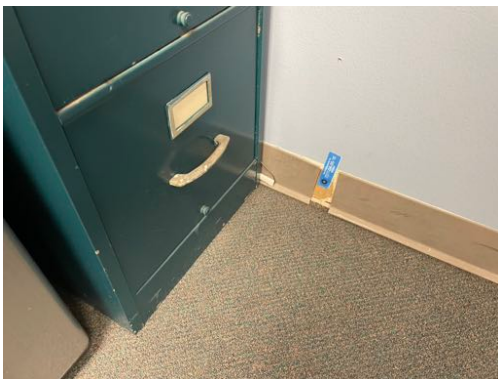


Photo 52- Sample# 7277-04-05-16, No Asbestos Detected in Cove Base and Mastic

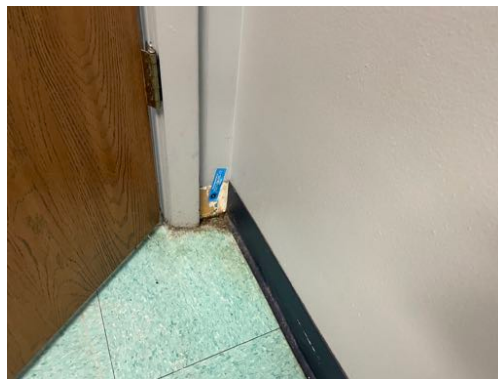


Photo 53- Sample# 7277-04-05-17, No Asbestos Detected in Cove Base and Mastic



Photo 54- Sample# 7277-04-05-18, No Asbestos Detected in Cove Base and Mastic



Photo 55- Sample# 7277-04-05-19, No Asbestos Detected in Cove Base and Mastic

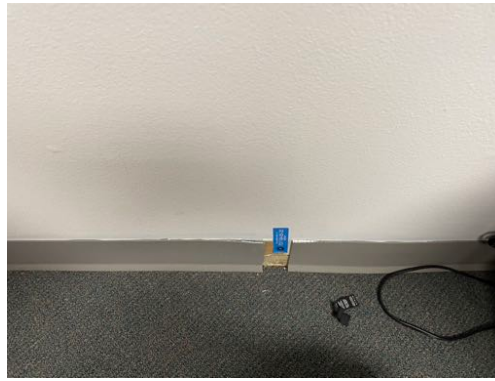


Photo 56- Sample# 7277-04-05-20, No Asbestos Detected in Cove Base and Mastic



Photo 57- Sample# 7277-04-05-21, No Asbestos Detected in Cove Base and Mastic



Photo 58- Sample# 7277-04-05-22, No Asbestos Detected in Cove Base and Mastic



Photo 59- Sample# 7277-04-05-23, 0.25% Chrysotile Asbestos in Joint Compound, No Asbestos in Drywall



Photo 60- Sample# 7277-04-05-24, 0.5% Chrysotile Asbestos in Joint Compound, No Asbestos in Drywall



Photo 61- Sample #7277-04-16-01, No Asbestos Detected in Ceiling Tile



Photo 62- Sample #7277-04-16-02, No Asbestos Detected in Ceiling Tile



Photo 63- Sample #7277-04-16-03, 0.75% Asbestos in Joint Compound, No Asbestos Detected in Drywall



Photo 64- Sample #7277-04-16-04, 10% Chrysotile Asbestos Detected in Black Insulation Sealant

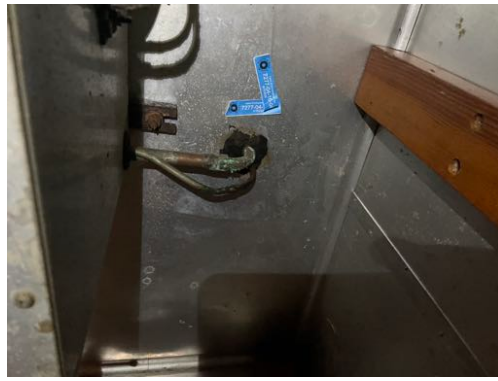


Photo 65- Sample #7277-04-16-05, 10% Chrysotile Asbestos Detected in Black Insulation Sealant



Photo 66- Sample #7277-04-16-06, No Asbestos Detected in White Sealant on Canvas



Photo 67- Sample #7277-04-16-07, 0.4% Chrysotile Asbestos Detected in White Sealant on Canvas



Photo 68- Sample #7277-04-16-08, No Asbestos Detected in Vibration Isolator Cloth



Photo 69- Sample #7277-04-16-09, No Asbestos Detected in Flooring



Photo 70- Sample #7277-04-16-10, No Asbestos Detected in Vibration Isolator Cloth



Photo 71- Sample #7277-04-16-11, No Asbestos Detected in Flooring



Photo 72- Sample #7277-04-16-12, No Asbestos Detected in Cove Base and Mastic



Photo 73- Sample #7277-04-16-13, No Asbestos Detected in Cove Base and Mastic



Photo 74- Sample #7277-04-16-14, 2.2% Chrysotile Asbestos Detected in Grey Exterior Caulk



Photo 75- Sample #7277-04-16-15, 3% Chrysotile Asbestos Detected in Grey Exterior Caulk



Photo 76- Sample #7277-04-16-16, No Asbestos Detected in Grey Duct Sealant



Photo 77- Sample #7277-04-16-17, No Asbestos Detected in Grey Duct Sealant



Photo 78- Sample #7277-04-24-01, No Asbestos Detected in Grey Roofing Sealant



Photo 79- Sample #7277-04-24-02, No Asbestos Detected in Grey Roofing Sealant



Photo 80- Sample #7277-04-24-03, No Asbestos Detected in Grey Electrical Sealant



Photo 81- Sample #7277-04-24-04, No Asbestos Detected in Grey Electrical Sealant

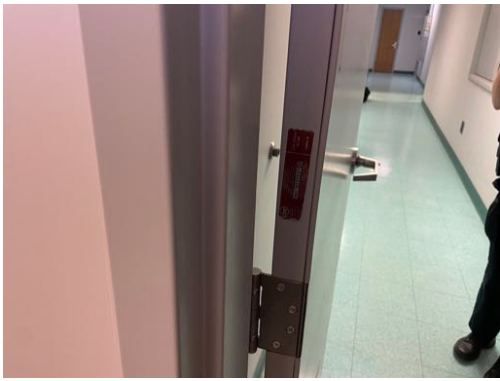


Photo 82- Fire Door to Evidence Garage is Assumed to Contain Asbestos



Photo 83- Bituminous Roofing is Assumed to be Category II Nonfriable Asbestos



Photo 84- Electrical Insulators in Electric Safety Switches are Assumed to Contain Asbestos



Photo 85- Electrical Insulators in Electric Safety Switches are Assumed to Contain Asbestos



Photo 86- Rooftop Air Handler, Inside of Ductwork, Fiberglass Insulation, No Vibration Isolator Cloth



Photo 87- Rooftop Air Handler, Inside Fiberglass Insulation



Photo 88- Rooftop Air Handler, Inside Fiberglass Insulation



Photo 89- 1st Floor, Inside of NE Inactive HVAC Unit in Evidence Garage



Photo 90- NE Evidence Cooler, Foam Insulation inside of Walk-in Coolers



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/9/2024

Project Name: 417 East Helena Street

Project #: 7277

SanAir ID#: 24019666



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24019666

FINAL REPORT

4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 24 sample(s) were received on Monday, April 08, 2024 via UPS. The final report(s) is enclosed for the following sample(s): 7277-04-05-01, 7277-04-05-02, 7277-04-05-03, 7277-04-05-04, 7277-04-05-05, 7277-04-05-06, 7277-04-05-07, 7277-04-05-08, 7277-04-05-09, 7277-04-05-10, 7277-04-05-11, 7277-04-05-12, 7277-04-05-13, 7277-04-05-14, 7277-04-05-15, 7277-04-05-16, 7277-04-05-17, 7277-04-05-18, 7277-04-05-19, 7277-04-05-20, 7277-04-05-21, 7277-04-05-22, 7277-04-05-23, 7277-04-05-24.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino".

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 24 samples in Good condition.



SanAir ID Number
24019666
FINAL REPORT
4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Analyst: Magalis, Lane

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-01 / 24019666-001 Hard Plaster And Skim Coat 1st Fl, Reception Office, East, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-01 / 24019666-001 Hard Plaster And Skim Coat 1st Fl, Reception Office, East, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-02 / 24019666-002 Hard Plaster And Skim Coat 1st Fl, Roll Call Room, NE, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-02 / 24019666-002 Hard Plaster And Skim Coat 1st Fl, Roll Call Room, NE, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-03 / 24019666-003 Hard Plaster And Skim Coat 1st Fl, East Office Area, SW, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-03 / 24019666-003 Hard Plaster And Skim Coat 1st Fl, East Office Area, SW, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-04 / 24019666-004 Hard Plaster And Skim Coat 1st Fl, East Office Area, West, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-04 / 24019666-004 Hard Plaster And Skim Coat 1st Fl, East Office Area, West, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-05 / 24019666-005 Hard Plaster And Skim Coat 1st Fl, East Office Area, S., Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-05 / 24019666-005 Hard Plaster And Skim Coat 1st Fl, East Office Area, S., Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: 

Approved Signatory: 

Analysis Date: 4/9/2024

Date: 4/9/2024



SanAir ID Number
24019666
FINAL REPORT
4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Analyst: Magalis, Lane

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-06 / 24019666-006 Hard Plaster And Skim Coat 1st Fl, East Office Area, East, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-05-06 / 24019666-006 Hard Plaster And Skim Coat 1st Fl, East Office Area, East, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-07 / 24019666-007 4" Cove Base & Mastic Reception Area, N Of Entrance, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-07 / 24019666-007 4" Cove Base & Mastic Reception Area, N Of Entrance, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-08 / 24019666-008 4" Cove Base & Mastic Reception Area, SE Desk Area, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-08 / 24019666-008 4" Cove Base & Mastic Reception Area, SE Desk Area, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-09 / 24019666-009 4" Cove Base & Mastic SW Hall By Door To Sgt. Randy Office, Cove Base	Green Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-09 / 24019666-009 4" Cove Base & Mastic SW Hall By Door To Sgt. Randy Office, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-10 / 24019666-010 4" Cove Base & Mastic NW Hall By N Hall Corner, Cove Base	Green Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-10 / 24019666-010 4" Cove Base & Mastic NW Hall By N Hall Corner, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 4/9/2024

Date: 4/9/2024



SanAir ID Number
24019666
FINAL REPORT
4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Analyst: Magalis, Lane

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-11 / 24019666-011 Sink Soundproofing Roll Call Room, SE Corner Under SS Sink	White Non-Fibrous Heterogeneous	20% Cellulose	80% Other	None Detected
7277-04-05-12 / 24019666-012 Sink Soundproofing Roll Call Room, SE Corner Under SS Sink	White Non-Fibrous Heterogeneous	20% Cellulose	80% Other	None Detected
7277-04-05-13 / 24019666-013 Cove Base & Mastic 4" Sgt. Staples Office, NE Corner Behind, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-13 / 24019666-013 Cove Base & Mastic 4" Sgt. Staples Office, NE Corner Behind, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-14 / 24019666-014 Cove Base & Mastic 4" Sgt Staples Office, E Wall Center, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-14 / 24019666-014 Cove Base & Mastic 4" Sgt Staples Office, E Wall Center, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-15 / 24019666-015 Cove Base & Mastic 4" Sgt. Cash Office, NE Corner Behind, Cove Base	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-15 / 24019666-015 Cove Base & Mastic 4" Sgt. Cash Office, NE Corner Behind, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-16 / 24019666-016 Cove Base & Mastic 4" Sgt. Cash Office, S Center Wall, Cove Base	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-16 / 24019666-016 Cove Base & Mastic 4" Sgt. Cash Office, S Center Wall, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 4/9/2024

Date: 4/9/2024



SanAir ID Number
24019666
FINAL REPORT
4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Analyst: Magalis, Lane

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-17 / 24019666-017 Cove Base & Mastic 4" Roll Call Room, SW Corner Behind Door, Cove Base	Blue Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-17 / 24019666-017 Cove Base & Mastic 4" Roll Call Room, SW Corner Behind Door, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-18 / 24019666-018 Cove Base & Mastic 4" Break Room, N Of Door To Exercise Room, Cove Base	Blue Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-18 / 24019666-018 Cove Base & Mastic 4" Break Room, N Of Door To Exercise Room, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-19 / 24019666-019 4" Cove Base & Mastic Sgt. Gross Office, SW Behind Door, Cove Base	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-19 / 24019666-019 4" Cove Base & Mastic Sgt. Gross Office, SW Behind Door, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-20 / 24019666-020 4" Cove Base & Mastic Sgt. Gross Office, E Wall Center At, Cove Base	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-20 / 24019666-020 4" Cove Base & Mastic Sgt. Gross Office, E Wall Center At, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-21 / 24019666-021 4" Cove Base & Mastic Men's Locker Room, NE Behind Door, Cove Base	Blue Non-Fibrous Homogeneous		100% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 4/9/2024

Date: 4/9/2024



SanAir ID Number
24019666
FINAL REPORT
4/9/2024 9:22:33 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/8/2024 10:40:00 AM

Analyst: Magalis, Lane

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-21 / 24019666-021 4" Cove Base & Mastic Men's Locker Room, NE Behind Door, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-22 / 24019666-022 4" Cove Base & Mastic Men's Restroom, W Wall S Of Door, Cove Base	Blue Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-22 / 24019666-022 4" Cove Base & Mastic Men's Restroom, W Wall S Of Door, Mastic	Beige Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-05-23 / 24019666-023 Drywall And Joint Compound 1st Fl, East Office Area, S., Drywall	White Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7277-04-05-23 / 24019666-023 Drywall And Joint Compound 1st Fl, East Office Area, S., Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	< 1% Chrysotile
7277-04-05-24 / 24019666-024 Drywall And Joint Compound 1st Fl, East Office Area, E., Drywall	White Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7277-04-05-24 / 24019666-024 Drywall And Joint Compound 1st Fl, East Office Area, E., Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	< 1% Chrysotile

Analyst:

Approved Signatory:

Analysis Date: 4/9/2024

Date: 4/9/2024

Disclaimer

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, po number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute nor shall not be used by the client to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agencies. Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations

National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075, LA-0084
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, Certificate #05088

HELIXXXXXX

ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO ☒

LABORATORY: SWA
DATE SAMPLED: 4/15/24
DATE REQUIRED: 24th DAY
JOB NO./LOCATION: 7277
CLIENT: City of Dayton
BUILDING: 419 East Highland Street
INSPECTOR: B. French
JOB NUMBER: 7277

24019666

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Asbestos PGM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRABLE/ NON	CONDITION	COMMENTS
7277-04-05-01		1st Fl, Reception office, East wall, Carter, 8.5 ft	Hard Plaster and skim coat	N	F	
7277-04-05-02		1st Fl, Roll Room, Mechanical Area, on ceiling, 12.5 ft	Hard Plaster and skim coat	N	F	Full cavity
7277-04-05-03		1st Fl, East office Area, SW Hallway, Above ceiling, on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7277-04-05-04		1st Fl, East office Area, West end of break room, West end of Area, above CT on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7277-04-05-05		1st Fl, East office Area, 5. Central hallway, Carter, Above ceiling, on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7277-04-05-06		1st Fl, East office Area, East end of hallway, Above CT, on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7277-04-05-07	30 SF (90 LF)	Reception Area, N of Entrance	4" Brown Lime Base & Masonic	N	G	
7277-04-05-08		Reception Area, SE West end	4" Brown Lime Base & Masonic	N	G	
7277-04-05-09		SW Hall by doors to 3rd Fl, Office Area, 0.4 ft	4" Brown Lime Base & Masonic	N	G	170 SF
7277-04-05-10		SW Hall by N Hall corner	4" Brown Lime Base & Masonic	N	G	
7277-04-05-11	5 SF	Roll Call Room, SE corner under SS sink	4" Brown Lime Base & Masonic	N	G	
7277-04-05-12		Roll Call Room, SE corner under SS sink	4" Brown Lime Base & Masonic	N	G	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by: <u>B. French</u>	Company: <u>Helix Env., Inc.</u>	Date/Time: <u>4/15/24 18:00</u>	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: <u>GR</u>	Company:	Date/Time: <u>4/18/24 10:30 a.m.</u>	REC'D 4	Relinquished by:	Company:	Date/Time:



1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helikx@helikxenv.com

RUSH - YES OR (NO)

LABORATORY: 5m AR
DATE SAMPLED: 4/15/24
DATE REQUIRED: 24 HR THT
JOB NO./LOCATION: 7217
CLIENT: City of Dayton
BUILDING: 417 East Highland Street
INSPECTOR: B. French
JOB NUMBER: 7217

24019666

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Absorbers, PCM

HEX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRAGILE/ NON	CONDITION	COMMENTS
7217-04-05-13	365F (120 LB)	Sgt. Staples Office, NE Corner behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-14	()	Sgt. Staples Office, E Wall Corner off 8th & Masonic	9" DE Brown Cone Base	N	G	
7217-04-05-15	205F (40 LB)	Sgt. Cash Office, NE Corner behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-16	()	Sgt. Cash Office, S Corner behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-17	150F (40 LB)	Roll Call Room, SW Corner behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-18	()	Break Room, N of Door to Exercise Room	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-19	50F (150 LB)	Sgt. Gross Office, SW behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-20	()	Sgt. Gross Office, E Wall Corner off 8th & Masonic	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-21	40F (120 LB)	Sgt. Gross Office, NE behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-22	()	Men's Restroom, W Wall behind door	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-23	()	1st Fl. East Office Area, S. Central Hallway, above CT	2" Brown Cone Base 9" DE Brown Cone Base	N	G	
7217-04-05-24	()	1st Fl. East Office Area, E. Central Hallway, above CT	2" Brown Cone Base 9" DE Brown Cone Base	N	G	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by: <u>B. French</u>	HEX ENV, INC.	Date/Time: <u>4/15/24 15:00</u>	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: <u>CDR</u>	Company:	Date/Time: <u>4/15/24 10:40</u>	REC'D 4	Relinquished by:	Company:	Date/Time:



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/11/2024

Project Name: 417 East Helena Street

Project #: 7277

SanAir ID#: 24019871



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24019871

FINAL REPORT

4/11/2024 10:46:45 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/9/2024 11:35:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 2 sample(s) were received on Tuesday, April 09, 2024 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7277-04-05-23, 7277-04-05-24.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino".

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 2 samples in Good condition.



SanAir ID Number
24019871
FINAL REPORT
4/11/2024 10:46:45 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/5/2024
Received Date: 4/9/2024 11:35:00 AM

Analyst: Magalis, Lane

Asbestos Bulk EPA PLM 400 Point Count

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-05-23 / 24019871-001 Drywall and Joint Compound, 1st Fl, East Office Area, JC	Off-White Non-Fibrous Homogeneous		99.75% Other	0.25% Chrysotile
7277-04-05-24 / 24019871-002 Drywall and Joint Compound, 1st Fl, East Office Area, JC	Off-White Non-Fibrous Homogeneous		99.5% Other	0.5% Chrysotile

Analyst: 
Analysis Date: 4/11/2024

Approved Signatory: 
Date: 4/11/2024

Disclaimer and Additional Information

400 Point Count Method EPA 600/R-93/116

EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure, additions, exclusions, method deviations and information provided to the laboratory by the client. When client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, purchase order number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start - stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute and shall not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agency. Samples are held for a period of 60 days.

Asbestos Accreditations

National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075, LA-0084
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, Certificate #05088

Revision Date: 5/10/2023

24019871

FW: Analysis Report for Job 24019666 is complete.

IAQ Forward <iaq@sanair.com>

Tue 4/9/2024 11:35 AM

To: AsbestosVA <AsbestosVA@sanair.com>; AsbestosOH <AsbestosOH@sanair.com>; Login <Login@sanair.com>

-Erin

From: Benjamin Froehlich <bfroehlich@helixenv.com>

Sent: Tuesday, April 9, 2024 11:29 AM

To: IAQ Forward <iaq@sanair.com>; Sandra C. Sobrino <ssobrino@sanair.com>

Subject: Re: Analysis Report for Job 24019666 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Sandra,

May I have 2 day turn-around point counts (ABEPA, EPA PLM 400 Point Count) of the following samples?

7277-04-05-23 / 24019666-023, Joint Compound only

7277-04-05-24 / 24019666-024, Joint Compound only

Thanks,
Ben Froehlich
Helix Environmental, Inc.
(937) 226-0650

On Apr 9, 2024, at 9:22 AM, SanAir Technologies Laboratory <iaq@sanair.com> wrote:

Your Analysis is complete. Your report in PDF format is attached. Information is periodically added to our additional information and disclaimer pages so please check them for updates.

Thank you for your continued business, SanAir

The information in this message may contain confidential information intended for use by the recipient only. If this information was received in error, please reply to the message and delete it.

<24019666_417 East Helena Street_20244992233.pdf>

RMB APR 09 2024 11:35am

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR **(NO)**

LABORATORY: San Ar
DATE SAMPLED: 4/31/24
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7217
CLIENT: City of Dayton
BUILDING: 419 East Helena Street
INSPECTOR: B. French
JOB NUMBER: 7217

24069871
24069666

BULK SAMPLE DATA SHEET

ANALYSIS REQUESTED: Asbestos PLM

HELM SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FINABLE/ NON	CONDITION	COMMENTS
7217-04-05-01		1st Fl, Reception Office, East wall, Canteen, 8.5 ft	Hard Plaster and skim coat	N	F	
7217-04-05-02		1st Fl, Roll Room, NE Central Area, on Ceiling, 12.5 ft	Hard Plaster and skim coat	N	F	Full ceiling
7217-04-05-03		1st Fl, East Office Area, SW Hallway, Above ceiling, the on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7217-04-05-04		1st Fl, East Office Area, West Central Brake Room, West Central Area, Above CT on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7217-04-05-05		1st Fl, East Office Area, S. Central Hallway, 13 ft	Hard Plaster and skim coat	N	F	
7217-04-05-06		1st Fl, East Office Area, East Central Hallway, Above CT, on ceiling, 13 ft	Hard Plaster and skim coat	N	F	
7217-04-05-07	30.5F (90 LF)	Reception Area, NW of Entrance	4" Brown Lamin Base & Mastie	N	G	
7217-04-05-08		Reception Area, SE Desk Area	4" Brown Lamin Base & Mastie	N	G	
7217-04-05-09		SW Hall by doors to 3rd Party Office	4" Brown Lamin Base & Mastie	N	G	170.5F
7217-04-05-10		NW Hall by NW Hall corner	4" Brown Lamin Base & Mastie	N	G	
7217-04-05-11	5.5F	Roll Call Room, SE corner under SS Sink	1.5" Green Sun & Sun-Proofing	N	G	
7217-04-05-12		Roll Call Room, SE corner under SS Sink	1.5" Green Sun & Sun-Proofing	N	G	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Received by: <u>B. French</u>	Company: <u>Helix Env, Inc.</u>	Date/Time: <u>4/30/24 10:40 a.m.</u>	REC'D 3	Retained by:	Company:	Date/Time:
REC'D 2	Received by: <u>GR</u>	Company:	Date/Time:	REC'D 4	Released by:	Company:	Date/Time:

HELIKORON ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
 Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

JOB NO./LOCATION:

LABORATORY: 300 AN
 DATE SAMPLED: 4/5/24
 DATE REQUIRED: 24 APR 2024

24019871
 24019666

CLIENT: City of Dayton
 BUILDING: 417 East Helena Street
 INSPECTOR: B. French
 JOB NUMBER: 7217

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Asbestos: PLM

HELIKORON ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FILABLE/ NON	CONDITION	COMMENTS
7217-04-05-13	3.55F (20 LB)	Sgt. Staples Office, NE Corner behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-14	—	Sgt. Staples Office, E Wall Corner	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-15	20.5F (40 LB)	Sgt. Cash Office, NE Corner behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-16	—	Sgt. Cash Office, S Corner behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-17	15.0F (40 LB)	Roll Call Room, SW Corner behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-18	—	Break Room, N of Door to Exercise Room	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-19	30.5F (120 LB)	Sgt. Gross Office, SW behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-20	—	Sgt. Gross Office, E Wall	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-21	40.5F (120 LB)	Men's Locker Room, NE behind door	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-22	—	Men's Restroom, N of Wall	DE Asbestos Base Fiberglass DE Asbestos Base	N	G	
7217-04-05-23	—	At E, East Office Area, S. Central Hallway, Room 417	DE Asbestos Base Fiberglass DE Asbestos Base	N	F	
7217-04-05-24	—	At E, East Office Area, E. Central Hallway, Room 417	DE Asbestos Base Fiberglass DE Asbestos Base	N	F	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

RECEIVED BY: <u>Helix Env, Inc.</u>	DATE/TIME: <u>4/5/24 8:00</u>	RECEIVED BY: <u>Helix Env, Inc.</u>	DATE/TIME: <u>4/5/24 10:40</u>
RECEIVED BY: <u>Helix Env, Inc.</u>	DATE/TIME: <u>4/5/24 10:40</u>	RECEIVED BY: <u>Helix Env, Inc.</u>	DATE/TIME: <u>4/5/24 10:40</u>



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/18/2024

Project Name: 419 East Helena Street

Project #: 7277

SanAir ID#: 24021509



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24021509

FINAL REPORT

4/18/2024 12:22:36 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/17/2024 10:25:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 17 sample(s) were received on Wednesday, April 17, 2024 via UPS. The final report(s) is enclosed for the following sample(s): 7277-04-16-01, 7277-04-16-02, 7277-04-16-03, 7277-04-16-04, 7277-04-16-05, 7277-04-16-06, 7277-04-16-07, 7277-04-16-08, 7277-04-16-10, 7277-04-16-09, 7277-04-16-11, 7277-04-16-12, 7277-04-16-13, 7277-04-16-14, 7277-04-16-15, 7277-04-16-16, 7277-04-16-17.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino".

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 17 samples in Good condition.



SanAir ID Number
24021509
FINAL REPORT
4/18/2024 12:22:36 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

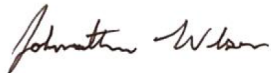
Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/17/2024 10:25:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-16-01 / 24021509-001 2'x4' Ceiling Tile, Gypsum 1st Fl, Bomb Squad Room, S Center	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7277-04-16-02 / 24021509-002 2'x4' Ceiling Tile, Gypsum 1st Fl, Bomb Squad Room, W Wall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7277-04-16-03 / 24021509-003 Drywall & Joint Compound 1st Fl, Bomb Squad Room, W Wall, Drywall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7277-04-16-03 / 24021509-003 Drywall & Joint Compound 1st Fl, Bomb Squad Room, W Wall, Joint Compound	White Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7277-04-16-04 / 24021509-004 Insulation 1st Fl, Evidence Garage, South Cooler SE Corner	Black Non-Fibrous Homogeneous		90% Other	10% Chrysotile
7277-04-16-05 / 24021509-005 Insulation 1st Fl, Evidence Garage, South Cooler SE Corner	Black Non-Fibrous Homogeneous		90% Other	10% Chrysotile
7277-04-16-06 / 24021509-006 Canvas Jacket On Duct & Sealant 1st Fl, Evidence Garage, NE, Jacket	Tan Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
7277-04-16-06 / 24021509-006 Canvas Jacket On Duct & Sealant 1st Fl, Evidence Garage, NE, Sealant	White Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-07 / 24021509-007 Canvas Jacket On Duct & Sealant 1st Fl, Evidence Garage, Jacket	Tan Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
7277-04-16-07 / 24021509-007 Canvas Jacket On Duct & Sealant 1st Fl, Evidence Garage, Sealant	White Non-Fibrous Homogeneous		97% Other	3% Chrysotile

Analyst: 

Approved Signatory: 

Analysis Date: 4/18/2024

Date: 4/18/2024



SanAir ID Number
24021509
FINAL REPORT
4/18/2024 12:22:36 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

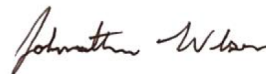
Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/17/2024 10:25:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-16-08 / 24021509-008 Cloth Vibration Isolation 1st Fl, Evidence Garage	Grey Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
7277-04-16-10 / 24021509-009 Cloth Vibration Isolation 1st Fl, Evidence Garage	Grey Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
7277-04-16-09 / 24021509-010 4"x48" Luxury Vinyl Flooring 1st Fl, W Garage, Men's RR	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-11 / 24021509-011 4"x48" Luxury Vinyl Flooring 1st Fl, W Garage, Women's RR	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-12 / 24021509-012 Cove Base & Mastic 1st Fl, W Garage, Men's RR, Cove Base	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-12 / 24021509-012 Cove Base & Mastic 1st Fl, W Garage, Men's RR, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-13 / 24021509-013 Cove Base & Mastic 1st Fl, W Garage, Women's RR NW Corner, Cove Base	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-13 / 24021509-013 Cove Base & Mastic 1st Fl, W Garage, Women's RR NW Corner, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-14 / 24021509-014 Exterior Caulk Exterior N. W Garage Door Frame E Side	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7277-04-16-15 / 24021509-015 Exterior Caulk Exterior N, NE Stairwell Door, W Frame	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile

Analyst: 

Approved Signatory: 

Analysis Date: 4/18/2024

Date: 4/18/2024



SanAir ID Number
24021509
FINAL REPORT
4/18/2024 12:22:36 PM

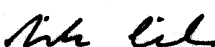
Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

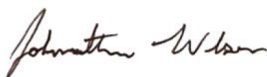
Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/17/2024 10:25:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-16-16 / 24021509-016 Duct Sealant Exterior, N, HVAC Cage on Duct	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7277-04-16-17 / 24021509-017 Duct Sealant Exterior N, HVAC Cage On Duct	Grey Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: 

Approved Signatory: 

Analysis Date: 4/18/2024

Date: 4/18/2024

Disclaimer

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, po number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute nor shall not be used by the client to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agencies. Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations

National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075, LA-0084
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, Certificate #05088

HELIXXXX

ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO

LABORATORY: San AN
DATE SAMPLED: 4/16/24
DATE REQUIRED: 24 APR 24
JOB NO./LOCATION: 7277 / Dayton, OH
CLIENT: City of Dayton
BUILDING: 419 East Helena Street
INSPECTOR: B. Freehlich, R. F. H. H.
JOB NUMBER: 7277

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Asbestos PLM

HEIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRAGILE/ NON	CONDITION	COMMENTS
7277-04-16-01	700 SF	1st Fl, Bomb Squad Room, S. Corner Ceiling at Block Wall	2'x4' Ceiling Tile, Gypsum	N	G	
7277-04-16-02	—	1st Fl, Bomb Squad Room, W. Wall Ceiling	2'x4' Ceiling Tile, Gypsum	N	G	
7277-04-16-03	—	1st Fl, Bomb Squad Room, W. Wall above Ceiling	Drywall & Joist Compounded	N	G	
7277-04-16-04	1 SF	1st Fl, Evidence Garage, South Corner SE Corner behind Collis	Black Insulation	N	F	
7277-04-16-05	—	1st Fl, Evidence Garage, South Corner SE Corner behind Collis	Black Insulation	N	F	
7277-04-16-06	100 SF	1st Fl, Evidence Garage, NE Area above Doorway	Canvas Jacket for Duct & Sealant	N	G	
7277-04-16-07	—	1st Fl, Evidence Garage, NE Area above Doorway	Canvas Jacket for Duct & Sealant	N	G	
7277-04-16-08	10 SF	1st Fl, Evidence Garage, Break Area above Ceiling	Grey Cloth Vibration Isolator	N	F	
7277-04-16-09	—	1st Fl, Evidence Garage, Break Area above Ceiling	Grey Cloth Vibration Isolator	N	F	
7277-04-16-10	100 SF	1st Fl, W. Garage, North RR, SW Corner by door	4" x 48" Luxury Vinyl Flooring	N	G	
7277-04-16-11	—	1st Fl, W. Garage, North RR, SW Corner by door	4" x 48" Luxury Vinyl Flooring	N	G	
7277-04-16-12	22 SF (66 SF)	1st Fl, W. Garage, North RR, SW Corner by door	Gray Core Base & Mastic	N	G	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by: <u>Bm Froehlich</u>	Company: <u>Helix Env, Inc.</u>	Date/Time: <u>4/16/24</u>	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: <u>12m</u>	Company:	Date/Time: <u>4/11/24</u>	REC'D 4	Relinquished by:	Company:	Date/Time:

7A021509

O/L LOCATION: 7277 / 1049 BVA, CH
CLIENT: City of Danden
BUILDING: 419 East Helena St.
INSPECTOR: B Fenech Rftnoehrick
JOB NUMBER: 7277

Hislop, RLM

REC'D 1	Relinquished by:	Company:	Date/Time:	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:
	18m		411712A				
	18m	Helix Mm, Kio	416624				



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/22/2024

Project Name: 419 East Helena Street

Project #: 7277

SanAir ID#: 24021899



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24021899

FINAL REPORT

4/22/2024 2:22:24 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/19/2024 10:05:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 3 sample(s) were received on Friday, April 19, 2024 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7277-04-16-07, 7277-04-16-14, 7277-04-16-15.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino". The signature is written in a cursive, flowing style.

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 3 samples in Good condition.



SanAir ID Number

24021899

FINAL REPORT

4/22/2024 2:22:24 PM

Name: Helix Environmental Inc

Address: 1 Elizabeth Place
Suite 160

Dayton, OH 45417

Phone: 937-226-0650

Project Number: 7277

P.O. Number:

Project Name: 419 East Helena Street

Collected Date: 4/16/2024

Received Date: 4/19/2024 10:05:00 AM

Analyst: Mayes, Jean

Asbestos Bulk EPA PLM NOB EPA 600/R-93/116

SanAir ID / Description	Appearance	% Fibrous	% Non Fibrous	Asbestos Types	% Total Asbestos
24021899-001 / 7277-04-16-07 Canvas Jacket On Duct & Sealant 1st Fl, Evidence Garage, Sealant	White Non-Fibrous Homogeneous		99.6 %	Chrysotile	0.4 %
24021899-002 / 7277-04-16-14 Exterior Caulk, Exterior N, W Garage Door Frame E Side	Grey Non-Fibrous Homogeneous		97.8 %	Chrysotile	2.2 %
24021899-003 / 7277-04-16-15 Exterior Caulk, Exterior N, NE Stairwell Door, W Frame	Grey Non-Fibrous Homogeneous		97 %	Chrysotile	3 %

EPA 400 Point Count with Gravimetric Reduction.

Analyst:

Analysis Date: 4/22/2024

Approved Signatory:

Date: 4/22/2024

Disclaimer:
Method for the Determination of Asbestos in Bulk Building Materials
EPA 600/R-93/116, July 1993
PLM EPA NOB

This report is the sole property of the client named on the SanAir Technologies Laboratory, Inc. (SanAir) chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure, additions, exclusions, method deviations and information provided to the laboratory by the client. When client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, purchase order number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start - stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. Where noted on the chain of custody, 400 point count with gravimetric reduction employed with this analysis. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute and shall not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agency. Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations.

24021899

Fw: Analysis Report for Job 24021509 is complete.

IAQ Forward <iaq@sanair.com>

Fri 4/19/2024 10:03 AM

To: AsbestosVA <AsbestosVA@sanair.com>; AsbestosOH <AsbestosOH@sanair.com>; Login <Login@sanair.com>

From: Benjamin Froehlich <bfroehlich@helixenv.com>

Sent: Friday, April 19, 2024 9:45 AM

To: IAQ Forward <iaq@sanair.com>

Cc: Sandra C. Sobrino <ssobrino@sanair.com>

Subject: Re: Analysis Report for Job 24021509 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Sandra,

May I have 48 hour turn-around on EPA PLM NOB of the following samples?:

7277-04-16-14 / 24021509-014

7277-04-16-15 / 24021509-015

Thanks,

Ben Froehlich

Helix Environmental, Inc.

(937) 226-0650

On Apr 18, 2024, at 12:22 PM, SanAir Technologies Laboratory <iaq@sanair.com> wrote:

Your Analysis is complete. Your report in PDF format is attached. Information is periodically added to our additional information and disclaimer pages so please check them for updates.

Thank you for your continued business, SanAir

The information in this message may contain confidential information intended for use by the recipient only. If this information was received in error, please reply to the message and delete it.

<24021509_419 East Helena Street_2024418122236.pdf>

RMB APR 19 2024 10:05am

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO ☒ NO

LABORATORY:

DATE SAMPLED: 4/16/24

DATE REQUIRED:

DATE REQUIRED:

JOB NO./LOCATION:

CLIENTS:

BUILDING:
INSPECTOR:

JOB NUMBER:

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

43625161

HEIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FINABLE/ NON	CONDITION	COMMENTS
7277-04-16-01	700 SF	1st F, Bomb Squad Room, S Gator Ceiling at Back Wall 12' H	2'x4' Ceiling Tie, Gypsum	N	G	
7277-04-16-02	—	1st F, Bomb Squad Room, W Wall Ceiling 12' H	2'x4' Ceiling Tie, Gypsum	N	G	
7277-04-16-03	—	1st F, Bomb Squad Room, W Wall above Ceiling 12' H	Drywall & joint compound	N	G	
7277-04-16-04	1 SF	1st F, Evidence Garage, South Corner behind Coils 8' H	Black insulation	N	F	
7277-04-16-05	—	1st F, Evidence Garage, South Corner behind Coils 8' H	Black insulation	N	F	
7277-04-16-06	400 SF	1st F, Evidence Garage, N/E Area above Doorway 8' H	Canvas Jacket for duct & Sealant	N	B	
7277-04-16-07	—	1st F, Evidence Garage, N/E Area 8' H	Canvas jacket on duct & Sealant	N	G	
7277-04-16-08	10 SF	1st F, Evidence Garage, Break Area above Ceiling 9' H	Grey Cloth V. Brown Isolator	N	F	
7277-04-16-09	—	1st F, Evidence Garage, Break Area above Ceiling 9' H	Grey Cloth V. Brown Isolator	N	F	
7277-04-16-10	—	1st F, Evidence Garage, Break Area above Ceiling 9' H	Grey Cloth V. Brown Isolator	N	F	
7277-04-16-11	160 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-12	—	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-13	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-14	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-15	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-16	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-17	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-18	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-19	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-20	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-21	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-22	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-23	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-24	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-25	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-26	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-27	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-28	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-29	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-30	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-31	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-32	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-33	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-34	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-35	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-36	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-37	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-38	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-39	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-40	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-41	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-42	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-43	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-44	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-45	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-46	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-47	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-48	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-49	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-50	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-51	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-52	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-53	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-54	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-55	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-56	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-57	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-58	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-59	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-60	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-61	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-62	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-63	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-64	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-65	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-66	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-67	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-68	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-69	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-70	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-71	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-72	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-73	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-74	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-75	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-76	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-77	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-78	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-79	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-80	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-81	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-82	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-83	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-84	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-85	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-86	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-87	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-88	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-89	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-90	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-91	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-92	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-93	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-94	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-95	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-96	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-97	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-98	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-99	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	
7277-04-16-100	22 SF	1st F, W Garage, W. Wall above Ceiling 0' H	9'x48" Luxury Vinyl Flooring	N	G	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Initiated by: <i>John Frank</i>	Company: <i>Helix EMI, Inc.</i>	Date/Time: <i>4/6/25 16:00</i>	REC'D 3	Requested by:	Company:	Date/Time:
REC'D 2	Received by: <i>HEM</i>	Company:	Date/Time: <i>4/11/25 2:58 PM</i>	REC'D 4	Requested by:	Company:	Date/Time:

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO ☒

LABORATORY: San Ar
DATE SAMPLED: 4/16/24
DATE REQUIRED: 24 APR 2024
JOB NO./LOCATION: 7277-04-16-13
CLIENT: City of Dayton
BUILDING: 419 East Helena St
INSPECTOR: FB Free Allen / R. Trochack
JOB NUMBER: 1217

24021899 24021509

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FINISH / NON	CONDITION	COMMENTS
7277-04-16-13	—	1st Fl, W Garage, Women's RR	Grey Concrete Base & Mast	N	G	
7277-04-16-14	10 SF	Extension N, W Garage Door Frame	Grey Exterior Caulk	N	G	
7277-04-16-15	—	1st Fl E Side Extension N, NE Stairwell Entry W	Grey Exterior Caulk	N	G	
7277-04-16-16	20 SF	Extension N, HVAC Duct on Duct	Grey Duct Insulation	N	G	
7277-04-16-17	—	Extension N, HVAC Duct on Duct	Grey Duct Insulation	N	G	
7277-04-16-18	—					
7277-04-16-19	—					
7277-04-16-20	—					
7277-04-16-21	—					
7277-04-16-22	—					
7277-04-16-23	—					
7277-04-16-24	—					

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

Helix ID: <u>7277-04-16-13</u>	Requisitioned by: <u>San Ar</u>	Company: <u>Helix Env, Inc</u>	Date/Time: <u>4/16/24</u>	HEC'D 3	Requisitioned by:	Company:	Date/Time:
HEC'D 2	Received by: <u>km</u>	Company:	Date/Time: <u>4/17/24</u>	HEC'D 4	Requisitioned by:	Company:	Date/Time:



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/23/2024

Project Name: 419 East Helena Street

Project #: 7277

SanAir ID#: 24022276



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24022276

FINAL REPORT

4/23/2024 2:40:03 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 419 East Helena Street
Collected Date: 4/16/2024
Received Date: 4/19/2024 9:45:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 1 sample(s) were received on Friday, April 19, 2024 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7277-04-16-03.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino".

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 1 samples in Good condition.



SanAir ID Number

24022276

FINAL REPORT

4/23/2024 2:40:03 PM

Name: Helix Environmental Inc

Address: 1 Elizabeth Place
Suite 160

Dayton, OH 45417

Phone: 937-226-0650

Project Number: 7277

P.O. Number:

Project Name: 419 East Helena Street

Collected Date: 4/16/2024

Received Date: 4/19/2024 9:45:00 AM

Analyst: Pisula, Nicholas

Asbestos Bulk EPA PLM 400 Point Count

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-16-03 / 24022276-001 Drywall & Joint Compound, 1st Fl, Bomb Squad Rm, Joint Comp	White Non-Fibrous Homogeneous		99.25% Other	0.75% Chrysotile

Analyst:

Approved Signatory:

Analysis Date:

4/23/2024

Date:

4/23/2024

Disclaimer and Additional Information

400 Point Count Method EPA 600/R-93/116

EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure, additions, exclusions, method deviations and information provided to the laboratory by the client. When client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, purchase order number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start - stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute and shall not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agency. Samples are held for a period of 60 days.

Asbestos Accreditations

National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075, LA-0084
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, Certificate #05088

Revision Date: 5/10/2023

From: Benjamin Froehlich <bfroehlich@helixenv.com>

Sent: Friday, April 19, 2024 9:44 AM

To: IAQ Forward <iaq@sanair.com>; IAQ Forward <iaq@sanair.com>; Sandra C. Sobrino <ssobrino@sanair.com>

Subject: Re: Analysis Report for Job 24021509 is complete.

24022776

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Sandra,

May I have 48 hour turn-around on EPA PLM point counts of the following samples?:

7277-04-16-03 / 24021509-003 (Joint Compound only)

7277-04-16-07 / 24021509-007 (white sealant only)

RMB APR 19th 2024 9:45am

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO ☒ YES

LABORATORY: SEM/AN
DATE SAMPLED: 4/16/24
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7277 / Dayton, OH
CLIENT: City of Dayton
BUILDING: 410 East Helena Street
INSPECTOR: B. Beechick, R. Smith
JOB NUMBER: 7277

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Asbestos: PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRAGILE/ NON	CONDITION	COMMENTS
7277-04-16-01	700 SF	1st Fl, Bomb Squad Room, S. corner 2'x4' ceiling tile, ceiling at back wall 12'x14' gypsum	2'x4' ceiling tile, gypsum	N	G	
7277-04-16-02	—	1st Fl, Bomb Squad Room, W. wall 2'x4' ceiling tile, ceiling	2'x4' ceiling tile, gypsum	N	G	
7277-04-16-03	—	1st Fl, Bomb Squad Room, W. wall 12'x14' gypsum above ceiling	12'x14' gypsum above ceiling	N	G	
7277-04-16-04	1 SF	1st Fl, Evidence Garage, South corner SE corner behind coils	Black insulation	N	F	
7277-04-16-05	—	1st Fl, Evidence Garage, South corner SE corner behind coils	Black insulation	N	F	
7277-04-16-06	100 SF	1st Fl, Evidence Garage, N.E. Area above doorway 8'x14'	Canvas jacket for duct & sealant	N	G	
7277-04-16-07	—	1st Fl, Evidence Garage, N.E. Area 8'x14'	Canvas jacket for duct & sealant	N	G	
7277-04-16-08	10 SF	1st Fl, Evidence Garage, Break Area 9'x14'	Grey cloth w. bristles	N	F	
7277-04-16-09	—	1st Fl, Evidence Garage, Break Area 9'x14'	Grey cloth w. bristles	N	F	
7277-04-16-10	160 SF	1st Fl, W. Garage, W. wall 9'x14' ceiling	9'x14' ceiling	N	G	
7277-04-16-11	—	1st Fl, W. Garage, W. wall 9'x14' ceiling	9'x14' ceiling	N	G	
7277-04-16-12	22 SF	1st Fl, W. Garage, W. wall 9'x14' ceiling	9'x14' ceiling	N	G	

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REC'D 1	Received by: <u>Tom Fackell</u>	Company: <u>Helix Env. Inc.</u>	Date/Time: <u>4/16/24</u>	REC'D 3	Returned by:	Company:	Date/Time:
REC'D 2	Received by: <u>12m</u>	Company:	Date/Time: <u>10/25/24</u>	REC'D 4	Returned by:	Company:	Date/Time:

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR NO ☒

LABORATORY: Sen AR
DATE SAMPLED: 4/16/24
DATE REQUIRED: 4/16/24
JOB NO./LOCATION: 7277, Dayton, OH
CLIENT: City of Dayton
BUILDING: 419 East Helena St
INSPECTOR: B. Forthick, R. Froehlich
JOB NUMBER: 7277

24022276 24021509

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED:

Asbestos: VMA

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FINABLE/ NON	CONDITION	COMMENTS
7277-04-16-13	1	1st Fl, W Garage, Women's RR	Grey Concrete Base & Mastix	N	G	
7277-04-16-14	10 SF	Extension N, W Garage door frame	Grey Exterior	N	G	
7277-04-16-15	(150 LF) E Side	Extension N, NE Stairwell Entry W	Grey Exterior	N	G	
7277-04-16-16	20 SF	Extension N, HVAC Duct	Grey Duct Insulation	N	G	
7277-04-16-17	1	Extension N, HVAC Cage on 1st fl	Grey Duct Sealant	N	G	
7277-04-16-18						
7277-04-16-19						
7277-04-16-20						
7277-04-16-21						
7277-04-16-22						
7277-04-16-23						
7277-04-16-24						

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REC'D 1	Relinquished by: <u>Ben Fackell</u>	Company: <u>Helix Env, Inc</u>	Date/Time: <u>4/16/24 15:00</u>	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: <u>Ken</u>	Company:	Date/Time: <u>4/17/24 10:25</u>	REC'D 4	Relinquished by:	Company:	Date/Time:



The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/29/2024

Project Name: 417 East Helena Street

Project #: 7277

SanAir ID#: 24023519



NVLAP LAB CODE 200870-0

10501 Trade Court | North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com



SanAir ID Number

24023519

FINAL REPORT

4/29/2024 9:46:55 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/24/2024
Received Date: 4/26/2024 10:20:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 4 sample(s) were received on Friday, April 26, 2024 via UPS. The final report(s) is enclosed for the following sample(s): 7277-04-24-01, 7277-04-24-02, 7277-04-24-03, 7277-04-24-04.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Sandra Sobrino".

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 4 samples in Good condition.



SanAir ID Number

24023519

FINAL REPORT

4/29/2024 9:46:55 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7277
P.O. Number:
Project Name: 417 East Helena Street
Collected Date: 4/24/2024
Received Date: 4/26/2024 10:20:00 AM

Analyst: Moore, Brandi

Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
7277-04-24-01 / 24023519-001 Roofing Cement Roof, SE Parapet Wall, Above Entrance	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-24-02 / 24023519-002 Roofing Cement Roof, N Parapet Wall, Above Over Head Door	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-24-03 / 24023519-003 Electrical Sealant Roof, Center HVAC Unit, At Roof	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7277-04-24-04 / 24023519-004 Electrical Sealant Roof, SE HVAC Unit At Roof Penetration	Grey Non-Fibrous Heterogeneous		100% Other	None Detected

Analyst: *Brandi Moore*

Approved Signatory: *[Signature]*

Analysis Date: 4/29/2024

Date: 4/29/2024

Disclaimer

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, po number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. This report does not constitute nor shall not be used by the client to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies and may not be accredited by every local, state, and federal regulatory agencies. Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations

National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075, LA-0084
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PCM00126, PLM00126, TEM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, Certificate #05088

HELIX

ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helixenv.com

RUSH - YES OR NO ☒ YES ☐ NO

LABORATORY: 5m AR
DATE SAMPLED: 4/24/24
DATE REQUIRED: 24 APR 24
JOB NO./LOCATION: 7277 / Dayton, OH
CLIENT: City of Dayton
BUILDING: 417 East Helix Street
INSPECTOR: B. Froehlich
JOB NUMBER: 7277

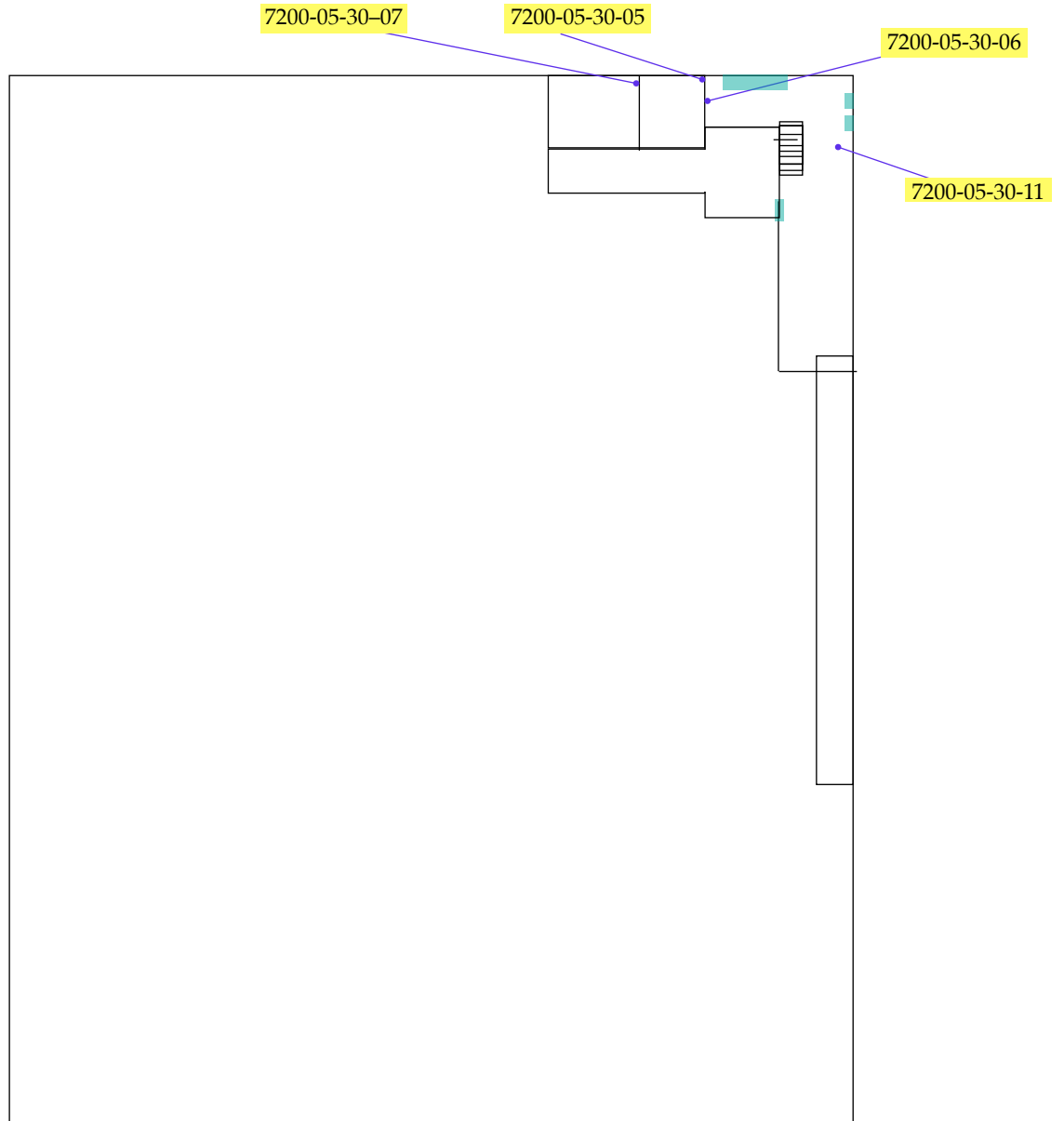
BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos PCM

HEIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRAGILE/ NON	CONDITION	COMMENTS
7277-04-24-01	250g	Roof, SE corner - parapet wall, above entrance	Grey concrete	N	F	
7277-04-24-02	—	Roof, N parapet wall, above rear door	Grey roofing cement	N	F	
7277-04-24-03	5g	Roof, under HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-24-04	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-24-05	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-24-06	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-24-07	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-27-08	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-27-09	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-27-10	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-27-11	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	
7277-04-27-12	—	Roof, SE HVAC unit, at roof penetration housing	Light grey electrical conduit	N	F	

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REC'D 1	Relinquished by: <u>B. Froehlich</u>	Company: <u>Helix Env, Inc.</u>	Date/Time: <u>4/24/24 18:00</u>	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: <u>IRM</u>	Company:	Date/Time: <u>4/26/24 10:20</u>	REC'D 4	Relinquished by:	Company:	Date/Time:



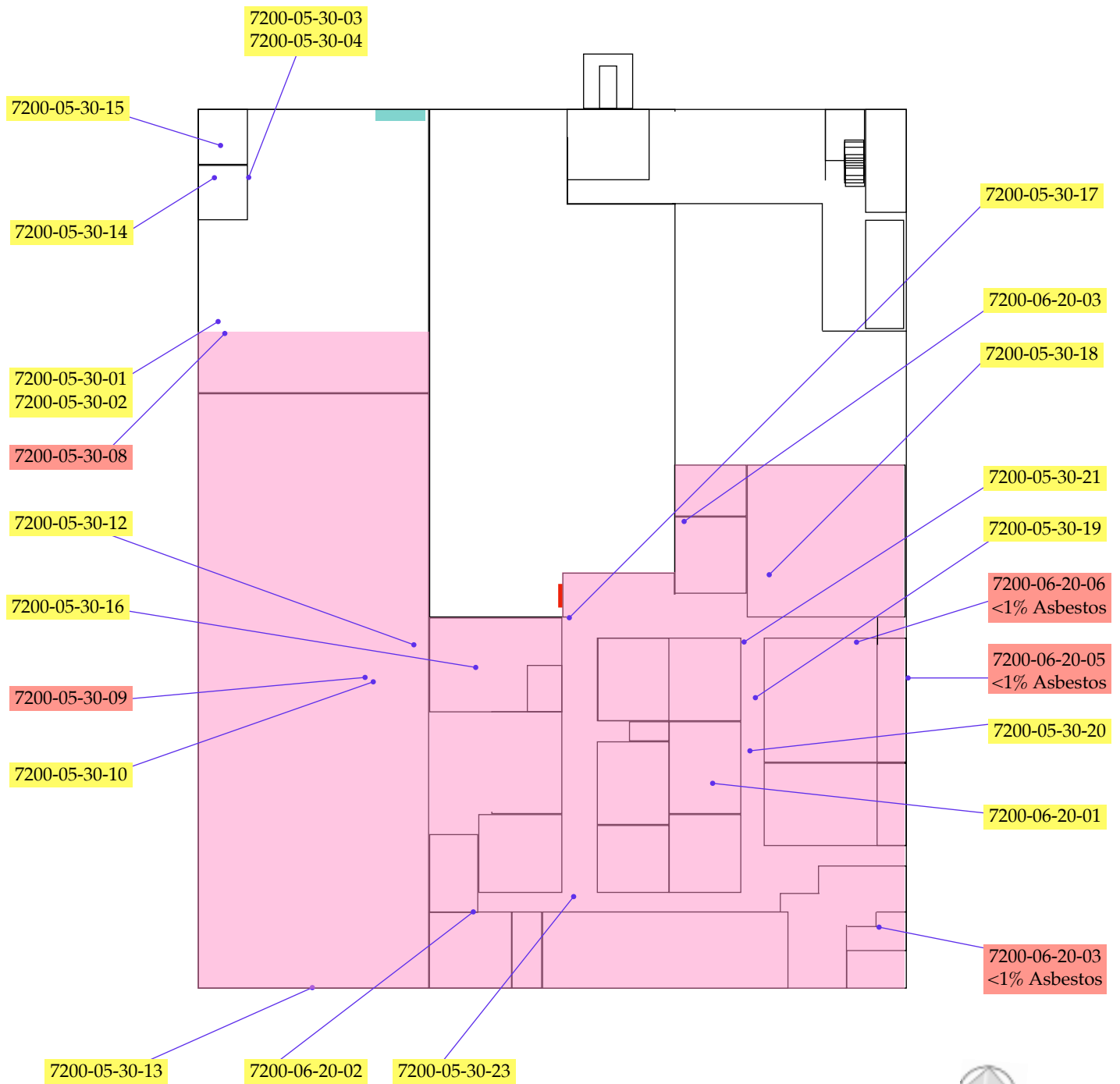
LEGEND

- Non-Asbestos Containing Material
- Asbestos Containing Material
- Asbestos-Containing Flooring
- Assumed Asbestos-Containing Material

ASBESTOS SAMPLE MAP
BASEMENT
EAST PATROL OPERATIONS- NORTH
417 EAST HELENA STREET,
DAYTON, OHIO 45404

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160
DAYTON, OHIO 45417
937-226-0650



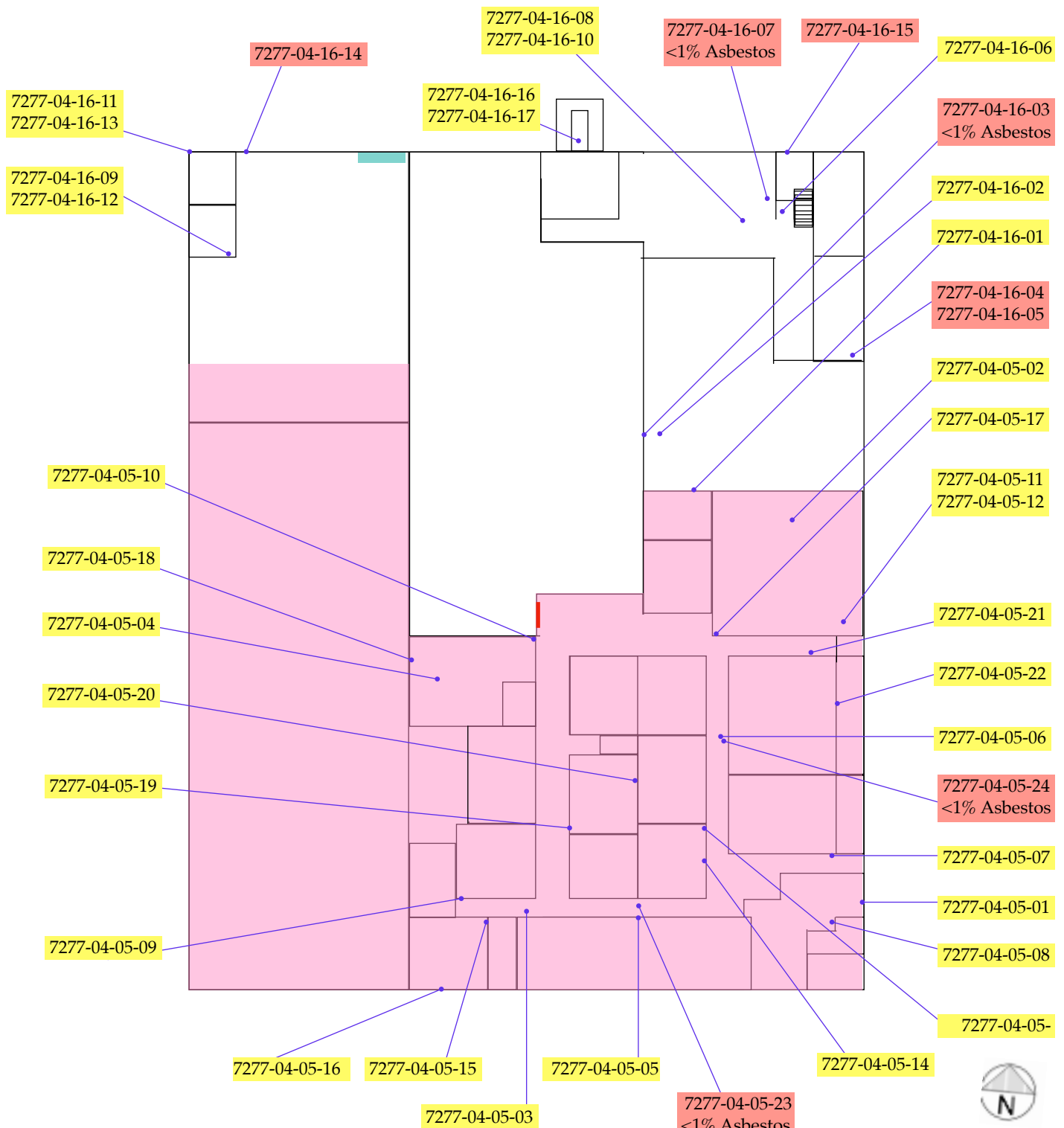
LEGEND

- Non-Asbestos Containing Material
- Asbestos Containing Material
- Asbestos-Containing Flooring
- Assumed Asbestos-Containing Material
- Assumed Asbestos-Containing Fire Door

INITIAL ASBESTOS SAMPLE MAP
1st FLOOR
EAST PATROL OPERATIONS- NORTH
417 EAST HELENA STREET,
DAYTON, OHIO 45404

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160
DAYTON, OHIO 45417
937-226-0650



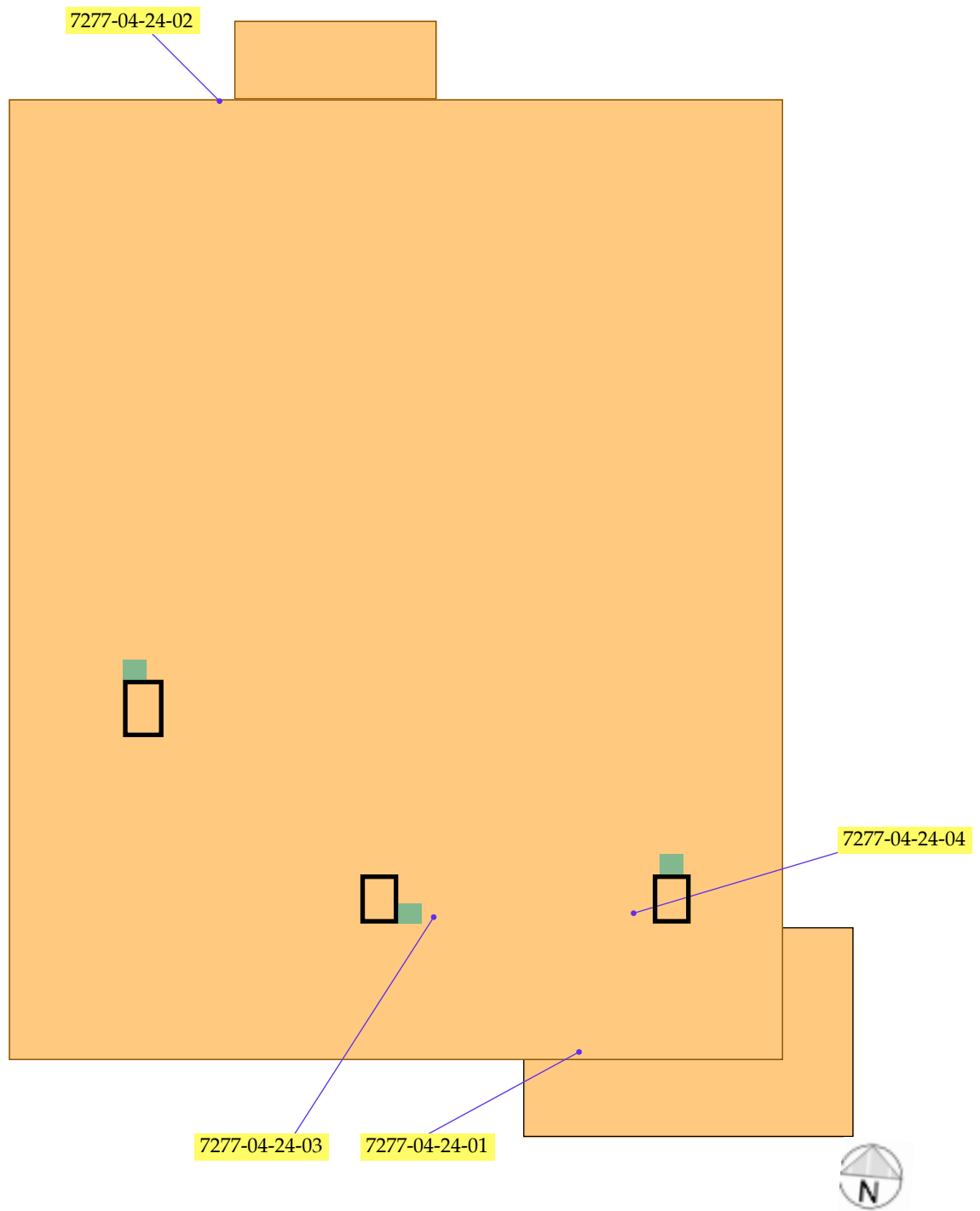
LEGEND

- Non-Asbestos Containing Material
- Asbestos Containing Material
- Asbestos-Containing Flooring
- Assumed Asbestos-Containing Material
- Assumed Asbestos-Containing Fire Door

ASBESTOS SAMPLE MAP
1st FLOOR, ADDITIONAL SAMPLES
EAST PATROL OPERATIONS- NORTH
417 EAST HELENA STREET,
DAYTON, OHIO 45404

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160
DAYTON, OHIO 45417
937-226-0650



LEGEND

-  Non-Asbestos Containing Material
-  Asbestos Containing Material
-  Assumed Asbestos-Containing Roofing
-  Assumed Asbestos-Containing

ASBESTOS SAMPLE MAP
ROOFTOP
EAST PATROL OPERATIONS- NORTH
417 EAST HELENA STREET,
DAYTON, OHIO 45404

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160
DAYTON, OHIO 45417
937-226-0650

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- 1.01.A. Project Name: 4209.00 City of Dayton Police Department – 1st District East Patrol Renovations.
- 1.01.B. Owner's Name: City of Dayton.
- 1.01.C. Architect's Name: App Architecture, Inc.
- 1.01.D. The Project consists of the renovation of an existing Police Station and other Work indicated in the Contract Documents to include, but not limited to, architectural, structural, plumbing, heating, ventilation and air conditioning, electrical, data and security.

1.02 CONTRACT DESCRIPTION

- 1.02.A. Contract Type: Project will be constructed under a Single Prime Contractor.

1.03 WORK BY OWNER

- 1.03.A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
 - 1. Furnishings.
 - 2. Small equipment, including but not limited to fitness equipment.
 - 3. Refer to construction documents for additional items.
- 1.03.B. Owner will supply and install the following:
 - 1. Refer to the matrices located on the drawings.
- 1.03.C. Owner will supply the following for installation by Contractor:
 - 1. Refer to the matrices located on the drawings.

1.04 OWNER OCCUPANCY

- 1.04.A. Owner intends to occupy the Project upon Substantial Completion.
- 1.04.B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- 1.04.C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

1.05.A. Construction Operations: Contractor shall have use of premises for construction operations.

1. Owner will vacate the building throughout construction.

1.05.B. Arrange use of site and premises to allow:

1. Work by Others.
2. Work by Owner.

1.05.C. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.05.D. Time Restrictions:

1. Limit conduct of the hours of 7:00 a.m. to 5:00 p.m.
2. Weekend Hours: As approved by Owner.
3. Early Morning Hours: As approved by Owner.

END OF SECTION 01 1000

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

1.01.A. Contingency allowance.

1.02 RELATED REQUIREMENTS

1.03 CONTINGENCY ALLOWANCE

1.03.A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

1.03.B. Funds will be drawn from the Contingency Allowance only by Change Order.

1.03.C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

1.04.A. This Alternate is for a CONTINGENCY ALLOWANCE to be used in the event of unforeseen work which must be undertaken to complete this project. The work could be as additional quantities to the bid items or as non-bid items. The amount of this ALLOWANCE may vary as determined by the City but shall not exceed the maximum of \$400,000.00.

1.04.B. Hazardous Material Abatement Allowance: \$100,000.

1.04.C. Building Permit Fee Allowance: \$30,000.

1.04.D. Mural Artwork South Elevation: \$6,000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2100

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SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Description of Alternates.
- 1.01.B. Procedures for pricing Alternates.
- 1.01.C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

- 1.02.A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 ACCEPTANCE OF Alternates

- 1.03.A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- 1.03.B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF ALTERNATES

- 3.01.A. Alternate No. E-1: Add for emergency generator and transfer switch.

END OF SECTION 01 2300

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SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- 1.02.B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- 1.03.A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - c. Unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- 3.01.A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.

5. Waives claims for additional costs or time extension that may subsequently become apparent.
 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- 3.01.B. A Substitution Request for specified installer constitutes a representation that the submitter:
1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- 3.01.C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
- 3.01.D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Warranties.
 - 6) Other salient features and requirements.
 - 7) Include, as appropriate or requested, the following types of documentation:
 - a) Product Data:
 - b) Samples.
 - c) Certificates, test, reports or similar qualification data.

- d) Drawings, when required to show impact on adjacent construction elements.
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- 3.01.E. Limit each request to a single proposed substitution item.
- 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- 3.02.A. Submittal Time Restrictions:
- 1. Section 00 2113 - Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- 3.03.A. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- 3.03.B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- 3.03.C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
 - b. Other construction by Owner.
 - c. Other unanticipated project considerations.
- 3.03.D. Substitutions will not be considered under one or more of the following circumstances:
- 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

3.04.A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

3.04.B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form cover sheet.

3.05 ACCEPTANCE

3.05.A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

3.06.A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.07 ATTACHMENTS

3.07.A. A facsimile of the Substitution Request Form Cover Sheet (During Construction) required to be used on the Project is included after this section.

END OF SECTION 01 2500

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. General administrative requirements.
- 1.01.B. Web-based project software service.
- 1.01.C. Preconstruction meeting.
- 1.01.D. Progress meetings.
- 1.01.E. Construction progress schedule.
- 1.01.F. Contractor's daily reports.
- 1.01.G. Coordination drawings.
- 1.01.H. Submittals for review, information, and project closeout.
- 1.01.I. Number of copies of submittals.
- 1.01.J. Requests for Information (RFI) procedures.
- 1.01.K. Submittal procedures.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 6000 - Product Requirements: General product requirements.
- 1.02.B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- 1.02.C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

1.04 PROJECT COORDINATOR

- 1.04.A. Construction Manager.
- 1.04.B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- 1.04.C. During construction, coordinate use of site and facilities through the Project Coordinator.

- 1.04.D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- 1.04.E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- 1.04.F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- 1.04.G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Information.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 Web-Based Project Software Service

- 3.01.A. Web-Based Project Software Service: Construction Manager to provide, administer, and use web-based project software to host and manage project communication and documentation.
 - 1. Include, at minimum, the following features:
 - a. Project directory, including Owner, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
 - b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.
 - c. Workflow planning, allowing customization of workflow for each project entity.
 - d. Creation, logging, tracking, and notification for project communications required in other Specification Sections, including, but not limited to RFI's, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.

- e. Tracking of project communication statuses in real time, including timestamped response log.
 - f. Procedures for viewing PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creation and distribution of meeting minutes.
 - j. Document management for drawings, specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility.
 - m. Creation of data analytics reports.
 - n. Creation and export of editable logs for software functions. Provide Owner, Architect, and Architect's consultants with rights and ability to download logs when requested.
- 2. Provide up to 20 user licenses for use by Owner, Architect, Architect's consultants, and other entities involved in the project.
 - 3. Comply with the software service's current published licensing agreements.
 - 4. Training: Provide one-hour, web-based training session for users of software service. Further training is the responsibility of the user.
 - a. Representatives of Owner are scheduled and included in this training.
 - 5. Project Closeout: Provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prohibit further changes after completion of the project.
 - 6. Web-Based Project Software Services: Subject to compliance with the requirements use one of the following:

3.02 PRECONSTRUCTION MEETING

- 3.02.A. Construction Manager will schedule a meeting no later than 10 days after the execution of the Agreement.
- 3.02.B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Construction Manager.
- 3.02.C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal schedule.

6. Designation of personnel representing the parties to Contract, Construction Manager and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Scheduling activities of the Special Inspector.

3.02.D. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

3.03.A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.

3.03.B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

3.03.C. Attendance Required:

1. Construction Manager.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

3.03.D. Agenda:

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

3.03.E. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

3.04.A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

- 3.04.B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- 3.04.C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- 3.04.D. Within 10 days after joint review, submit complete schedule.
- 3.04.E. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

- 3.05.A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- 3.05.B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. List of separate contractors at Project site.
 - 5. Approximate count of personnel at Project site.
 - 6. Major equipment at Project site.
 - 7. Material deliveries.
 - 8. Safety, environmental, or industrial relations incidents.
 - 9. Meetings and significant decisions.
 - 10. Unusual events (submit a separate special report).
 - 11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 12. Testing and/or inspections performed.
 - 13. Signature of Contractor's authorized representative.

3.06 COORDINATION DRAWINGS

- 3.06.A. Provide information required by Project Coordinator for preparation of coordination drawings.
- 3.06.B. Review drawings prior to submission to Architect.
- 3.06.C. Architect and consultants will provide CAD or REVIT files as requested for use in producing coordination drawings. Waiver forms are provided at the end of this section and must be completed and signed as part of any request for digital files.

3.07 REQUESTS FOR INFORMATION (RFI)

3.07.A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit an RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Architect.

3.07.B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

3.07.C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.

1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Construction Manager's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).

6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- 3.07.D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- 3.07.E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
- 3.07.F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- 3.07.G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

- 3.08.A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section 01 3216 - Construction Progress Schedule.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.

4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

3.09.A. When the following are specified in individual sections, submit them for review:

1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

3.09.B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

3.09.C. Samples will be reviewed for aesthetic, color, or finish selection.

3.09.D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

3.10.A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

3.10.B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

3.11.A. Submit Correction Punch List for Substantial Completion.

3.11.B. Submit Final Correction Punch List for Substantial Completion.

3.11.C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.

4. Bonds.
5. Other types as indicated.

3.11.D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

3.12.A. Electronic Documents: Submit one electronic copy in PDF format; an electronically marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

3.12.B. Extra Copies at Project Closeout: See Section 01 7800.

3.12.C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

3.13.A. General Requirements:

1. Use a separate Project Submittal Cover Sheet for each item. Form included at end of this specification section.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties and is of the benefit to the project.
 - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 15 days.

8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. When revised for resubmission, identify all changes made since previous submission.
10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work and have received prior approval for their use.

3.13.B. Product Data Procedures:

1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.

3.13.C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.13.D. Samples Procedures:

1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

3.14.A. Submittals for Review: Architect and Cons will review each submittal, and approve, or take other appropriate action.

3.14.B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

3.14.C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

3.14.D. Architect's and consultants' actions on items submitted for review:

1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Reviewed", or language with same legal meaning.
 - b. "Reviewed as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Reviewed as Noted, Resubmit for Record", or language with same legal meaning.

2. Not Authorizing fabrication, delivery, and installation:
- 3.14.E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 3000

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SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Submittals.
- 1.01.B. Quality assurance.
- 1.01.C. References and standards.
- 1.01.D. Testing and inspection agencies and services.
- 1.01.E. Contractor's design-related professional design services.
- 1.01.F. Control of installation.
- 1.01.G. Mock-ups.
- 1.01.H. Tolerances.
- 1.01.I. Manufacturers' field services.
- 1.01.J. Defect Assessment.

1.02 RELATED REQUIREMENTS

- 1.02.A. Document 00 3100 - Available Project Information: Soil investigation data.
- 1.02.B. Section 01 3000 - Administrative Requirements: Submittal procedures.
- 1.02.C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- 1.03.A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 DEFINITIONS

- 1.04.A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:

- a. Design-Related: Design services explicitly required to be performed by another design professional due to highly technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

1.04.B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

1.05.A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

1.05.B. Base design on performance and/or design criteria indicated in individual specification sections.

1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

1.05.C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1.06 SUBMITTALS

1.06.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06.B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

1.06.C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

1.06.D. Test Reports: After each test/inspection, promptly submit copies of report to Architect and to Contractor.

1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

1.06.E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.06.F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.07 Quality Assurance

1.07.A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.07.B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

- 1.08.A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- 1.08.B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- 1.08.C. Obtain copies of standards where required by product specification sections.
- 1.08.D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- 1.08.E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- 1.08.F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 Testing and Inspection Agencies and Services

- 1.09.A. Owner will employ and pay for services of an independent testing agency to perform special tests and inspections required by authorities having jurisdiction as the responsibility of the Owner, as indicated in the Statement of Special Inspections included at the end of this Section and as follows:
 - 1. Notifying Architect and Contractor promptly of any irregularities and deficiencies observed in the Work during performance of its services.
 - 2. Submitting a certified written report of each test, inspection, and similar quality control services to Architect with a copy to Contractor and to authorities having jurisdiction.
 - 3. Retesting and reinspecting corrected Work.
- 1.09.B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- 1.09.C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- 3.01.A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

- 3.01.B. Comply with manufacturers' instructions, including each step in sequence.
- 3.01.C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- 3.01.D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- 3.01.E. Have work performed by persons qualified to produce required and specified quality.
- 3.01.F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- 3.01.G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- 3.02.A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- 3.02.B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- 3.02.C. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- 3.02.D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- 3.02.E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- 3.02.F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- 3.02.G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- 3.02.H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- 3.02.I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- 3.03.A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- 3.03.B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- 3.03.C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- 3.04.A. See individual specification sections for testing and inspection required.
- 3.04.B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Construction Manager in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- 3.04.C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- 3.04.D. Construction Manager Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.

- 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 3.04.E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- 3.04.F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- 3.05.A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- 3.05.B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- 3.06.A. Replace Work or portions of the Work not complying with specified requirements.
- 3.06.B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 01 4000

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SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Dewatering
- 1.01.B. Temporary utilities.
- 1.01.C. Temporary telecommunications services.
- 1.01.D. Temporary sanitary facilities.
- 1.01.E. Temporary Controls: enclosures and Barriers, Fencing, Enclosures.
- 1.01.F. Temporary Fire Protection.
- 1.01.G. Security requirements.
- 1.01.H. Vehicular access and parking.
- 1.01.I. Waste removal facilities and services.
- 1.01.J. Project identification sign.
- 1.01.K. Field offices.

1.02 Dewatering

- 1.02.A. Provide temporary means and methods for dewatering all temporary facilities and controls. Comply with requirements of authorities having jurisdiction.
- 1.02.B. Maintain temporary facilities in operable condition.

1.03 TEMPORARY UTILITIES

- 1.03.A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes. Construction Manager to coordinate installation, removal, and use charges. Costs to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- 1.03.B. New permanent facilities may be used.

1.04 ELECTRONIC COMMUNICATION SERVICES

- 1.04.A. Provide, maintain, and pay for a secure WiFi wireless connection to internet services to field office at time of project mobilization. Include provisions for access to relevant parties including but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- 1.04.B. Telecommunications services shall include:

1.05 TEMPORARY SANITARY FACILITIES

- 1.05.A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- 1.05.B. Maintain daily in clean and sanitary condition.

1.06 TEMPORARY CONTROLS: BARRIERS, FENCING, ENCLOSURES

1.06.A. BARRIERS

- 1. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
 - a. Provide warning sites and lights as required by authorities having jurisdiction.
- 2. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- 3. Provide protection for plants designated to remain. Replace damaged plants.
- 4. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- 5. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1.06.B. FENCING

- 1. Construction: Commercial grade chain link fence.
- 2. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.
 - a. Extent of Fence: As indicated on the Drawings.
 - b. Coordinate with City.

1.06.C. EXTERIOR ENCLOSURES

- 1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 TEMPORARY FIRE PROTECTION

- 1.07.A. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire protection program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.

1.08 SECURITY

- 1.08.A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.09 VEHICULAR ACCESS AND PARKING

- 1.09.A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- 1.09.B. Coordinate access and haul routes with governing authorities and Owner.
- 1.09.C. Provide and maintain access to fire hydrants, free of obstructions.
- 1.09.D. Provide means of removing mud from vehicle wheels before entering streets.
- 1.09.E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

- 1.10.A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- 1.10.B. Provide containers with lids. Remove trash from site periodically.
- 1.10.C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- 1.10.D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- 1.11.A. Provide project identification sign of design and construction indicated on drawings.
- 1.11.B. Erect on site at location indicated.

1.11.C. No other signs are allowed without Owner permission except those required by law.

1. Provide other temporary signs as indicated and as required to inform public and individuals seeking entrance to Project.
2. Maintain and touch up signs, so they are legible at all times.

1.12 FIELD OFFICES

1.12.A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

1.12.B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

1.12.C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

1.13.A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

1.13.B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

1.13.C. Clean and repair damage caused by installation or use of temporary work.

1.13.D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 5000

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. General product requirements.
- 1.01.B. Transportation, handling, storage and protection.
- 1.01.C. Product option requirements.
- 1.01.D. Substitution limitations.
- 1.01.E. Procedures for Owner-supplied products.
- 1.01.F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 1000 - Summary: Identification of Owner-supplied products.
- 1.02.B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- 1.02.C. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 DEFINITIONS

- 1.03.A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product": includes the terms "material," "equipment," "system," and terms of similar intent.
- 1.03.B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1.04 SUBMITTALS

- 1.04.A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- 1.04.B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

- 1.04.C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- 2.01.A. Provide new products unless specifically required or permitted by Contract Documents.
- 2.01.B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.
- 2.01.C. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
- 2.01.D. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

2.02 PRODUCT OPTIONS

- 2.02.A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- 2.02.B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- 2.02.C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

- 2.03.A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- 2.03.B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- 3.01.A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

3.02.A. See Section 01 1000 - Summary for identification of Owner-supplied products.

3.02.B. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

3.02.C. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

3.03.A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

3.03.B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

3.03.C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

3.03.D. Transport and handle products in accordance with manufacturer's instructions.

3.03.E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

3.03.F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

3.03.G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

3.03.H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

3.04.A. Provide protection of stored materials and products against theft, casualty, or deterioration.

- 3.04.B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- 3.04.C. Store and protect products in accordance with manufacturers' instructions.
- 3.04.D. Store with seals and labels intact and legible.
- 3.04.E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- 3.04.F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- 3.04.G. For exterior storage of fabricated products, place on sloped supports above ground.
- 3.04.H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- 3.04.I. Comply with manufacturer's warranty conditions, if any.
- 3.04.J. Do not store products directly on the ground.
- 3.04.K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- 3.04.L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- 3.04.M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- 3.04.N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 6000

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Examination, preparation, and general installation procedures.
- 1.01.B. Pre-installation meetings.
- 1.01.C. Cutting and patching.
- 1.01.D. Surveying for laying out the work.
- 1.01.E. Cleaning and protection.
- 1.01.F. Starting of systems and equipment.
- 1.01.G. Demonstration and instruction of Owner personnel.
- 1.01.H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 3000 - Administrative Requirements: Submittals procedures.
- 1.02.B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- 1.02.C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- 1.02.D. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- 1.02.E. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- 1.02.F. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- 1.03.A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- 1.04.B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- 1.04.C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.05 QUALIFICATIONS

- 1.05.A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.06 PROJECT CONDITIONS

- 1.06.A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- 1.06.B. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1.07 COORDINATION

- 1.07.A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- 1.07.B. Notify affected utility companies and comply with their requirements.
- 1.07.C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

- 1.07.D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- 1.07.E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- 1.07.F. Coordinate completion and clean-up of work of separate sections.
- 1.07.G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- 2.01.A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- 2.01.B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- 2.01.C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- 3.01.B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- 3.01.C. Examine and verify specific conditions described in individual specification sections.
- 3.01.D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- 3.01.E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

- 3.01.F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- 3.02.A. Clean substrate surfaces prior to applying next material or substance.
- 3.02.B. Seal cracks or openings of substrate prior to applying next material or substance.
- 3.02.C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- 3.03.A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- 3.03.B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- 3.03.C. Notify Architect four days in advance of meeting date.
- 3.03.D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- 3.03.E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- 3.04.A. Verify locations of survey control points prior to starting work.
- 3.04.B. Promptly notify Architect of any discrepancies discovered.
- 3.04.C. Contractor shall locate and protect survey control and reference points.
- 3.04.D. Control datum for survey is that indicated on drawings.
- 3.04.E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- 3.04.F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- 3.04.G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

- 3.04.H. Utilize recognized engineering survey practices.
- 3.04.I. Establish a minimum of two permanent benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- 3.04.J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- 3.04.K. Periodically verify layouts by same means.
- 3.04.L. Maintain a complete and accurate log of control and survey work as it progresses.
- 3.04.M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- 3.05.A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- 3.05.B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- 3.05.C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- 3.05.D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- 3.05.E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- 3.06.A. Whenever possible, execute the work by methods that avoid cutting or patching.
- 3.06.B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- 3.06.C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- 3.06.D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- 3.06.E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- 3.06.F. Restore work with new products in accordance with requirements of Contract Documents.
- 3.06.G. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- 3.06.H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- 3.06.I. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

- 3.07.A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- 3.07.B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- 3.07.C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- 3.07.D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- 3.08.A. Protect installed work from damage by construction operations.

- 3.08.B. Provide special protection where specified in individual specification sections.
- 3.08.C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- 3.08.D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- 3.08.E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- 3.08.F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- 3.08.G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- 3.08.H. Prohibit traffic from landscaped areas.
- 3.08.I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
- 3.08.J. Comply with manufacturer's written instructions for temperature and relative humidity.

3.09 SYSTEM STARTUP

- 3.09.A. Coordinate schedule for start-up of various equipment and systems.
- 3.09.B. Notify Architect and Owner seven days prior to start-up of each item.
- 3.09.C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- 3.09.D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- 3.09.E. Verify that wiring and support components for equipment are complete and tested.
- 3.09.F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- 3.09.G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- 3.09.H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

3.10.A. See Section 01 7900 - Demonstration and Training.

3.11 ADJUSTING

3.11.A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11.B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

3.12.A. Execute final cleaning prior to Substantial Completion.

3.12.B. Use cleaning materials that are nonhazardous. Use materials recommended by manufacturer or fabricator of the surface to be cleaned.

3.12.C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

3.12.D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

3.12.E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

3.12.F. Clean filters of operating equipment.

3.12.G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.

3.12.H. Clean site; sweep paved areas, rake clean landscaped surfaces.

3.12.I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

3.13.A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect.

3.13.B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

3.13.C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

- 3.13.D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- 3.13.E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- 3.13.F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- 3.13.G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- 3.13.H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION 01 7000

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SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Project record documents.
- 1.01.B. Operation and maintenance data.
- 1.01.C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- 1.02.B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- 1.02.C. Individual Product Sections: Specific requirements for operation and maintenance data.
- 1.02.D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- 1.03.A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- 1.03.B. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- 1.03.C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- 3.01.A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- 3.01.B. Ensure entries are complete and accurate, enabling future reference by Owner.
- 3.01.C. Store record documents separate from documents used for construction.
- 3.01.D. Record information concurrent with construction progress.
- 3.01.E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- 3.01.F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- 3.01.G. Submit PDF electronic files of scanned record prints, specifications and product data, including addenda and contract modifications.

3.02 OPERATION AND MAINTENANCE DATA

- 3.02.A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- 3.02.B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

- 3.02.C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- 3.02.D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- 3.03.A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- 3.03.B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- 3.03.C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- 3.03.D. Additional information as specified in individual product specification sections.
- 3.03.E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- 3.04.A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- 3.04.B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- 3.04.C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- 3.04.D. Include color coded wiring diagrams as installed.
- 3.04.E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

- 3.04.F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - 1. Include HVAC outdoor and exhaust air damper calibration strategy.
 - a. Include provisions which ensure that full closure of dampers can be achieved.
 - 2. Include Carbon Dioxide Monitoring Protocol.
 - 3. Include Carbon Monoxide Monitoring Protocol.
 - 4. Include Frost Mitigation Strategy for ventilation heat-recovery system.
- 3.04.G. Provide servicing and lubrication schedule, and list of lubricants required.
- 3.04.H. Include manufacturer's printed operation and maintenance instructions.
- 3.04.I. Include sequence of operation by controls manufacturer.
- 3.04.J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- 3.04.K. Provide control diagrams by controls manufacturer as installed.
- 3.04.L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- 3.04.M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- 3.04.N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- 3.04.O. Include test and balancing reports.
- 3.04.P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- 3.05.A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- 3.05.B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- 3.05.C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- 3.05.D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

- 3.05.E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Construction Manager, Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- 3.05.F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- 3.05.G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- 3.05.H. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.
- 3.05.I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- 3.05.J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Operation and maintenance data.
 - c. Field quality control data.
 - d. Photocopies of warranties and bonds.
- 3.05.K. Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents base on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

3.06 WARRANTIES AND BONDS

- 3.06.A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- 3.06.B. Verify that documents are in proper form, contain full information, and are notarized.
- 3.06.C. Co-execute submittals when required.

- 3.06.D. Retain warranties and bonds until time specified for submittal.
- 3.06.E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- 3.06.F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- 3.06.G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- 3.06.H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- 3.06.I. Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at the beginning of each document.

END OF SECTION 01 7800

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- 1.01.A. Demonstration of products and systems where indicated in specific specification sections.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.
- 1.02.B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- 1.03.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.03.B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- 1.03.C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.03.D. Training Reports:

1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.03.E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.

1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

1.04.A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

3.01.A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

3.01.B. Demonstration may be combined with Owner personnel training if applicable.

3.01.C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

3.01.D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

3.02.A. Conduct training on-site unless otherwise indicated.

- 3.02.B. Owner will provide classroom and seating at no cost to Contractor.
- 3.02.C. Provide training in minimum two-hour segments.
- 3.02.D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- 3.02.E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- 3.02.F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- 3.02.G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900

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SECTION 02 4119
SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.5 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Furnishings and equipment in the area.

- b. Items attached to the walls to be removed.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 4. Maintain adequate ventilation when using cutting torches.
 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 8. Dispose of demolished items and materials promptly.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- C. Relocate existing overhead door at remaining opening at west side of existing building.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION WORK

- A. Existing Items to Be Removed: See Demolition Notes on Drawings.

END OF SECTION 02 4119

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SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Reinforcing bars as noted on drawings.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with requirements indicated, based on comprehensive testing of current materials:

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
 - 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
 - 2. Formwork and form accessories.
 - 3. Steel reinforcement and supports.

4. Concrete mixtures.
5. Handling, placing, and constructing concrete.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 – PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Furnish formwork and form accessories according to ACI 301.
- B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better.
 - b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Types I or II or Type III.
 1. Fly Ash: ASTM C 618, Class C or F.
 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, not exceeding 1 ½ inch nominal size. For slab with thickness less than 3 inches use max. 3/8" aggregate. For masonry fill use 3/8" aggregate.

- C. Water: Potable and complying with ASTM C 94.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.
- B. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 CONCRETE MIXES

- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Prepare design mixes, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days. Minimum Portland Cement 500 lbs.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45
 - 3. Slump: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
 - 4. Add water-reducing admixture.
 - 5. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Do not allow air content of trowel-finished floor slabs to exceed 3 percent.
 - 6. Max. Fly Ash: 20%
- C. For masonry fill (grouting), 2500 psi at 28 days with superplasticizer.
- D. For all exterior concrete conform to ODOT Item 499 Class QC1.

2.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
 - 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.10 BONDING AGENT

- A. Film-forming, freeze-thaw resistant acrylic latex admixture and bonding agent suitable for brush or spray application, complying with ASTM C881. Where epoxy bonding agent is indicated, provide bonding agent with minimum 1500 PSI bond strength from the listed manufacturers. Subject to compliance with requirements, provide one of the following:
 - 1. Adbond (J40); Dayton Superior Corp., Oregon, Illinois.
 - 2. Euroweld; Euclid Chemical, Cleveland, Ohio.
 - 3. Everbond; L&M Construction Chemicals, Omaha, Nebraska

4. Acrylic Additive; Sonneborn Building Products, Shakopee, Minnesota
5. Intralok; W.R. Meadows, Inc., Elgin, Illinois
6. Strong Bond; Conspec Marketing & Manufacturing Co., Inc., Kansas City, Kansas
7. SIKA Corp. – Various

2.11 ADHESIVE ANCHOR

- A. Chemically grouted adhesive anchor bolts. Anchors to be installed per the approved ICC Evaluation Report and manufacturer's strict recommendations. Subject to compliance with requirements, provide one of the following:
1. Products: Subject to compliance with specified requirements, provide one of the following:
 - a. HILTI Super HAS Rod Material with HIT HY 200 Epoxy, Hilti, Inc., Tulsa, Oklahoma. ICC Evaluation Report ESR-3013 (latest issue).
 - b. Powers PE1000+ Epoxy Adhesive; Powers Fasteners, Inc., Brewster, New York. ICC Evaluation Report ESR-2583 (latest issue) .
 - c. Simpson Set Epoxy-Tie SET-XP Adhesive Anchors; Simpson Strong-Tie Company, Inc, Pleasanton, California. ICC Evaluation Report ESR-2508 (latest issue).
 - d. Approved equals must be rated for cracked and uncracked concrete and meet the requirements in accordance with the ICC-ES Acceptance Criteria for Post-installed Adhesive Anchors in Concrete (AC308).
 2. Anchors to be ASTM A193, Grade B7 galvanized steel threaded rods (Fy = 105 ksi) unless otherwise noted.
 3. Where noted on the drawings anchors to be ASTM F593, Condition CW stainless steel threaded rods (Fy = 65 ksi for diameters 3/8 inch through 5/8 inch and Fy = 45 ksi for diameters 3/4 inch through 1-1/4 inch).
 4. Anchors to be installed in strict conformance to manufacturer's installation instructions.
 5. Adhesive and Epoxy Anchors shall have the following minimum allowable load capacities: (Based on embedment in 4000 psi concrete and a minimum safety factor on ultimate load capacities or 3.5. Use proportional allowable loads for other strengths of concrete.)

<u>Size</u>	<u>Allowable Shear</u>	<u>Allowable Tension</u>	<u>Minimum Embedment</u>
3/8 inch	2000 lbs.	2000 lbs.	3-1/2 inch
1/2 inch	3500 lbs.	4150 lbs.	4-1/4 inch
5/8 inch	5500 lbs.	5200 lbs.	5 inch
3/4 inch	8000 lbs.	9000 lbs.	6-5/8 inch
1 inch	14,000 lbs.	13,500 lbs.	8-1/4 inch

PART 3 – EXECUTION

3.1 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
 - 1. Lap joints 6 inches and seal with manufacturer recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 CONCRETE PLACEMENT

- A. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane, sawed contraction joints, sectioning concrete into areas as indicated. Where not specifically indicated, joint shall be 2.5 times thickness of slab. For exterior, max 10' C/C. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness.
- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.7 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.
- E. For all exterior concrete, conform to ODOT Item 499 Class C.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch (13 mm).
 1. Apply to concrete surfaces (not exposed to public view).
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).
 1. Apply to concrete surfaces exposed to public view, or to receive a rubbed finish.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301 (ACI 301M), to smooth-formed finished as-cast concrete where indicated:
 1. Smooth-rubbed finish.
 2. Grout-cleaned finish.
 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.10 TOLERANCES

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by a curing compound.
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301 (ACI 301M).
 - 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m) but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

3.13 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section, at no additional cost to Owner.

END OF SECTION 03 3000

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SECTION 04 2200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

B. Related Requirements:

1. Section 03 3000 "Cast-In-Place Concrete" for grout for masonry core fill.
2. Section 05 1200 "Structural Steel Framing" for grout and installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 07 1900 "Water Repellents" for water repellents applied to unit masonry assemblies.
4. Section 07 6200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. Include data on material properties, and material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Integral water repellant used in CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (6 m) vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2250 psi (15.5 MPa).
 - 2. Density Classification: Normal weight, unless otherwise indicated.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.

2.5 CONCRETE AND MASONRY LINTELS

- A. General: Provide lintels as indicated on the structural drawings.
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 03 3000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91/C 91M.
- B. Mortar Cement: ASTM C 1329/C 1329M.
- C. Aggregate for Grout: ASTM C 404.
- D. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- E. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckman Building Products, Inc.; No. 376 Rebar Positioner.
 - c. Hohman & Barnard, Inc.; #RB or #RB – Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
 - 1. Interior Walls: Mill- galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm diameter).
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 5. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.
 - 6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- D. Masonry Cleaner:
 - 1. Use potable water and detergents to clean masonry unless otherwise acceptable.
 - 2. Unless otherwise required, do not use acid or caustic solutions.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.

3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
- D. Partition Top Anchors: 0.105-inch-(2.66-mm-) thick metal plate with a 3/8-inch-(9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use masonry cement or mortar cement mortar unless otherwise indicated.

3. For exterior masonry, use masonry cement or mortar cement mortar.
 4. For reinforced masonry, use masonry cement or mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S or Type M.
 2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type S.
 4. For interior nonload-bearing partitions, use Type N may be used instead of Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi (17.2 MPa).
 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.

3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.

5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm).

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
 - 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Wet joint surfaces thoroughly before applying mortar.
 - 3. Rake out mortar joints for pointing with sealant.
- D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

3.9 BOND BEAMS

- A. Continuous bond beams shall be located at the following locations and as noted on the plans:
1. Under roof framing bearing locations
 2. Floor framing bearing locations
- B. Bond beam reinforcing shall be continuous through control joints at bearing walls, unless noted otherwise on drawings.
- C. Continuous bond beams shall be located at the top of non-load bearing partition walls.
1. Where joists pass through the concrete masonry wall, bond beam shall be lowered so the bond beam is not cut by the joist pass-thru.

3.10 LINTELS

- A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 16 inches (200 mm) at each jamb unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- H. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

3.13 PARING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 2200

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SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

- A. The Work required under this Section consists of structural steel, steel erection, shop painting, field touch-up painting, and related items necessary to complete the Work indicated.
- B. Miscellaneous angles, channels, anchor bolts, bent plates, sleeves, sag rods, leveling plates, bearing plates for structural steel and steel joists, and other incidental items of structural steel required to be built into concrete or masonry shall be provided as indicated or specified and be furnished to respective trades at proper time; including instructions and templates for their installation.
- C. Provide, where specifically called for, lintels, steel shelf angles, perimeter angle closure and accessories.

For openings in metal deck 12 by 12 inches inches and larger, provide steel reinforcing members on all sides of opening. Reinforcing shall be not less than 3 by 3 inches by 3/8 inch angles, unless otherwise indicated. Openings in deck shall be cut under Section 05 31000 - Metal Deck.

- D. Related Work Specified Elsewhere
 - 1. Division I – Quality Control
 - 2. Section 09 91 00 – Painting
 - 3. Section 03 30 00 – Cast in Place Concrete
- E. Refer to Section Division I for Alternates that may affect the Work of this Section.

1.3 SUBMITTALS

- A. Approved manufacturer's published complete product data for:
 - 1. Proposed base plate grout.
- B. Complete shop Complete shop drawings by approved fabricator including dimensioned plan layouts of columns and anchor bolt locations, dimensioned erection diagrams, and

shop detail drawings. Symbols and indications used for structural components on design drawings must appear identically on submitted shop drawings. Types of electrodes proposed for welding processes must also appear thereon.

1. The fabricator must review, and check shop drawings prepared by the fabricator or the fabricators subcontractors prior to submission to the Structural Engineer (SE).
2. AutoCAD drawings, for use in preparation of erection plans and shop drawings: Drawings may be available from the SE. The Contractors requiring this service must contact the SE to verify availability.
3. Changes to shop drawings for resubmissions shall be “clouded” or “flagged” to clearly indicate all changes, additions, or deletions to the previous submission. Resubmissions will be reviewed only to verify those items clouded or flagged. All other information will be assumed to be unchanged from the previous submission.

- C. Letter from a Professional Engineer (PE) licensed within the state of construction activities certifying that he has carefully studied the design drawings, that shop drawings have been prepared under his direct guidance and supervision, and that provided components and connections will meet or exceed loading requirements, where loads are shown at element ends. PE’s full signature and seal of authenticity must evidence such letter of certification. It should not be expected that Structural Engineer’s (SE’s) review of shop drawings will begin until such certification has been received. This certification is to verify the adequacy of members and connections designed by the fabricator and are not intended to require verifications of the design of structural elements shown in the plans.

1.4 QUALITY ASSURANCE

- A. Structural fasteners shall be manufactured in the United States. Fabricator shall furnish proof of U.S. manufacturer. If it becomes necessary to use imported fasteners, each size, type, and each large quantity package (500 pcs. or more) shall undergo a random sampling of a minimum 5 pieces for testing, and the test results to be provided to SE. Test shall be performed by an independent testing agency, and the cost shall be included in the Base Bid. If inferior fasteners are discovered, all fasteners of that type shall be removed and replaced with acceptable fasteners at no cost to the Owner. If possible, fasteners shall be tested prior to use in construction.
- B. Comply with the provisions of applicable building codes as well as the following specific requirements: Latest Edition:
1. AISC “Code of Standard for Steel Buildings and Bridges.”
 2. AISC “Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings” and including the “Commentary of the AISC Specification,” and the current supplements.
 3. AISC “Specifications for Structural Joints using ASTM A325 Bolts” approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 4. AWS “Structural Welding Code,” AWS D1.1 and its latest revision.
 5. ASTM A6 “General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piping, and Bars for Structural Use.”

- C. Structural Steel Alignment Quality Control: Refer to Division 1 – Quality Control.
- D. See Section 3.05 – Field Quality Control for additional requirements.
- E. DELIVERY, STORAGE, AND HANDLING
- F. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for observation and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 FABRICATORS

- A. Firms acceptable as fabricators for structural steel work under this Section shall be certified in the category of “Conventional Steel Buildings (Sbd)” by the American Institute of Steel Construction. The fabricator shall cooperate with and make available to the testing agency records and documents which focus on general management, engineering and drafting, procurement, operations and quality control and shall allow access to facilities to allow the testing agency to examine actual fabrication work in the shop and drafting room at the time of the inspection. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 MATERIALS

- A. Structural Angles, Plates, and Bars: ASTM A572 Grade 50, unless otherwise noted.
- B. Rolled Steel Shapes (Wide Flanges and WT Shapes): ASTM A992 (Fy=50 ksi).
- C. Hollow Structural Sections

1. Square, Rectangular, and Special Shapes: ASTM A500, Grade B (Fy=46 ksi).
 2. Round, Structural Steel Pipe: ASTM A53, Type E or S, Grade B or ASTM A500, Grade B (Fy=46 ksi).
- D. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325. Use 3/4 inch bolts, unless noted otherwise on the Drawings.
 2. Direct tension indicator washers may be used at Contractors option per ASTM F959.
- E. Electrodes for Manual Shielded and Metal-Arch Welding: AWS Code and ASTM A233, Series E60 and E70 as required.
- F. Electrodes and Flux for Submerged Arc Welding: AWS Code and ASTM A588, Series F60 and F70 as required.
- G. Structural Steel Primer Paint: Steel Structures Painting Council (SSPC) - Paint 15.
- H. Shrinkage-Resistant Grout (SR-G): CE (Corps of Engineers) CRD-C621 latest edition (formerly CRD-588) and ASTM C 1107, premixed, factory-packaged, flowable, mortar grouting compound with a minimum compressive strength of 9000 psi at 28 days. Products offered by manufacturers to comply with the requirements include the following:
1. Non-Ferrous Aggregate
 - a. Five Star Fluid Grout 100; Five Star Products, Inc., Fairfield, Connecticut.
 - b. Crystex; L&M Construction Chemicals, Inc., Omaha, Nebraska.
 - c. Sure-Grip High Performance Grout; Dayton Superior Corp., Miamisburg, Ohio.
 - d. Sonnogrout 10K; Sonneborn Building Products, Shakopee, Minnesota.
 - e. Sealtight Pack-H Grout; W. R. Meadows, Inc., Hampshire, Illinois.
 - f. Enduro 50; Conspec Marketing & Manufacturing Co., Inc., Kansas City, Kansas.
- I. Masonry Bearing Plates
1. All Joists shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld joists to bearing plates in accordance with SJI Specifications. See Framing Details and Plans for bearing plate sizes.
 2. All beams shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld beams to bearing plates unless otherwise noted.
 3. Bearing plates are to be set under the work of Division 4 – Masonry.
- J. Anchor bolts – threaded rods per ASTM A307.
- K. Adhesive Anchor Bolts
1. Concrete Base Material: Refer to Section 03 2000 - Concrete Reinforcing.
- L. Preformed Joint Material: Provide closed cell polyethylene expansion joint material equal to the following manufacturers:
1. Sonoflex F; Sonnebom Building Products, Shakopee, Minnesota.

2. Deck-O-Foam; W. R. Meadows, Inc., Hampshire, Illinois.
3. Econo Foam; Williams Products, Inc., Troy, Michigan

2.3 FABRICATION

- A. General: Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the final shop drawings. Provide camber in structural members as shown.
 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 2. Where finishing is required, complete the assembly, including riveting and welding of units, before start of finishing operations.
- B. Connections.
 1. Weld or bolt shop connections as shown.
 2. Bolt field connections, except where welded connections or other connections are shown or specified.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints."
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp
- E. Galvanizing:
 1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - a. ASTM A123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strip 1/8 inch thick and heavier
 2. Lintels in exterior walls and in other walls exposed to moist environments shall be hot-dipped galvanized.
 - a. Lintels consisting of a plate and rolled beam W16 and smaller shall have both plate and beam galvanized after welding.
 - b. Lintels consisting of a plate and rolled beam larger than W16 shall have plate galvanized and beam painted a cold applied mill galvanizing.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, such as nailers, plates, and for the passage of other work through steel framing members, as shown on the final shop drawings. Provide threaded nuts welded to framing and other specialty items as shown to receive other

2.4 FINISHES

- A. General: Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on the exposed portions and the initial 2 inch of embedded areas only. Do not paint

contact surfaces that are to be welded or high-strength bolted with friction-type connections. Coat with tar all steel encased in concrete and/or masonry below adjacent slab on grade.

- B. Surface Preparation: After observation and before shipping, clean steel work to be painted. Remove loose rust, mill scale, and spatter, slag or flux deposits. Clean steel in accordance with SSPC (Steel Structures Painting Council) as follows:
 - 1. SP-2 "Hand Tool Cleaning"
- C. Painting: immediately after surface preparation, apply structural steel rust inhibitive primer paint in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 1.5 mils. Use painting methods that will result in full coverage of joints, comers, edges, and exposed surfaces.
- D. Galvanizing: Joints between plates and beams and between intermittent welds shall be touched-up with cold applied galvanizing coating as required to insure uniform coating.
 - 1. Galvanized Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21 035A or 95 PC-Paint 20.

2.5 SOURCE QUALITY CONTROL

- A. The materials and workmanship to be furnished under this Specification shall be subject to observation in the mill, shop, and field by the SE. Observation will be conducted without expense to the Contractor; however, observation in the mill or shop shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with contract requirements.
- B. Refer to Division 1- Quality

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

3.2 ERECTION

- A. General: Comply with the AISC Specifications and Code of Standard Practice and with specified requirements.

- B. Surveys and Bench Marks: Establish permanent bench marks as shown and as necessary for the accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices before erection work proceeds and report measurement discrepancies to the A/E. Do not proceed with erection until corrections have been made or until compensating adjustments to the structural steel work have been agreed upon with the NE.
- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members as required, with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.
- D. Temporary Planking: Provide temporary planking and working platforms as required and as necessary to effectively complete the work.
- E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Electrodes for Manual Shielded and Metal-Arch Welding: AWS Code and ASTM A233, Series E60 and E70 as required.
 - 1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
 - 2. Refer to Division 3 of these Specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation, if required.
 - 3. Where anchor bolts are broken after installation, the concrete shall be removed around the remaining portion of the bolt in the concrete to a depth of 1/2 inch below the top of the bolt. A new segment of bolt of the same steel strength shall be full penetration welded to the remaining bolt in the concrete. The new segment of bolt shall be tapered on the welded end to a 30-degree bevel all around to leave a thickness at the beveled end of 1/4 inch.
 - 4. Where anchor bolts are incorrectly located in the concrete or masonry which encases them, the following procedures shall be used
 - a. For bolt misalignment less than 5/16 inch: offset the column with base plate as required to locate column correctly. The 5/16 inch oversized holes in the column base plates will allow this movement without modification to the column or the anchor bolts.
 - b. For bolt misalignment more than 5/16 inch and less than 2 inches: cut and remove base plate from column, relocate base plate and reweld to column.
 - c. For bolt misalignment more than 2 inch and less than 6 inches: cut off anchor bolts flush with surface of concrete or masonry and install adhesive anchor bolts as specified in Division 4 for masonry and Division 3 for concrete base material.
- F. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
 - 1. Setting Plate Procedure
 - a. Set loose and attached base plates and bearing plates for structural members on wedges or other adjustable devices.

- b. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
 - c. Pack bedding grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow curing in strict compliance with the manufacturers instructions, or as otherwise required.
 - G. Field Assembly: Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of the structure within specified AISC tolerances.
 - 2. Splice members only where shown or specified, unless approved otherwise by the A/E or his representative.
 - H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces
 - I. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.
 - 1. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
 - J. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing.
 - K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
 - L. Lintels and Shelf Angles: Weld or bolt members together where so indicated.
 - 1. Lintels shall have 8-inch bearing at each end, minimum, unless shown otherwise. Bearing pressures shall not exceed the allowable stress for masonry
 - 2. Where shelf angles are attached to concrete with bolts and adjustable inserts, provide slotted holes of proper size and spacing in the vertical leg of shelf angles.
- 3.3 HIGH STRENGTH BOLTS
- A. Structural joints using high strength bolts, hardened washers, and nuts shall be tightened to a high tension; the materials, methods of installation and tension control, type of wrenches to be used, and observation methods shall conform to specifications for “Structural Joints

using ASTM A325 or A490 Bolts,” as approved by the Research Council on Structural Connections of the Engineering Foundation, Latest Edition

- B. The high strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
- C. All high strength bolted connections shall be “snug-tight” connections, unless otherwise indicated on the Drawings.
 - 1. “Snug-tight” is defined as the tightness that exists when all plies in a joint are in firm contact and can be attained with a few impacts of an impact wrench or by the full effort of a person using an ordinary spud wrench
- D. Where specifically noted on the Drawings, bolted connections shall be installed “slip-critical”.
 - 1. Tightening of nuts shall be done by the turn-of-nut method, according to the Specifications for Structural Joints” using ASTM A325 or A490 bolts,” endorsed by AISC, unless direct tension indicator washers are used, in which case tightening will terminate when the proper gap is attained.
 - 2. For the “turn-of-nut” method, bolts that have been “snug-tight” shall be marked on both the bolt head and the nut with an identifying symbol, and then given an additional fraction of a turn as specified in Table 5 of the above referenced specification. Marks shall be such that visual observation can be made of finished connections. Snug-tight is defined as the tightness developed by the full effort of a man using a spud wrench on all bolts in the connections.
 - 3. Slotted holes will be allowed in following locations, only and shall have snug tight bolted connections
 - a. The outstanding legs of angles used in beam shear splices
 - b. Hip and valley beams where both ends frame into steel members in an all steel frame.
 - c. Diagonal or skewed beams where both ends frame into steel members in an all steel frame.
 - d. Other connections where specifically detailed in the drawings.
 - e. All other holes shall be standard bolt (1/16 inch larger than bolt).

3.4 ERECTION ALIGNMENT

- A. Framing: The framing shall be carried up true, plumb, and level within a tolerance of 1:500; and temporary bracing shall be introduced, wherever necessary, to take care of loads to which the structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. The Contractor as part of his equipment shall finally remove it. As erection progresses, the Work shall be securely connected to take care of dead load, wind, and erection stresses.

3.5 FIELD QUALITY CONTROL

- A. Contractor shall retain an independent testing agency to check connection and (Note retained by contractor of owner) fastening as specified herein. Conform to Division One — Quality Control.
- B. Steel (includes work for metal joists and metal deck).
- C. Structural Steel
 - 1. The Testing Agency shall conduct and interpret tests and state in each report whether test specimens comply with the requirements, and specifically state any deviations from requirements.
 - a. Contractor shall provide access for the Testing Agency to places where structural steel is being fabricated or produced so inspection and testing can be accomplished.
 - 2. Bolted Connections: Inspection in accordance with AISC Specification for Structural Joints, as follows:
 - a. Visually inspect all bolts.
 - b. Check for proper torque with a calibrated torque wrench. Minimum two bolts of alternate design connections between beams and girders. Minimum two bolts of every connection between girders and columns.
 - c. All bolted connections that fail shall be corrected and all bolts in that connection shall be retested. The cost of retests on connections that fail shall be borne by the contractor.
 - 3. Field During erection of structural steel, inspect and test assemblies in accordance with AWS Structural Welding Code and as follows:
 - a. Perform visual inspection of all welds and test those which are questionable.
 - b. Perform non-destructive tests of weld as required above, as follows:
 - 1) Fillet Welds: One spot test per member. Magnetic particle testing may be used.
 - 2) Partial Penetration Welds: One spot test per weld using ultrasonic testing techniques.
 - 3) Full Penetration Welds: One spot test per weld for shop welds and the entire length of all field welds. Use radiographic or ultrasonic testing techniques.
 - c. Ultrasonic inspection shall be performed on all welds subject to tension in moment connections. See drawings for locations. In addition, any other welds in question or selected at random by the inspector or Structural Engineer shall be tested by this method. When ultrasonic inspection is used, 100 percent of the length of the weld shall be inspected. Any retesting required shall be paid for by the Contractor responsible for work being tested.
 - d. Re-inspect and retest defective welds which have been re-welded. The cost of re-welding, re-inspection and retesting shall be paid by the Contractor.

END OF SECTION 05 1200

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.02 DESCRIPTION

- A. Work included: All labor and materials required to design, furnish, and install cold-formed metal framing as shown on the Drawings and or required by these specifications. Cold-formed metal framing includes:
 - 1. Interior and Exterior non-load bearing wall studs and framing.
 - 2. Related accessories and necessary fasteners to complete the system.
- B. Related work specified elsewhere: The general provisions of the Contract apply to the work of this Section, as though reproduced herein. Carefully examine all other sections and all Drawings for related work.
- C. Provide openings and special framing required by other trades. Equipment framing, loads, openings, and structure are shown for bidding purposes only. Obtain approval of other trades before proceeding with such work. Coordinate work with mechanical and electrical requirements.
- D. Field measurement of the existing construction shall be conducted when required to ensure the proper coordination and fit of new work.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-Formed Structural Steel Members", except as otherwise indicated.
 - 1. The minimum uncoated thickness of the cold-formed metal framing delivered to the project shall not be less than 95% of the design thickness indicated. Lesser thicknesses shall be permitted at the bends due to cold forming.
- B. Welding of CFMF: Comply with American Welding Society, AWS D1.1 "Structural Welding Code – Steel" and AWS D1.3 "Structural Welding Code – Sheet Steel". Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

- C. Provide each type of cold-formed metal framing required produced by one manufacturer.
- D. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot-Dip Process”.
 - b. ASTM A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings”.
 - c. ASTM A924 “Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process”.
 - d. ASTM A1003 “Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members”.
 - e. ASTM C955 “Standard Specification for Load bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases”.
 - f. ASTM C1007 “Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories”.
 - 2. American Welding Society (AWS):
 - a. AWS A2.4 “Symbols for Welding and Nondestructive Testing”.
 - b. AWS D1.1 “Structural Welding Code-Steel”.
 - c. AWS D1.3 “Structural Welding Code – Sheet Steel”.
 - 3. Association of Wall and Ceiling Industries-International (AWCI) and Metal Lath/Steel Framing Association (ML/SFA)
 - a. AWCI-ML/SFA “Steel Framing Systems Manual”.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide cold-formed metal framing capable of withstanding design loads and within deflection limits indicated.
- B. Design Loads: Occupancy Live, Roof Live, Snow, Wind, and Seismic loads shall be as indicated in the General Structural Notes on the Structural Drawings.
- C. Deflection Limits: Design framing systems to withstand the total design loads without the deflection exceeding the following:
 - 1. Exterior wall framing horizontal deflection where “L” is the stud height:
 - a. Supporting flexible finishes (including EIFS): L/240
 - b. Supporting Portland Cement-based Plaster (Stucco): L/360
 - c. Supporting masonry, brick, or stone finishes: the more stringent of L/600 or 3/8”.
 - d. Supporting extremely brittle finishes: L/720 or as defined by finish manufacturer.
 - 2. Interior wall framing horizontal deflection where “L” is the stud height and the applied horizontal live load is 5 psf (ASD) loading:

- a. Supporting flexible finishes: L/240.
 - b. Supporting brittle finishes: L/360.
3. Ceiling and soffit joist framing vertical deflection where “L” is the horizontal span of the joist:
 - a. Total Loads: L/240 or L/360.

1.05 SUBMITTALS

- A. Submit Manufacturer’s product data and installation instructions for each type of cold-formed metal framing and accessory required.
- B. Delegated design:
 1. Stud size and details shown on the Drawings indicate general installation and connection methods. Complete detail of components for all loads and forces is to be shown on the Shop Drawings. No changes from sizes and installation methods shown on the Construction Drawings will be permitted without verification that the design criteria cannot be met and without express written consent of the Architect and the Engineer of Record.
 2. Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services for installations of cold-formed metal framing that are similar to those indicated for this project in material, design, and extent.
 3. Shop drawings must include structural analysis data of all cold-formed metal framing and connections in conformance with design loads stated on the Structural Drawings. Shop drawings and analysis must bear the seal of the qualified Engineer responsible for their preparation.
- C. Shop Drawings: submit drawings for approval that include the following minimum information:
 1. Fully dimensioned plans and elevations with cross sections and details depicting all component member locations, orientations, and layout.
 2. Wall, Floor, and/or Roof member sizes and gauge designations, number, type and spacing.
 3. Supplemental strapping, bracing, bridging accessories, and details required for proper installation.
 4. Details of connections that indicate screw types, quantities, locations, weld size and locations, and any other fastener requirements.
- D. Supplier’s Certification:
 1. The supplier of the cold-formed metal framing shall submit written evidence of having a minimum of five years’ experience on projects of similar type and scope, including a description of physical facilities, quality control, methods, personnel experience, and erection capacities.
 2. Cold-formed pre-engineered steel truss manufacturer must adhere to Special Inspection requirements for fabricated items.

- E. Welding of cold-formed metal components shall only be performed by operators qualified per AWS D1.1 and D1.3 for the thickness of materials being used. Submit copies of welder certificates upon request only.
- F. Upon request only, submit mill certificates from the steel producer.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturers unopened containers or bundles fully identified by name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.
- B. Protect cold-formed metal framing members and accessories from corrosion, deformation, damage, and deterioration when stored at the job site as required in AISI's Code of Standard Practice. Store cold-formed metal framing off the ground on pallets, platforms or other supports, and provide a waterproof covering. Keep cold-formed metal framing free of dirt and other foreign material.

1.07 PROJECT CONDITIONS

- A. Coordinate metal frame positioning with trades furnishing items for attachment of built-in members.
- B. Promptly furnish anchors, bolts, inserts, clips, and other items required under this section but built in with work of other trades.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Cold-formed metal framing products by the following manufacturers are approved for use on this project: ClarkDietrich Metal Framing; Marino Ware, a division of Ware Industries; United Metal Products, Inc.; Scafco Corp.; and The Steel Network, Inc.
- B. Connection component and fastener products by the following manufacturers are approved for use on the project: ClarkDietrich Metal Framing; Marino Ware, a division of Ware Industries; and The Steel Network Inc.
- C. Alternate manufacturers of cold-formed metal framing, connection components, and fasteners are to be submitted for review and approval two weeks before submitting bids.

2.02 MATERIALS AND FINISHES:

- A. Steel sheet: ASTM 1003, Structural Grade, Type H, metallic coated, of thickness and grade as follows:
1. 33 mils – 0.0346 inches (20 gauge), $F_y = 33$ ksi.
 2. 43 mils – 0.0451 inches (18 gauge), $F_y = 33$ ksi.
 3. 54 mils – 0.0566 inches (16 gauge), $F_y = 50$ ksi.
 4. 68 mils – 0.0713 inches (14 gauge), $F_y = 50$ ksi.
 5. 97 mils – 0.1017 inches (12 gauge), $F_y = 50$ ksi.
 6. Track and bridging components shall have a minimum $F_y = 33$ ksi.
 7. Connection clip angles and vertical or horizontal deflection connections shall have a minimum $F_y = 33$ ksi.
- B. Framing Components: Manufacturer's standard C-shaped cold-formed metal framing having punched and/or un-punched webs with stiffened flanges shall comply with ASTM C955. Provide sizes, shapes, and gauges indicated. Nomenclature used on the Drawings is designated by: Depth, Shape, Width, and Thickness of framing components. i.e. "600 S162-54".
1. Depth: The number represents the depth of the member multiplied by 100 and expressed as a whole number in inches. i.e. '362' = 3-5/8"; 600' = 6"; '800' = 8".
 2. Shape: 'S' = C-shaped member; 'T' = Track member; 'F' = Furring channel; 'U' = U-shaped member.
 3. Width: The number represents the flange width of the member multiplied by 100 and expressed as a whole number in inches. i.e. '162' = 1-5/8"; '200' = 2"; 250 = 2-1/2".
 4. Thickness: Expressed in mils as defined above.
- C. System Accessories: Provide manufacture's standard steel tracks, bridging, blocking, clip angles, reinforcements, stiffeners, fasteners, braces, and accessories for each type of cold-formed metal framing required. Provide all components recommended by the manufacturer for the applications indicated and as needed to provide a complete metal framing system.
- D. Finish:
1. Galvanized: Provide framing components: studs, joists, rafters, and headers with protective zinc coating complying with ASTM A1003, minimum G60 coating.
 2. Provide connection components; clip angles, deflection angles, joist hangers, hurricane ties, holdowns, etc. with protective zinc coating complying with ASTM A1003, minimum G90 coating.
 3. Galvanized repair paint: Tnemec Co., Inc. – No. 92 "Tneme-Zinc"; SSPC-Paint 20; or an approved equal zinc-rich primer paint.
- E. Fasteners:
1. Manufacturer's recommended self-drilling, self-tapping screws, bolts, nuts, and washers with hot-dip galvanized finish complying with ASTM C1513.
 2. Anchorage devices: Power-actuated Fasteners (PAF), anchor rods, drilled expansion anchors, or chemical anchors.

- 3. Welding: Comply with AWS D1.1 when applicable, and AWS D1.3 for welding base materials less than 1/8" thick.
- F. Shims: Load-bearing, high-density multimonomer plastic, non-leaching.

2.03 FABRICATION

- A. Cut framing to fit squarely against abutting members. Hold members securely in position until properly fastened.
- B. Saw cut all field cuts of cold-formed metal framing members and components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members.
- C. Attach and join indicated components by welding. Attach and join other components by welding, bolting, or screw fasteners as recommended by the manufacturer. Wire-tying of framing members is not permitted.

PART 3 EXECUTION

3.01 INSTALLATION – GENERAL

- A. Install cold-formed metal framing in accordance with ASTM C1007 unless otherwise indicated.
- B. Install load bearing shims or grout between underside of wall bottom track or rim track and top of foundation wall or slab at studs or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- C. Install cold-formed metal framing and accessories plumb, square, and true to line according to the manufacturer's written recommendations and requirements in this Section.
- D. Connections of cold-formed metal framing members and components are to be securely anchored to the supporting structure according to the manufacturer's written recommendations and requirements of this Section.
- E. Do not bridge building expansion joints and control joints with cold-formed metal framing members or accessories. Frame each side of joints with independent members.
- F. Install insulation in assemblies and built-up members in exterior framing, such as headers, multiple stud columns and jambs, sills, and boxed beams or joists that are not accessible to the insulation contractor upon erection of framing work.

- G. Fasten hole-reinforcing plates over web penetrations that exceed the manufacturer's standard punched openings.

3.02 INSTALLATION – INTERIOR AND EXTERIOR NON-LOAD BEARING STUD WALLS

- A. Install continuous top and bottom tracks sized to match studs. Align tracks securely to layout at base and top of studs. Secure tracks at corners, ends, and laps as recommended by the manufacturer for type of construction involved. Anchor tracks to building framing as recommended by the manufacturer except do not exceed 16 inches on center spacing for nail or power actuated fasteners, or 32 inches on center for anchor rods, expansion and chemical anchors, and other similar types of attachment.
- B. Set studs plumb except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- C. Where stud systems abut structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- D. Install supplementary framing, blocking and bracing in cold-formed metal framing systems wherever required to provide a complete and stable wall-framing system. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight for loading resulting from item supported.
- E. Squarely set studs against web of tracks and secure studs to top and bottom runner tracks by either welding or fastening with screws at both inside and outside flanges.
- F. Install stud wall bridging (continuous cold-rolled channels positioned through the stud punch-outs) either by welding directly to the stud or attaching with clips. Bridging shall consist of the following:
 - 1. 3-5/8" and 6" studs: 1-1/2" x 16-ga. channel fastened to each stud with standard clip angles.
 - 2. Proprietary bridging bars provided and installed according to manufacturer's written instructions.
 - 3. A combination of flat, taut, steel straps of width and thickness indicated and stud-track solid blocking of width and thickness to match stud. Fasten straps to stud flanges and secure solid blocking to stud webs or flanges with standard clip angles.
 - 4. Install bridging rows at a maximum spacing of 4'-0" on center.
- G. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame, except where more than 2 studs are shown. Provide stud or joist header at all rough openings greater than 24 inches. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack

studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

- H. Provide extra studs, tracks, headers, etc. as required to frame the perimeter of openings.
- I. Provide insulation, as indicated elsewhere, in all double jamb studs, double header members, and other assemblies that will not be accessible to the insulation contractor after erection.
- J. Splicing of load-bearing studs and box headers is not permitted, unless specifically detailed otherwise.
- K. Install steel sheet diagonal straps to both stud flanges, terminate at and fastened to reinforced top and bottom tracks. Fasten clip angle connectors to multiple studs at ends of bracing and anchor to structure.

3.03 TOLERANCES

- A. Fabricate and install members and assemblies to a maximum allowable variation as follows:
 - 1. Variation from plumb, level, and true to line: 1/8 inch in 10 feet.
 - 2. Variation of member spacing: not more than 1/8 inch plus or minus from spacing indicated. Cumulative error shall not exceed the minimum fastening requirements of the sheathing or other finishing materials.
 - 3. Squareness: fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

3.04 FIELD REPAIRS AND PROTECTION

- A. Galvanized repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing, connections, and components with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer, which ensure cold-framed metal framing is without damage or deterioration at time of Substantial Completion.

3.05 FIELD QUALITY CONTROL

- A. Inspection and testing shall be in accordance with Special Inspections designated for this project as approved by the Building Official. Special Inspections must be documented with all corrective measures completed to satisfy compliance certificates as deemed necessary by the Jurisdiction.

CITY OF DAYTON POLICE DEPARTMENT
1ST DISTRICT EAST PATROL RENOVATIONS

2025

END OF SECTION 05 4000

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SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Shop fabricated steel items, including: Handrail.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- 1.03.B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.
- 1.03.C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- 1.03.D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- 1.03.E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- 1.03.F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- 1.03.G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- 1.03.H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- 1.03.I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- 1.03.J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- 1.03.K. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.04.B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- 2.01.A. Steel Sections: ASTM A36/A36M.
- 2.01.B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- 2.01.C. Plates: ASTM A283/A283M.
- 2.01.D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- 2.01.E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- 2.01.F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- 2.01.G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- 2.01.H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- 2.02.A. Fit and shop assemble items in largest practical sections, for delivery to site.
- 2.02.B. Fabricate items with joints tightly fitted and secured.
- 2.02.C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- 2.02.D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- 2.02.E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- 2.03.A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- 2.03.B. Handrail for basement level.

2.04 FINISHES - STEEL

- 2.04.A. Prime paint steel items.
 - 1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- 2.04.B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- 2.04.C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- 2.04.D. Prime Painting: One coat.
- 2.04.E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating. (Provide minimum 530 g/sq m galvanized coating.)
- 2.04.F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

- 2.05.A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- 2.05.B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- 2.05.C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- 2.05.D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- 2.05.E. Maximum Deviation from Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- 3.02.A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- 3.03.A. Install items plumb and level, accurately fitted, free from distortion or defects.
- 3.03.B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- 3.03.C. Obtain approval prior to site cutting or making adjustments not scheduled.

- 3.03.D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- 3.04.A. Maximum Variation from Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- 3.04.B. Maximum Offset from True Alignment: 1/4 inch (6 mm).
- 3.04.C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION 05 5000

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Sheathing.
- 1.01.B. Preservative treated wood materials.
- 1.01.C. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- 1.03.B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- 1.03.C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- 1.03.D. AWP A U1 - Use Category System: User Specification for Treated Wood; 2023.
- 1.03.E. PS 2 - Performance Standard for Wood Structural Panels; 2018.
- 1.03.F. PS 20 - American Softwood Lumber Standard; 2021.
- 1.03.G. SPIB (GR) - Standard Grading Rules; 2021.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Provide technical data on insulated sheathing.

1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- 2.01.A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- 2.02.A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- 2.02.B. Sizes: Nominal sizes as indicated on drawings, S4S.
- 2.02.C. Moisture Content: S-dry or MC19.

2.03 CONSTRUCTION PANELS

- 2.03.A. Wall Sheathing: Glass mat faced gypsum with integral water-resistive and air barrier, ASTM C1177/C1177M, 5/8 inch (15.9 mm) thick.
1. Edges: Square.
 2. Water Vapor Permeance: 1 perm (57.5 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
 3. Air Permeance, Sheathing: 0.001 cfm/sq ft (0.005 L/s per sq m), maximum, when tested in accordance with ASTM E2178.
 4. Products:
 - a. Georgia-Pacific LLC; DensElement Barrier System: www.DensElement.com/#sle.
 - b. USG Corporation; Securock ExoAir 430 Panel 5/8 in. (15.9 mm): www.usg.com/#sle.

2.04 ACCESSORIES

- 2.04.A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- 2.04.B. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.
- 2.04.C. Sill Flashing: See Section 07 6200.

2.04.D. General Purpose Construction Adhesives: Comply with ASTM C557.

2.05 FACTORY WOOD TREATMENT

2.05.A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.

2.05.B. Preservative Treatment:

1. Preservative Pressure Treatment of Plywood Above Grade: AWWA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 PREPARATION

3.01.A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

3.02.A. Select material sizes to minimize waste.

3.02.B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02.C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

3.03.A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.03.B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

3.03.C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

3.04 INSTALLATION OF CONSTRUCTION PANELS

3.04.A. Wall Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. Nail panels to framing; staples are not permitted.

3.05 TOLERANCES

3.05.A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

3.05.B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 FIELD QUALITY CONTROL

3.06.A. See Section 01 4000 - Quality Requirements for additional requirements.

END OF SECTION 06 1000

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Specially fabricated cabinet units.
- 1.01.B. Hardware.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- 1.02.B. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

- 1.03.A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- 1.03.B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- 1.03.C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- 1.03.D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- 1.03.E. BHMA A156.9 - Cabinet Hardware; 2020.
- 1.03.F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.05.B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
- 1.05.C. Product Data: Provide data for hardware accessories.
- 1.05.D. Samples for Verification: Provide the following.

1. Plastic Laminates, 8 x 10 inch for each type, color, pattern and surface finish.
2. Lumber products with Shop-Applied Opaque Finish: 5 x 12 inch.

1.06 QUALITY ASSURANCE

1.06.A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

1.07.A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

1.08.A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

2.01.A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.01.B. Plastic Laminate Faced Cabinets: Premium grade.

2.01.C. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Semi-Exposed Surfaces: Decorative laminate
3. Finish - Concealed Surfaces: Manufacturer's option.
4. Door and Drawer Front Edge Profiles: Square edge with inset band.
5. Door and Drawer Front Retention Profiles: Fixed panel.
6. Casework Construction Type: Type A - Frameless.
7. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
8. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
9. Cabinet Style: Flush overlay.
10. Cabinet Doors and Drawer Fronts: Flush style.
11. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

2.02.A. Wood fabricated from old growth timber is not permitted.

2.03 Panel Core Materials

- 2.03.A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
1. Grade: M-2; moisture resistance: MR10.
 2. Panel Thickness: 3/4 inch (19.1 mm).
- 2.03.B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
1. Grade: 115; moisture resistance: MR10.
 2. Panel Thickness: 3/4 inch (19.1 mm).

2.04 Thermally Fused Laminate Panels

- 2.04.A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
1. Test in accordance with NEMA LD 3 Section 3.
 2. Panel Core Substrate: Particleboard.
 3. Color: White.

2.05 LAMINATE MATERIALS

- 2.05.A. Manufacturers:
1. As indicated on the drawings..
- 2.05.B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- 2.05.C. Provide specific types as indicated.
1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, colors as indicated, finish as indicated.
 2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, colors as indicated, finish as indicated.
 3. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 COUNTERTOPS

- 2.06.A. Countertops: See Section 12 3600.

2.07 ACCESSORIES

- 2.07.A. Adhesive: Type recommended by fabricator to suit application.
- 2.07.B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self-locking serrated tongue; of width to match component thickness.

1. Color: As indicated on drawings.

2.07.C. Fasteners: Size and type to suit application.

2.07.D. Grommets: Standard plastic grommets for cut-outs, 3-inch OD, with matching plastic caps with slot for wire passage.

1. Product: Doug Mockett & Company, Inc., "SG Series".
 - a. Color: To be selected by the Architect.

2.08 HARDWARE

2.08.A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

2.08.B. Adjustable Cabinet Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self-rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

2.08.C. Adjustable Shelf Standards and Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

1. Products:
 - a. Knappe and Vogt; #82 Heavy Duty Steel Standards and #182 Steel Shelf Supports.
 - b. Location: Tactical Gear Storage.

2.08.D. Workstation Brackets: Fixed, L-shaped, face-of-stud mounting.

1. Materials: Steel; L-shape cross-section.
 - a. Finish: Manufacturer's standard, factory-applied, powder coat.
 - b. Color: Almond.
 - c. Height: 15 inches (380 mm).
 - d. Support Length: 21 inches (530 mm).
 - e. Width: 1-1/2 inches (38 mm).
2. Products:
 - a. A&M Hardware, Inc; Standard Brackets: www.aandmhardware.com/#sle.

2.08.E. Drawer and Door Pulls: Extruded aluminum pull, full width of drawer, polished finish.

2.08.F. Drawer Slides: General purpose cabinet drawers and specialty purpose drawers including but not limited to keyboard trays, pencil drawers and file drawers.

1. Type: Full extension with overtravel.
2. Static Load Capacity: Heavy Duty grade (HD-100).
 - a. File drawers: Provide Heavy Duty grade (HD-200)
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self-closing/stay closed type.

2.08.G. Drawer Slides: General purpose cabinet drawers in the Kitchen only.

1. Type: Full extension with overtravel.

2. Static Load Capacity: Heavy Duty grade (HD-100)
3. Mounting: Bottom mounted.
4. Stops: Integral type.

2.08.H. Hinges: European style concealed self-closing type, 125 degrees of opening, steel with nickel-plated finish.

1. Manufacturers:
 - a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle.71B7550D

2.09 FABRICATION

- 2.09.A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- 2.09.B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- 2.09.C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- 2.09.D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify adequacy of backing and support framing.
- 3.01.B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- 3.02.A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- 3.02.B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- 3.02.C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- 3.02.D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- 3.02.E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- 3.03.A. Adjust installed work.

3.03.B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

3.04.A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 4100

SECTION 07 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Water repellents applied to exterior, masonry, and concrete surfaces.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

- 1.03.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.03.B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- 1.03.C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- 1.03.D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- 1.03.E. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.
- 1.03.F. Manufacturer's Qualification Statement.
- 1.03.G. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

- 1.04.A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- 1.04.B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience
- 1.04.C. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.05 FIELD CONDITIONS

- 1.05.A. Protect liquid materials from freezing.
- 1.05.B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C).

1.06 WARRANTY

- 1.06.A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- 1.06.B. Correct defective Work within a five-year period after Date of Substantial Completion.
- 1.06.C. Provide five-year manufacturer warranty for water repellency.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
 - 1. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - 2. Pecora Corporation; KlereSeal 910-W/920-W Water-Based Penetrating Masonry Sealer: www.pecora.com/#sle.
 - 3. PROSOCO, Inc: www.prosoco.com/#sle.

2.02 MATERIALS

- 2.02.A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete and masonry.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify existing conditions before starting work.
- 3.01.B. Verify joint sealants are installed and cured.
- 3.01.C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

3.02.A. Protection of Adjacent Work:

1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
2. Protect adjacent surfaces not intended to receive water repellent.

3.02.B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

3.02.C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

3.02.D. Remove loose particles and foreign matter.

3.02.E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

3.02.F. Scrub and rinse surfaces with water and let dry.

3.02.G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

3.03.A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

3.03.B. Apply at rate recommended by manufacturer, continuously over entire surface.

3.03.C. Apply two coats, minimum.

3.03.D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

3.03.E. Provide manufacturer's field service representative to inspect preparation and application work continuously during entire application period to ensure that manufacturer's "best practices" for preparation and application are being followed.

END OF SECTION 07 1900

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SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
- 1.01.B. Board insulation at exterior walls.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 07 5423 – Thermoplastic Polyolefin (TPO) Roofing: Installation requirements for board insulation over low slope roof deck.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- 1.03.B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- 1.03.C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- 1.03.D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

- 1.05.A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- 2.01.A. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.
- 2.01.B. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.
- 2.01.C. Insulation behind metal panel system: polyisocyanurate insulated bonded to fire treated plywood.

2.02 FOAM BOARD INSULATION MATERIALS

- 2.02.A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Type and Compressive Resistance: Type XII, 15 psi (104 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 - 5. Products:
 - a. DuPont de Nemours, Inc; Styrofoam Brand
UtilityFit: building.dupont.com/#sle.
 - b. Styrofoam Cavitymate Ultra System
 - c. Owens Corning Corporation

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

- 2.03.A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Thermal Resistance: R-value (RSI-value) as indicated on the drawings.
 - 5. Thickness: As indicated on the drawings.
 - 6. Facing: Unfaced.
 - 7. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS
Insulation: www.ocbuildingspec.com/#sle.

2.04 ACCESSORIES

- 2.04.A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch (0.25 mm) thick.
- 2.04.B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 - 2. Width: Are required for application.
- 2.04.C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- 3.01.B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- 3.02.A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- 3.02.B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- 3.02.C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- 3.02.D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- 3.02.E. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically.
- 3.02.F. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (152 mm) on center. Lap and seal sheet retarder joints over face of member.
- 3.02.G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member
- 3.02.H. Tape seal tears or cuts in vapor retarder.
- 3.02.I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.
- 3.02.J. Place insulation against baffles, and do not impede natural attic ventilation to soffit.

3.03 PROTECTION

3.03.A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100

SECTION 07 4213.13
METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concealed fastener metal wall panels as part of the assembly described in Section 2.1.

1.2 RELATED REQUIREMENTS

- A. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.
- B. Division 07 Section "Joint Sealants" for field-applied joint sealants.
- C. Division 07 Section "Air Barriers" for transition and flashing components of air/moisture barrier.
- D. American Architectural Manufacturer's Association (AAMA):
 - 1. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.
 - 2. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- E. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- F. ASTM International (ASTM):
 - 1. ASTM A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 3. ASTM A 755/A 755M - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - 4. ASTM A 792/A 792 M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 5. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - 6. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
 - 7. ASTM C 920 - Specification for Elastomeric Joint Sealants.
 - 8. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

9. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
10. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
11. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):

1. Architectural Sheet Metal Manual.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

1.4 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.
1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Load span tables including evaluation of panel clip and panel side joint interaction.
 - c. Samples of each component.
 - d. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
 - e. Sample warranty.
 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 3. Approved manufacturers must meet separate requirements of Submittals Article.
- C. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years experience with successfully completed projects of a similar nature and scope.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.
 - 1. Coordinate building framing in relation to metal wall panel assembly.
 - 2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
 - 3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.6 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets, for specified products.
 - 1. Include data indicating compliance with performance requirements.
- B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale of 1-1/2-inch per foot (1:8) of all required trim and extrusions needed for a complete installation.
 - 1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.
 - 2. Indicate details of fastening, including clip spacing, supported by load span tables that include an evaluation of clip and panel side joint interaction.
- C. Samples for Initial Selection: For each product specified. Provide representative color charts of manufacturer's full range of colors.
- D. Samples for Verification: Provide 12-inch (300 mm) section of panel(s) showing finishes. Provide 12-inch (300 mm) long pieces of trim pieces and other exposed components.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
- B. Qualification Information: For Installer firm.
- C. Manufacturer's warranty: Submit sample warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect metal wall panel products during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
 - 1. Deliver, unload, store, and erect metal wall panel products and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.
- B. Special Panel Finish Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panels that display evidence of deterioration of finish within 10 years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Metal Wall Panels over Multi-Component Framed Wall System: Single-skin concealed fastener metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers", and insulation within the framing specified in Division 07 Section "Thermal Insulation". Metal wall panel installation specified in this Section may include secondary metal subgirt framing and mounting clips for panel attachment.
 - 1. Air, moisture, and water vapor control membrane is provided under Division 07 Section "Air Barriers."

2.2 MANUFACTURERS

- A. Basis of Design: CENTRIA, Concept Series Metal Wall Panels. Provide basis of design product, or comparable product approved by Architect 30 days prior to bid.
 - 1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

Michael Rathburn, CENTRIA Architectural Systems; Tel: (614)767-9663. Email: mstrathburn@CENTRIA.com.

2. Approved equal.

2.3 PANEL MATERIALS

- A. Metallic-Coated Steel Face Sheet: Coil-coated, ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Class Z275), structural steel.
2. Aluminum-zinc alloy-coated (Galvalume) Steel Sheet: ASTM A 792/A 792M, Class AZ50 Grade 50 (Class AZM150, Grade 275), structural steel quality.
3. Face Sheet: Minimum 0.030 inch/22 gage (0.76 mm) nominal uncoated thickness.
4. Surface: Smooth.

2.4 CONCEALED FASTENER METAL WALL PANELS

- A. Metal Wall Panels, General: Factory-formed, concealed fastener panels with interconnecting side joints, fastened to supports with concealed fasteners, with factory-applied sealant in side laps when required to meet performance requirements.

- B. Reveal-joint profile with raised flat pan:

1. Basis of Design Product: CENTRIA, CS-200.
2. Panel Coverage: 12 inches (305 mm).
3. Panel Height: 0.875 inch (22 mm).

- C. Triple-reveal profile with raised flat pan and two ribs:

1. Basis of Design Product: CENTRIA, CS-612.
2. Panel Coverage: 16 inches (406 mm).
3. Panel Height: 0.875 inch (22 mm).

- D. Exposed Coil-Coated Finish System:

1. Fluoropolymer Two-Coat System: 0.2 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 620.

- a. Basis of Design: CENTRIA Fluorofinish.

- E. Color:

1. Exterior Surface: #9946, Silversmith, as selected by Architect from manufacturer's color options.
2. Interior Surface: Manufacturer's standard primer color.

2.5 METAL WALL PANEL ACCESSORIES

- A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, inside and outside corners,

and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, lap tapes, and closure strips for a complete installation. Fabricate and install accessories in accordance with SMACNA Manual.

- B. Mitered Corners: Structurally bonded horizontal interior and exterior trimless corners matching metal wall panel material, profile, and factory-applied finish, fabricated and finished by metal wall panel manufacturer.
 - 1. Welded, riveted, fastened, or field- fabricated corners do not meet the requirements of this specification.
 - 2. Basis of Design: CENTRIA, MicroSeam Corners.
- C. Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.
- D. Sealants: Type recommended by metal wall panel manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."
- E. Flashing Tape: 4-inch-wide self-adhering butyl flashing tape.
- F. Fasteners, General: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided for miscellaneous applications, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.
- G. Concealed Clips: Galvanized steel, 0.06 inch/16 ga. (1.52 mm) nominal thickness, designed to allow unimpeded thermal movement of panel and configured to hold panel minimum 1/2 inch (12.7 mm) from substrate.

2.6 SECONDARY METAL SUBGIRT FRAMING

- A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z180).
 - 1. Hat Channels: 0.06 inch/16 ga. (1.52 mm) minimum – nominal thickness.
 - 2. Sill Channels: 0.06 inch/16 ga. (1.52 mm) minimum – nominal thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.
- B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.
 - 1. Maximum deviations acceptable:

- a. 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
 - b. 1/2-inch (12.7 mm) across building elevation.
 - c. 1/8-inch in 5 feet (3.2 mm in 1.5 m).
- C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.
- D. Advise G.C., in writing, of out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.
- E. Correct out of tolerance work and other deficient conditions prior to proceeding with insulated composite backup panel installation.

3.2 SECONDARY FRAMING INSTALLATION

- A. Secondary Metal Framing: Install secondary metal framing components to tolerances indicated, as shown on approved shop drawings. Install secondary metal framing and other metal panel supports per ASTM C 1007 and metal wall panel manufacturer's recommendations.

3.3 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement
- B. Joint Sealers: Install joint sealants where indicated on approved shop drawings.

3.4 ACCESSORY INSTALLATION

- A. General: Install metal wall panel accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
 2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, lap strips, flashings, sealants, fillers, closure strips, and similar items.
 3. Comply with performance requirements and manufacturer's written installation instructions.
 4. Provide concealed fasteners except where noted on approved shop drawings.
 5. Set units true to line and level as indicated.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report.
- B. Correct deficiencies noted in manufacturer's report.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION 07 4213.13

SECTION 07 4243
COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall panel assembly consisting of:
 - a. Metal Composite Material (MCM)
 - b. Installation System
 - c. Accessories
 - 2. The extent of the wall panel assembly as indicated in these specifications and in the drawings.
- B. Related Sections:
 - 1. Section 05 12 00 - Structural Metal Framing
 - 2. Section 06 10 00 - Rough Carpentry
 - 3. Section 07 21 00 - Thermal Protection
 - 4. Section 07 62 00 - Flashing And Sheet Metal
 - 5. Section 07 92 00 - Joint Protection

1.2 REFERENCES

- A. American Society For Testing And Materials (ASTM)
 - 1. ASTM B117 Standard Practice For Operating Salt Spray (Fog) Apparatus
 - 2. ASTM B137 Standard Test Method For Measurement Of Coating Mass Per Unit Area On Anodically Coated Aluminum
 - 3. ASTM B211 Standard Specification For Aluminum And Aluminum-Alloy Rolled Or Cold Finished Bar, Rod, And Wire
 - 4. ASTM B680 Standard Test Method For Seal Quality Of Anodic Coatings On Aluminum By Acid Dissolution
 - 5. ASTM C267 Standard Test Methods For Chemical Resistance Of Mortars, Grouts, And Monolithic Surfacing And Polymer Concretes
 - 6. ASTM C297 Standard Test Method For Flatwise Tensile Strength Of Sandwich Construction
 - 7. ASTM C1371 Standard Test Method For Determination Of Emittance Of Materials Near Room Temperature Using Portable Emissometers
 - 8. ASTM D523 Standard Test Method For Specular Gloss
 - 9. ASTM D635 Standard Test Method For Rate Of Burning And/Or Extent And Time Of Burning Of Plastics In A Horizontal Position
 - 10. ASTM D714 Standard Test Method For Evaluating Degree Of Blistering Of Paints
 - 11. ASTM D968 Standard Test Methods For Abrasion Resistance Of Organic Coatings By Falling Abrasive
 - 12. ASTM D1308 Standard Test Method For Effect Of Household Chemicals On Clear And Pigmented Organic Finishes

13. ASTM D1781 Standard Test Method For Climbing Drum Peel For Adhesives
14. ASTM D1929 Standard Test Method For Determining Ignition Temperature Of Plastics
15. ASTM D2244 Standard Practice For Calculation Of Color Tolerances And Color Differences From Instrumentally Measured Color Coordinates
16. ASTM D2247 Standard Practice For Testing Water Resistance Of Coatings In 100% Relative Humidity
17. ASTM D2248 Standard Practice For Detergent Resistance Of Organic Finishes
18. ASTM D2794 Standard Test Method For Resistance Of Organic Coatings To The Effects Of Rapid Deformation (Impact)
19. ASTM D3359 Standard Test Methods For Measuring Adhesion By Tape Test
20. ASTM D3363 Standard Test Method For Film Hardness By Pencil Test
21. ASTM D4145 Standard Test Method For Coating Flexibility Of Prepainted Sheet
22. ASTM D4214 Standard Test Methods For Evaluating The Degree Of Chalking Of Exterior Paint Films
23. ASTM D5420 Standard Test Method For Impact Resistance Of Flat, Rigid Plastic Specimen By Means Of A Striker Impacted By A Falling Weight (Gardner Impact)
24. ASTM E84 Standard Test Method For Surface Burning Characteristics Of Building Materials
25. ASTM E283 Standard Test Method For Determining Rate Of Air Leakage Through Exterior Windows, Curtain Walls, And Doors Under Specified Pressure Differences Across The Specimen
26. ASTM E330 Standard Test Method For Structural Performance Of Exterior Windows, Doors, Skylights And Curtain Walls By Uniform Static Air Pressure Difference
27. ASTM E331 Standard Test Method For Water Penetration Of Exterior Windows, Skylights, Doors, And Curtain Walls By Uniform Static Air Pressure Difference
28. ASTM E903 Standard Test Method For Solar Absorptance, Reflectance And Transmittance Of Materials Using Integrated Spheres

B. American Architectural Manufacturers Association (AAMA)

1. AAMA 2605 Voluntary Specification, Performance Requirements And Test Procedures For Superior Performing Organic Coatings On Aluminum Extrusions And Panels

1.3 DEFINITIONS

A. Metal Composite Material (MCM):

A factory manufactured panel consisting of metal skins bonded to a plastic core, as defined by the International Building Code (IBC) Section 1402.

B. Leadership In Energy And Environmental Design (LEED):

A set of guidelines set forth by the United States Green Building Council (USGBC) to promote the building of environmentally responsible and sustainable structures.

C. ISO 9001:2008

A set of guidelines set forth by the International Organization For Standardization (ISO) to provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved.

1.4 SYSTEM DESCRIPTION

A. Design Requirements:

1. Barrier System:

Wall panel assembly shall be designed in accordance with manufacturer's guidelines to be sealed at all panel joints, intersections, dissimilar material abutments, and cutouts, thus providing a weathertight barrier system.

2. Expansion And Contraction:

Wall panel assembly shall be designed with provisions for thermal expansion and contraction of the component parts to prevent buckling, failure of joint seals, undue stress on fasteners or other detrimental effects due to accumulation of dead loads and various live loads.

3. Windload:

Wall panel assembly shall be designed to withstand a positive and negative windload pressure acting inward and outward normal to the plane of the wall to meet the requirements of the latest adopted Local Building Code.

B. General Performance:

Wall panel assembly shall comply with performance requirements, as determined by the following testing performed by a qualified agency.

1.5 SUBMITTALS

A. Product Data:

1. Submit manufacturer's datasheet for specified product.
2. Submit manufacturer's installation guidelines for specified product.
3. Submit manufacturer's literature indicating pre-consumer and post-consumer percentages of recycled content in the context of LEED MR Credit 4.1 and/or MR Credit 4.2.
4. Submit manufacturer's literature indicating compliance with the American Recovery & Reinvestment Act (ARRA), Section 1605.

B. Shop Drawings:

Submit shop drawings indicating project layout and elevations, fastening and anchoring methods, dimensions of individual components and profiles, detail and location of joints, sealants and gaskets, flashing and accessories.

C. Samples:

1. Submit two (2) samples 3" x 5" of each product specified.
2. Submit two (2) samples 3" x 5" of each finish specified.

- D. Test Reports:
Submit test reports indicating compliance of products with specified performance requirements from an independent testing agency.
- E. Warranty:
Submit manufacturer's warranty meeting the requirements of this section.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
Manufacturer shall have a minimum of ten (10) years' experience in the manufacture of this product, shall be an ISO 9001:2008 Registered Company, and shall be located within the United States of America.
 - 2. Installer:
Installer shall be experienced in performing work of this section and in work of similar scope required by this project.
- B. Pre-Installation Meeting:
Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance At Site:
Materials to be packaged to protect against transportation damage. Examine materials upon receipt to ensure that no damage has occurred during shipment.
- B. Storage And Protection:
 - 1. Storage:
Materials should be stored horizontally on pallets or platforms, covered with a suitable ventilated and weathertight covering. Do not store materials where accumulation of moisture may occur or in contact with materials that might cause staining, denting, or other damage.
 - 2. Material Handling:
Use care in unloading, storing, and erecting the materials to prevent bending, warping, and twisting. Protect finish and edges from damage. The protective film on the panel surface is to remain in place until installation and shall be removed immediately upon completion.

1.8 PROJECT CONDITIONS

- A. Field Measurements:
Verify location and dimension of all elements related to the installation of the wall panel assembly. Indicate those measurements on the shop drawings.
- B. Limitations:

Proceed with installation of the wall panel assembly only when existing site conditions comply with manufacturer's recommendations.

1.9 WARRANTY

- A. Metal Composite Material (MCM):
 - 1. Panel:

The integrity of the panel bond will remain intact for a minimum of ten (10) years from the Date Of Substantial Completion.
 - 2. Finish:
 - a. Polyvinylidene Fluoride (PVDF):
 - 1) The finish will not have a Fade Differential of greater than 5E units. Testing shall be in accordance with ASTM D2244.
 - 2) The finish will not have a Chalk Rating of less than 8. Testing shall be in accordance with ASTM D4214.
 - 3) The finish will not check, peel, lose adhesion or fracture (other than minute fractures which may develop due to fabrication and which are acceptable by industry standards on the Date Of Substantial Completion).
 - 4) Warranty period shall be thirty (30) years from the Date Of Substantial Completion.
- B. Installation System:
 - 1. Fabricator and/or installer standard form in which they agree to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 2. Weathertight warranties or other such guarantees regarding installation shall be the responsibility of the installing contractor.
- C. Accessories:

Warranties or other such guarantees regarding accessories used during installation shall be the responsibility of the installing contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design:

Citadel Architectural Products; Local Rep: Spohn Associates, Andy Muhlada (P) 513-321-8200; amuhlada@spohnassociates.com
- B. Substitutions:
 - 1. Not permitted without approval of the architect 10 days prior to bid.
 - 2. Items being submitted for consideration must be of the same function and meet the performance requirements set forth in this section.

- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
 - 1. Product Data:
Submit product data including testing performed by a qualified agency indicating compliance with performance requirements specified in this section.
 - 2. Samples:
Submit two (2) samples 3" x 5" of each proposed product substitution.

2.2 WALL PANEL ASSEMBLY

- A. Metal Composite Material (MCM):
 - 1. Panel:
Envelope 2000® as manufactured by Citadel Architectural Products
 - a. Composition:
Face: .024" (min) prefinished smooth aluminum
Core: .105" thermoset phenolic resin
Back: .010" primed smooth aluminum
 - b. Thickness: 4mm (nominal)
 - c. Weight: 1.25 lbs/ft²
 - d. Tolerance:
Thickness: $\pm 1/32$ "
Length / Width: +0, -1/8"
Squareness: 1/64" per lineal ft
 - e. Performance:
 - 1) Surface Burning Characteristics:
Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450.
Testing shall be in accordance with ASTM E84.
 - 2) Bond Integrity:
Panel shall have a minimum peel strength of 34.5 lb-in/lb.
Testing shall be in accordance with ASTM D1781.
 - 3) Ignition Temperature:
Panel shall have a minimum self-ignition temperature of 900° F.
Testing shall be in accordance with ASTM D1929.
 - 4) Impact Resistance:
Panel shall not have a deformation measuring larger than 0.186" in diameter or 0.007" in depth after being struck by a falling ball at 24 in-lb.
Testing shall be in accordance with ASTM D5420.
 - 5) Rate Of Burning:
Panel shall have a CC1 Classification indicating a burning extent of 1" (25.4mm) or less when tested at a nominal thickness of .060" (1.5mm) or thickness of intended use.
Testing shall be in accordance with ASTM D635.
 - 6) Tensile Strength:
Panel shall have a mean value of 1650 lbs.

Testing shall be in accordance with ASTM C297.

2. Finish:
 - a. Polyvinylidene Fluoride (PVDF):
 - 1) Type:
Kynar 500[®] coating using 70% resin.
Finish shall be in conformance with AAMA 2605.
 - 2) Color:
 - a) As selected by Architect: Match metal wall panels from manufacturer's stock PVDF finishes.
 - 3) Composition:
 - a) Two-Coat Colors:
0.2-mil primer coat, 0.8-mil color coat

B. Installation System:

1. Reveal (RV) System:
 - a. Description:
Field-assembled installation system consisting of metal composite material (MCM), trim moldings, silicone sealant, and accessories to provide a barrier system.
 - b. Performance:
 - 1) Air Infiltration:
Installation system shall not allow air infiltration in excess of 0.06 cfm/ft² at 1.57 psf.
Testing shall be in accordance with ASTM E283.
 - 2) Structural Performance:
Installation system shall have a design load of 35.0 psf applied in the positive and negative direction. There shall be no deflection in excess of L/175 of the span of any support member nor shall there be any failure of the system. At a structural test load equal to 1.5 times the specified design load, no support member shall have permanent deformation in excess of 1/1000 of its span nor shall there be any failure of the system.
Testing shall be in accordance with ASTM E330.
 - 3) Water Penetration:
Installation system shall not have uncontrolled water penetration to the room side at a static air pressure differential of 15.0 psf.
Testing shall be in accordance with ASTM E331.
 - c. Trim Moldings:
 - 1) Manufacturer's RV2000 system standard moldings.

C. Accessories:

1. Extrusions:
 - a. Shall conform with ASTM B211 and the manufacturer's recommendations.
 - b. Shall be applied in accordance with the panel manufacturer's installation guidelines.
2. Sealants:

- a. Selected from the panel manufacturer's approved list of sealants.
 - b. Shall be applied in accordance with both the panel manufacturer's installation guidelines and the sealant manufacturer's recommendations.
3. Fasteners:
- a. Selected by contractor to suit project requirements.
 - b. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
 - c. Shall be coated to prevent corrosion and/or reaction with other materials.
 - d. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal.
4. Flashing:
- a. Selected by contractor to suit project requirements.
 - b. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate to receive the work of this section to verify that the conditions are acceptable for installation.
1. Substrate to receive panels shall be even, smooth, sound, clean, dry, and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.
2. Substrate to receive panels shall be in vertical and horizontal alignment with no more deviation than 1/4" in 20'.
- B. Proceed with installation only after all unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as installer's acceptance of surface conditions.

3.2 PREPARATION

- A. Verify dimensions as required.
- B. Protect adjacent work areas and finished surfaces to prevent damage that otherwise might occur during the work of this section.

3.3 INSTALLATION

- A. Wall panel assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.
- B. Erect wall panel assembly level and true to the intended plane.
- C. Maximum deviation from vertical and horizontal alignment of erected wall panel assembly

shall be no more than 1/4" in 20'-0".

- D. Maximum deviation in panel flatness shall be 0.6% of the assembled units.
- E. Seal all joints as required using methods and materials as recommended by the panel manufacturer.

3.4 CLEANING

- A. Remove panel masking immediately after installation. Delay will result in difficulty with removal and possibly residue on the panel surface.
- B. Remove temporary coverings and protection to adjacent work areas.
- C. Remove and legally dispose of construction debris from project site.

END OF SECTION 07 4243

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SECTION 07 5423
THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic polyolefin (TPO) roofing system.
2. Accessory roofing materials.
3. Roof insulation.

B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 05 3100 "Steel Decking."

C. Related Requirements:

1. Section 06 1000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 2100 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Thermoplastic polyolefin (TPO) roofing system.
2. Accessory roofing materials.
3. Roof insulation.
4. Walkways.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture,

approval or listing agency markings, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

- A. TPO Sheet: ASTM D6878/D6878M, scrim-reinforced, TPO sheet.
 - 1. Thickness: 60 mils (1.5 mm), nominal.
 - 2. Exposed Face Color: Grey.
- B. Manufacturers:
 - 1. Elevate Ultraply TPO
 - 2. Carlisle Companies
 - 3. GAF Materials Corporation

2.2 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

2.3 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, felt or glass-fiber mat facer on both major surfaces.
 - 1. Compressive Strength: 20 psi (138 kPa).
 - 2. Size: 48 by 96 inches (1219 by 2438 mm).
 - 3. Thickness:
 - a. Base Layer: 1-1/2 inches (38 mm).
 - b. Upper Layer: Tapered.
- B. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch (6.35 mm).
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.

2.4 INSULATION ACCESSORIES AND COVER BOARD

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

3.4 INSTALLATION OF INSULATION

- A. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
 - 1. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 - 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.

3.5 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

- A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

3.6 INSTALLATION OF INDUCTION-WELDED ROOF MEMBRANE

- A. Unroll roof membrane and allow to relax before installing.

- B. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer, with side laps shingled with slope of roof deck where possible.
- C. Seams: Clean seam areas, overlap roof membrane, and hot-air-weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

3.10 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner:
 - 2. Owner Address:
 - 3. Building Name/Type:
 - 4. Building Address:
 - 5. Area of Work:
 - 6. Acceptance Date: _____.
 - 7. Warranty Period: 2 years.

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

END OF SECTION 07 5423

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and other items indicated in Schedule.
- 1.01.B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- 1.02.A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- 1.02.B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- 1.02.C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- 1.02.D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- 1.02.E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- 1.02.F. CDA A4050 - Copper in Architecture - Handbook; current edition.
- 1.02.G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- 1.03.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.03.B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- 1.03.C. Samples: Submit two samples, 6 by 6 inches (152 by 152 mm) in size, illustrating metal finish color.

1.04 QUALITY ASSURANCE

- 1.04.A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- 1.05.B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- 2.01.A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal.
- 2.01.B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal, shop pre-coated with PVDF coating.
 - 1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.
- 2.01.C. Anodized Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 20-gauge, 0.032 inch (0.81 mm) thick; clear anodized finish.
- 2.01.D. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18-gauge, 0.040 inch (1.02 mm) thick; plain finish shop pre-coated with silicone modified polyester coating.
 - 1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.

2.02 FABRICATION

- 2.02.A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- 2.02.B. Form pieces in longest possible lengths.
- 2.02.C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- 2.02.D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- 2.02.E. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.
- 2.02.F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUTS (OUTLET TUBES)

- 2.03.A. Gutter: SMACNA (ASMM) Built-in gutter.
- 2.03.B. Downspouts: Gutter drain with outlet tube.
- 2.03.C. Gutter and Downspouts: Size indicated.
- 2.03.D. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: Framed sheathing.
 - 3. Gutter Liner: 60 mil reinforced TPO membrane.

2.04 Flashing

- 2.04.A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.05 ACCESSORIES

- 2.05.A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
- 2.05.B. Primer Type: Zinc chromate.
- 2.05.C. Concealed Sealants: Non-curing butyl sealant.
- 2.05.D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- 2.05.E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- 3.01.B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- 3.02.A. Install starter and edge strips, and cleats before starting installation.
- 3.02.B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 INSTALLATION

- 3.03.A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- 3.03.B. Apply plastic cement compound between metal flashings and felt flashings.
- 3.03.C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.04 SCHEDULE

- 3.04.A. Through-Wall Flashing in Masonry: Refer to Section 04 2613 Masonry Veneer
- 3.04.B. Gutter and Downspouts: Pre-finished aluminum, TPO membrane.
- 3.04.C. Coping, Cap, Parapet, Sill and Ledge Flashings: Pre-finished aluminum.
- 3.04.D. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney: Refer to Section 07 3113 Asphalt Shingles.
- 3.04.E. Counterflashings at Roofing Terminations (over roofing base flashings): Formed aluminum.
- 3.04.F. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: Formed aluminum.

END OF SECTION 07 6200

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Firestopping systems.
- 1.01.B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- 1.03.B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- 1.03.C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).
- 1.03.D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- 1.03.E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- 1.03.F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023b.
- 1.03.G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.
- 1.03.H. ITS (DIR) - Directory of Listed Products; Current Edition.
- 1.03.I. FM (AG) - FM Approval Guide; Current Edition.
- 1.03.J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

1.03.K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.03.L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.04.B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

1.04.C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.04.D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

1.04.E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04.F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

1.05.A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

1.05.B. Installer Qualifications: Company specializing in performing the work of this section and:

1. Verification of minimum three years documented experience installing work of this type.

1.06 FIELD CONDITIONS

1.06.A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.01.A. Firestopping Manufacturers:

1. 3M Fire Protection Products: www.3m.com/firestop/#sle.

2. Hilti, Inc: www.hilti.com/#sle.
3. Specified Technologies Inc: www.stifirestop.com/#sle.

2.02 MATERIALS

- 2.02.A. Firestopping Materials: Any materials meeting requirements.
- 2.02.B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- 2.02.C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- 2.03.A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
- 2.03.B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- 2.03.C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- 2.03.D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING SYSTEMS

- 2.04.A. Firestopping: Any material meeting requirements.
 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- 3.02.A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- 3.02.B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

- 3.03.A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- 3.03.B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- 3.03.C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- 3.04.A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- 3.04.B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- 3.05.A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

- 3.06.A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 8400

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Nonsag gunnable joint sealants.
- 1.01.B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- 1.02.B. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- 1.03.B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.
- 1.03.C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- 1.03.D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- 1.03.E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
- 1.04.C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

- 1.04.D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

2.01.A. Scope:

1. Exterior Joints:
 - a. Seal the following joints:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 3) Joints between different exposed materials.
2. Interior Joints:
 - a. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
 - 3) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant installation is specified in other sections.
 - d. Joints between suspended ceilings and walls.

2.02 JOINT SEALANTS - GENERAL

- 2.02.A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- 2.02.B. Colors: As selected by Architect.

2.03 NONSAG JOINT SEALANTS

- 2.03.A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Color: To be selected by Architect from manufacturer's standard range.
 3. Products:
 - a. Pecora Corporation: www.pecora.com/#sle.
 - b. Sika Corporation: www.usa.sika.com/#sle.

- c. Tremco Commercial Sealants & Waterproofing; Spectrem 2 (Basis-of-Design): www.tremcosealants.com/#sle.
- 2.03.B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: White.
 - 2. Products:
 - a. Pecora Corporation: www.pecora.com/#sle.
 - b. Sika Corporation: www.usa.sika.com/#sle.
- 2.03.C. Hybrid Silane Polyether Sealant: ASTM C920, Grade NS, Uses NT, M, G, A, and O; single component; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus and minus 35 percent.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Products:
 - a. Tremco Incorporated, Dynomic FC, (Basis of Design).
 - b. Master Builders Solutions.
- 2.03.D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
 - 3. Products:
 - a. Pecora Corporation: www.pecora.com/#sle.
 - b. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: (Basis-of-Design) www.tremcosealants.com/#sle.

2.04 ACCESSORIES

- 2.04.A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- 2.04.B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- 2.04.C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- 2.04.D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that joints are ready to receive work.
- 3.01.B. Verify that backing materials are compatible with sealants.
- 3.01.C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- 3.02.A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- 3.02.B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- 3.02.C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- 3.02.D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- 3.02.E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- 3.03.A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- 3.03.B. Provide joint sealant installations complying with ASTM C1193.
- 3.03.C. Install acoustical sealant application work in accordance with ASTM C919.
- 3.03.D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- 3.03.E. Install bond breaker backing tape where backer rod cannot be used.
- 3.03.F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- 3.03.G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- 3.03.H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION 07 9200

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section "Flush Wood Doors".
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
7. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Maintenance manual must be provided for tornado/hurricane storm shelter impact protective systems.
- C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- E. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
 1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
 1. Design: Flush panel.
 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
 - a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on- center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
 - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure

channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.

6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- D. Manufacturers Basis of Design:

1. Curries Company (CU) - Honeycomb Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL DOOR AND SHUTTER ASSEMBLIES FOR STORM SHELTERS

- A. General: Provide complete tornado or hurricane storm shelter resistant assemblies constructed, test, and listed/labeled to resist the design pressures for components and cladding and missile impact resistance as described in ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Door and shutter systems, tested and complying with ICC 500 (2014/2020) and FEMA P-361 (2015/2021), Design and Construction Guidance for Community Safe Rooms and supported by third party test results.
2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.

3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

B. Manufacturers Basis of Design:

1. CECO Door Products (C) - StormPro Series.
2. Curries Company (CU) - StormPro Series.

2.5 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - Mercury 3 Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

- F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.8 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.10 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
 - a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
 - b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
 - c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
 - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.

- 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.11 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 08 1113

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 08 1113 "Hollow Metal Doors and Frames" for wood doors in metal frames.
2. Section 08 7100 "Door Hardware" for door hardware for flush wood doors.
3. Section 08 8000 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, profiles, fire-resistance ratings, and finishes.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
4. Dimensions and locations of blocking for hardware attachment.
5. Dimensions and locations of mortises and holes for hardware.
6. Clearances and undercuts.
7. Requirements for veneer matching.
8. Doors to be factory finished and application requirements.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.

1.3 CLOSEOUT SUBMITTALS

- A. Special warranties.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

- 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

- 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

- c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C, or NFPA 252.

2.3 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WT's "Architectural Woodwork Standards."

1. Provide labels from AWI certification program indicating that doors comply with requirements of grades specified.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Doors, Solid-Core Five-Ply Veneer-Faced Insert drawing designation:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Oshkosh Door Company (Basis-of-Design)
 - b. Masonite Architectural - Aspiro
 - c. VT Industries, Inc.
 2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
 3. Architectural Woodwork Standards Grade: Premium.
 4. Faces: Single-plywood veneer not less than 1/50 inch thick.

- a. Species: Red Oak.
 - b. Cut: Plain sliced.
 - c. Finish: Ginger – 1530.
 - d. Match between Veneer Leaves: Book match.
 - e. Assembly of Veneer Leaves on Door Faces: Running match.
5. Exposed Vertical Edges: Same species as faces - Architectural Woodwork Standards edge Type A.
- a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
6. Core for Non-Fire-Rated Doors:
- a. ANSI A208.1, Grade LD-2 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - 2) Provide doors with glued-wood-stave, or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
- a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Manufacturer's standard shape.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 8000 "Glazing."

2.7 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Premium.
 - 2. Architectural Woodwork Standards System-5, Varnish, Conversion.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 7100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 - 1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 - 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
 - 3. Install fire-rated doors and frames in accordance with NFPA 80.
 - 4. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 - 2. Machine doors for hardware.
 - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 4. Clearances:

- a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
- 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1416

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SECTION 08 1473.20
WOOD SLIDING DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Interior Aluminum-Framed, Top-Hung Sliding Wood Door Assemblies and Related Hardware.

B. Related Sections:

- 1. Division 01 Section "General Conditions".
- 2. Division 06 Section "Rough Carpentry".
- 3. Division 08 Section "Door Schedule".
- 4. Division 08 Section "Door Hardware Schedule".
- 5. Division 08 Section "Flush Wood Doors".

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- 2. ICC/IBC - International Building Code.
- 3. NFPA 80 - Fire Doors and Windows.
- 4. NFPA 101 - Life Safety Code.
- 5. NFPA 105 - Installation of Smoke Door Assemblies.
- 6. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.
- 7. State Building Codes, Local Amendments.

D. Standards: Comply with the following industry standards:

- 1. UL 1784 Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Refer to Division 01 Section "Project Requirements".

1.4 SUBMITTALS

- A. Comply with Division 01 Section "Submittal Procedures".
- B. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, door hardware and accessories, and finishes.
- C. Shop Drawings: Show details of fabrication and installation, including the following:
 - 1. Assembly elevations and sections indicating dimensions, tolerances, materials, components, hardware, finishes, options, and accessories.
 - 2. Door hardware locations, mounting heights, quantities, and installation requirements.
 - 3. Frame anchorages and wall reinforcement requirements.
- D. Samples for Verification: For each type of exposed finish indicated, provide samples below as requested by Architect.
 - 1. Frame finish sample.
 - 2. Door veneer sample.
- E. Maintenance Data: For top-hung, sliding door assemblies include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Notify manufacturer immediately of any shipping damage.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials and finish during storage, handling, and installation to prevent damage.

1.6 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

- B. Special Warranty: Manufacturer's written warranty agreeing to repair or replace components of the top-hung, sliding door assemblies that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 3. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - 4. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
 - 5. Failure of operating components to function normally.
- C. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
- D. General Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Aluminum Frames: Aluminum cased opening perimeter frames manufactured with integral C-channel door cavity and acoustic seals.
- B. Closing Mechanism: Soft self-closing mechanism integrated with top track.
- C. Door Guide: Concealed type door guide.
- D. Accessibility Standards: Comply with applicable provisions in Accessibility Guidelines for Buildings and Facilities ICC (ANSI) A117.1 and requirements of authorities having jurisdiction.

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide the named product, or the comparable product by one of the alternate specified manufacturers. Comparable products are subject to review and approval through the submittal process specified.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ASSA ABLOY
 - 2. AD Systems.

2.3 INTERIOR TOP-HUNG, SLIDING DOOR ASSEMBLIES

- A. Basis-of-Design Manufacturer:

1. ASSA ABLOY RITE SLIDE Sliding Door System (RS).
- B. Frame and Door Assembly Components:
 1. Single Piece Box Top Track: Extruded aluminum track system with mounting brackets.
 2. Fascia: Extruded aluminum with matching integral end caps.
 3. Integral Soft-Closer: Soft and self-closing damper mechanism.
 4. Concealed Door Bottom Floor Guide.
 5. Seal Sets: Integral to frame.
 6. Operating Hardware.
- C. Specified Wall Thickness:
 1. As indicated on Architectural Drawings.
- D. Fascia Profile:
 1. Custom Fascia Profile:
 - a. Owner / Architect selection from manufacturer's standard profile options.
- E. Frame Finish:
 1. Standard: Clear Anodized.
- F. Framing Anchors and Fastenings: Manufacturer's standard concealed anchors and fastenings.
- G. Flush Wood Door Construction:
 1. Standard: WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: A Premium.
 2. Minimum Thickness: 1-3/4".
 3. Core Construction" Particleboard Core Door (PC). Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-1.
 4. Face Veneer: As selected by Architect.
 5. Finish: Comply with referenced standard for factory finishing.
 6. LEED Standard: Minimum requirements of LEED MR4 and IEQ4.4.
 7. Door Glazing: As indicated on Architectural Elevations and Drawings.
 - a. Minimum 6" vertical stiles and 10" bottom rail required.
- H. Door Preparation. Doors leafs to be factory machined for hardware including pilot and function holes.
- I. Door Hardware Components:
 1. General: Heavy-duty, operating door hardware units in sizes, quantities, and types recommended by manufacturer for sliding door assemblies indicated.

2. Cylinders and Keying: Refer to Division 08 Section "Door Hardware".

2.4 FABRICATION

- A. General: Fabricate top-hung, sliding door assemblies in sizes, profiles, and configurations indicated on Architectural Schedules and Drawings.
- B. Factory prepare door assemblies for field installation of door hardware and accessories to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify dimensions of wall openings.
- B. Examine wall openings and conditions, with Installer present, for plumb, level and square, and compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Sliding door operation will be adversely affected by out-of-tolerance framing.
- C. Examine surfaces to receive door bottom guide. Floor shall have no height variance throughout the complete sliding operation.
- D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DOOR, FRAME AND HARDWARE ASSEMBLY INSTALLATION

- A. General: Comply with manufacturer's written installation instructions and approved shop drawings.
- B. Install frame components and sliding doors plumb, level, square, and in proper alignment.
- C. Anchor sliding door assemblies securely in place to supports according to manufacturer's written installation instructions.

3.3 ADJUSTING AND CLEANING

- A. Adjust sliding doors and hardware for smooth operation in accordance with manufacturer's written instructions without binding and with tight fit at contact points and seals. Sliding doors to close against walls without gaps.
- B. Repair minor damages to finish in accordance with manufacturer's written instructions and as approved by Architect.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure sliding door assemblies are without damage or deterioration at the time of Substantial Completion.

3.5 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

- 1. Refer to Section 08 7100, Door Hardware Sets, for hardware sets.

END OF SECTION 08 1473.20

SECTION 08 3613
SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sectional-door assemblies.
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
 - 2. For power-operated doors, include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.
- B. Manufacturer's warranty.
- C. Finish warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Failure of components or operators before reaching required number of operation cycles.
 - c. Faulty operation of hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
 - e. Delamination of exterior or interior facing materials.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide sectional doors that comply with performance requirements specified without failure from defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
 2. Testing: In accordance with ASTM E330/E330M or DASMA 108 for garage doors and complying with DASMA 108 acceptance criteria.
 3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
 - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of door width.
 - b. Deflection of horizontal track assembly shall not exceed 1/240 of door height.
 4. Operability under Wind Load: Design sectional doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa) wind load, acting inward and outward.
- C. Windborne-Debris Impact Resistance: Provide sectional doors complying with the following requirements:
 1. Garage-Door Glazed Openings: Pass DASMA 115.
- D. Seismic Performance: Provide sectional doors that withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

2.3 SECTIONAL-DOOR ASSEMBLY

- A. Galvanized Steel Sectional Door: Provide sectional door formed with hinged sections and fabricated so that finished door assembly is rigid and aligned with tight hairline joints; free of warp, twist, and deformation; and complies with requirements in DASMA 102.
 1. Manufacturers: Subject to compliance with requirements, provide wide frame and/or heavy-duty products by one of the following:
 - a. Overhead Door (Model 596) – Basis-of-Design.
 - b. Clopay Building Products (Model 3722).
 - c. C.H.I. Overhead Doors.

- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000 operation cycles. One operation cycle is complete when door is opened from closed position to the open position and returned to closed position.
- C. Air Infiltration: Maximum rate of 0.8 cfm/sq. ft. at 15 and 25 mph when tested in accordance with ASTM E283 or DASMA 105.
- D. R-Value: 4.5 deg F x h x sq. ft. BTU.
- E. Steel Sections: ASTM B221 (ASTM B221M) extruded-aluminum stile and rail members of alloy and temper standard with manufacturer for type of use and finish indicated; in minimum thickness required to comply with requirements; with rail and stile dimensions and profiles indicated on Drawings; and with overlapped or interlocked weather- and pinch-resistant seal at meeting rails.
 - 1. Door-Section Thickness: 2 inches. Fill steel door frame sections with polyurethane insulation.
 - 2. Section Reinforcing: Continuous horizontal and diagonal reinforcement as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
 - a. Hardware Locations: Provide reinforcement for hardware attachment.
 - 3. Solid Steel Panels: ASTM B209 (ASTM B209M), alloy and temper standard with manufacturer for use and finish indicated.
 - a. Description: 1/2-inch-thick overall insulated panel composed of 0.050-inch steel interior and exterior panels with an extruded polystyrene (EPS) core.
 - b. Attachment to Frame: Sealed with glazing tape and aluminum glazing bead.
 - c. Aluminum Surface: Smooth.
- F. Track: Manufacturer's standard-lift track system. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides. Refer to Drawings for track location.
 - 1. Material: Galvanized steel, ASTM A653/A653M, minimum G60 (Z180) zinc coating.
 - 2. Size: As recommended in writing by manufacturer for door size, weight, track configuration and door clearances indicated on Drawings.
 - 3. Track Reinforcement and Supports: Provide galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device.
 - a. Vertical Track: Incline vertical track to ensure weathertight closure at jambs. Provide continuous angle attached to track and wall.
 - b. Horizontal Track: Provide continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
 - c. High lift clearance track to follow the roof headroom.

- G. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom, top, and, jams of door. Provide combination bottom weatherseal and sensor edge for bottom seal.
- H. Hardware: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless steel, or other corrosion-resistant fasteners, to suit door type.
 - 1. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch (2.01-mm) nominal coated thickness at each end stile and at each intermediate stile, in accordance with manufacturer's written recommendations for door size.
 - a. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible.
 - b. Provide double-end hinges where required for doors more than 16 ft. (4.88 m) wide unless otherwise recommended by door manufacturer in writing.
 - 2. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Match roller-tire diameter to track width.
 - a. Roller-Tire Material: Case-hardened steel.
 - 3. Push/Pull Handles: Equip each door with galvanized-steel lifting handles on each side of door, finished to match door.
- I. Counterbalance Mechanism:
 - 1. Torsion Spring: Adjustable-tension torsion springs complying with requirements of DASMA 102 for number of operation cycles indicated, mounted on torsion shaft.
 - 2. Cable Drums and Shaft for Doors: Cast-aluminum cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised.
 - a. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
 - b. Provide one additional midpoint bracket for shafts up to 16 ft. (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 ft. (4.88 m) long unless closer spacing is recommended in writing by door manufacturer.
 - 3. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
 - 4. Cable Safety Device: Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if lifting cable breaks.
 - 5. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

6. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.
- J. Electric Door Operator: Electric door operator assembly of size and capacity recommended by door manufacturer for door and operation cycles specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 1. Comply with NFPA 70.
 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24 V ac or dc.
 3. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
 - a. Liftmaster, Model GH or equal by The Chamberlain Group.
 - b. Overhead Door RSX Commercial Operator.
 4. Safety: Listed in accordance with UL 325 by a qualified testing agency for commercial or industrial use.
 5. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 6. Operator Type: Jackshaft, side mounted
 7. Motor: Reversible-type with controller (disconnect switch) for exterior, dusty, wet, or humid motor exposure. Use adjustable motor-mounting bases for belt-driven operators.
 - a. Motor Size: As required to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 - b. Electrical Characteristics:
 - 1) Refer to Drawings.
 8. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
 9. Obstruction Detection: Automatic external entrapment protection consisting of automatic safety sensor capable of protecting full width of door opening. Activation of device upon sensing an obstruction and immediately stops and reverses downward door travel.
 - a. Monitored Entrapment Protection: Photoelectric light curtain sensor designed to interface with door-operator control circuit to detect damage to or disconnection of sensor and complying with requirements in UL 325.
 - 1) Provide Liftmaster LC36M or MLC-K36 by MillerEdge.
 - 2) Install per manufacturer's instructions.

10. Control Station: Coordinate mounting with Drawings at two locations indicated, three-position (open, close, and stop) control.
 - a. Operation: Push button.
 - b. Interior-Mounted Unit: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - c. Control Panel: Coordinate mounting and location with electrician for inclusion in the Apparatus Bay Control Panel.
 - d. Automatic closing with 30 second delay.
 11. Emergency Manual Operation: Chain type designed so required force for door operation does not exceed 25 lbf.
 12. Emergency Operation Disconnect Device: Hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
 13. Motor Removal: Design operator so motor can be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
 14. Portable, Radio-control System: Consisting of the following:
 - a. Three-channel universal coaxial receiver to open, close, and stop door.
 - b. Provide one unit per door.
 15. Provide a door position switch on each track/operator for the purposes of sending a signal to the apparatus ignition activated bay exhaust systems.
- K. Metal Finish: Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
1. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; in accordance with manufacturer's written instructions.
- B. Tracks:
 - 1. Fasten vertical track assembly to opening jambs and framing with fasteners spaced not more than 24 inches apart.
 - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers in accordance with UL 325.

3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
- D. Touchup Painting Galvanized Material: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 3613

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SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Aluminum-framed storefront, with vision glass.
- 1.01.B. Aluminum doors and frames.
- 1.01.C. Weatherstripping.
- 1.01.D. Door hardware.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- 1.02.B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- 1.02.C. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- 1.03.A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- 1.03.B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- 1.03.C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- 1.03.D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- 1.03.E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- 1.03.F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- 1.03.G. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

- 1.03.H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.05.B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- 1.05.C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- 1.05.D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- 1.05.E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- 1.05.F. Manufacturer's qualification statement.
- 1.05.G. Installer's qualification statement.
- 1.05.H. Specimen warranty.

1.06 QUALITY ASSURANCE

- 1.06.A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Insulating Glass Certification Council (IGCC).
 - b. Safety Glazing Certification Council (SGCC).
- 1.06.B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- 1.07.A. Handle products of this section in accordance with AAMA CW-10.
- 1.07.B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- 1.08.A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- 1.09.A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- 1.09.B. Provide five-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- 1.09.C. Provide five-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Aluminum-Framed Storefronts:
1. Kawneer North America; Trifab VersaGlaze 451T Framing System: (450 for interior units) www.kawneer.com/#sle. (Basis-of-Design)
 2. Oldcastle Building Envelope: www.oldcastlebe.com/#sle.
 3. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- 2.02.A. Center-Set Style, Thermally-Broken:
1. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).

2.03 BASIS OF DESIGN -- SWINGING DOORS

- 2.03.A. Medium Stile, Insulating Glazing, Thermally-Broken:
1. Thickness: 1-3/4 inches (43 mm).

2.04 ALUMINUM-FRAMED STOREFRONT

- 2.04.A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
 2. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

3. Finish Color: As selected by Architect from manufacturer's standard line.
4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12-hour period without causing detrimental effect to system components, anchorages, and other building elements.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.04.B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
3. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
4. Overall U-value Including Glazing: 0.45 Btu/sq ft in accordance with NFRC 100.

2.05 COMPONENTS

2.05.A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Glazing Stops: Flush.

2.05.B. Glazing: See Section 08 8000.

2.05.C. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches (43 mm).
2. Top Rail: 4 inches (100 mm) wide.
3. Vertical Stiles: 4-1/2 inches (115 mm) wide.
4. Bottom Rail: 10 inches (254 mm) wide.
5. Glazing Stops: Square.

6. Finish: Same as storefront.

2.05.D. Operable Sash: Aluminum project-out awning; finished to match storefront; turn handle latch with manufacturer's standard insect screen.

2.06 MATERIALS

2.06.A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.06.B. Fasteners: Stainless steel.

2.06.C. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

2.06.D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

2.07.A. High Performance Organic Coating: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

2.07.B. Color: As selected by Architect from manufacturer's standard range.

2.07.C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 HARDWARE

2.08.A. For each door, include weatherstripping, sill sweep strip, and threshold.

2.08.B. Other Door Hardware: See Section 08 7100.

2.08.C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

2.08.D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.08.E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

3.01.A. Verify dimensions, tolerances, and method of attachment with other work.

3.01.B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- 3.02.A. Install wall system in accordance with manufacturer's instructions.
- 3.02.B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- 3.02.C. Provide alignment attachments and shims to permanently fasten system to building structure.
- 3.02.D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- 3.02.E. Provide thermal isolation where components penetrate or disrupt building insulation.
- 3.02.F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form watertight dam.
- 3.02.G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- 3.02.H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- 3.02.I. Install operating sash.
- 3.02.J. Set thresholds in bed of sealant and secure.
- 3.02.K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- 3.03.A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- 3.03.B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 ADJUSTING

- 3.04.A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- 3.05.A. Remove protective material from pre-finished aluminum surfaces.
- 3.05.B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

- 3.05.C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

- 3.06.A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 4313

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SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
 - B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.
- 1.5 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
 - B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Storm Shelter Openings: Furnish a complete set of operational and maintenance instructions as needed for Owner's continued adjustment, maintenance, and repairs of door hardware as required by ICC 500 (2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. Ives (IV) - 5BB Series, 5-knuckle.
 - c. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
 2. Manufacturers:
 - a. Hager Companies (HA).
 - b. Ives (IV).
 - c. Select Hinges (SL).
- B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Manufacturers (Storm Shelter Assemblies):
 - a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
 - b. No Substitution.

2.3 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 - 1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA).
 - b. Match Existing, Field Verify.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Match Facility Standard.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. New System: Key locks to a new key system as directed by the Owner.
- D. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
 - 3. Construction Keys (where required): Ten (10).
- E. Construction Keying: Provide construction master keyed cylinders.
- F. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

2.5 CYLINDRICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

- a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 5400LN Series.
- b. No Substitution.

2.6 MULTI-POINT LOCKS AND LATCHING DEVICES

- A. Multi-Point Locksets, Storm Shelter: Provide ANSI/BHMA A156.37, Series 1000, Operational Grade 1 and Security Grade 1 Certified Products Directory (CPD) listed multi-point locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
- b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
- c. Meets Florida Building Code FL2998 and UL Certification Directory ZHEM.R21744 for latching hardware for hurricane requirements.
- d. Approved for usage as part of a complete ICC 500 (2014/2020) and FEMA P-361 (2015/2021) door, frame, and hardware assemblies for storm shelter components.
- e. Lever torque to retract all bolts less than 28 in.lb.
- f. Cycle tested to 1,000,000 cycles.
- g. Seven-year limited warranty for mechanical functions.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - FE6600 Series.
- b. Sargent Manufacturing (SA) - FM7300 Series.

2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 7000 Series.
 - b. dormakaba BEST (PR) - Apex 2000 Series.
 - c. Von Duprin (VD) – 33/99 Series.

- C. Conventional Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

- a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 6000 Series.
- b. dormakaba (K2) - QED110 Series.
- c. Von Duprin (VD) - 22 Series.

2.9 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
 - a. LCN Closers (LC) - 4040XP Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hager Companies (HA).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko (PE).
 3. Zero (ZE).

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. MR - Markar
3. PE - Pemko
4. RI - RITE Door
5. YA - ASSA ABLOY ACCENTRA
6. RU - Corbin Russwin
7. RS - RITE Slide
8. HS - HES
9. RO - Rockwood
10. RF - Rixson
11. LC - LCN Closers
12. SU - Securitron
13. AK - Alarm Controls
14. OT - Other

Hardware Sets

Set: 1.0

Doors: 109A, 109B, 121C, 126B, 127F

Description: Exterior HM - Panic Egress - Access Control Function

3 HW Hinge, Full Mortise (SS)	T4A3386 NRP (size per spec)	US32D	MK
1 Rim Exit Device, Nightlatch	6100ED 632F	630	YA
1 Rim Cylinder	Match Existing System	626	YA
1 Bridge Rectifier	2005M3		HS
1 Electric Strike - Exit Device	9500	630	HS
1 Closer w/ Stop	4040XP .SCUSH	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Gasketing	303APKTST		PE

1 Rain Guard	346A		PE
1 Sweep	345APK TKSP		PE
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Position Switch	DPS-M		SU
1 Power Supply	by Security Contractor		SU

Notes:

Entry by valid input at reader to release electric strike or manual key.
Free egress at all times. Door position switch to monitor opening status.

Set: 2.0

Doors: 100A

Description: Exterior Aluminum Storefront - Access Control x Lockdown Function

1 Continuous Hinge	CFMxxSLF-HD1-M PT		PE
1 Elec Rim Exit Device, EL/RX/NL	7200 B MELR 121NL	630	YA
1 Rim Cylinder	Match Existing System	626	YA
1 Pull	RM201 Mtg-Type 12XHD	US32D	RO
1 Conc Overhead Stop	6-336	630	RF
1 Closer (Top Jamb)	4040XP .LONG	.689	LC
1 Closer Mtg Plate	4040XP-18TJ	.689	LC
1 Seals, Sweeps & Astragal(s)	By Aluminum Door Mfr.		
1 Threshold	171A FHSL14SS		PE
1 Wiring Harness - Frame	QC-C3000P		MK
1 Wiring Harness - Door	QC-CxxxP length as req'd		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Position Switch	DPS-M		SU
1 Pushbutton	PBA (toggle)		SU
1 Power Supply	by Security Contractor		SU

Notes:

Entry by valid input at reader to retract latch or manual key when locked. Free egress at all times.
Push / Pull operation as required by timed unlock of electronic exit device.
Push button switch located in Vestibule will cut power to exit device to lock door in emergency.
Door remains locked/unpowered until button is pushed again.
Door position switch to monitor opening status. Exit device has RX option to signal egress.
Coordinate with electrical and security contractors.

Set: 3.0

Doors: [100B](#)

Description: Panic Egress - Access Control Function x Remote Release

3 Hinge, Full Mortise	TA2714 NRP (size per spec)	US26D	MK
1 Rim Exit Device, NL Lever	6100ED AU627F	630	YA
1 Rim Cylinder	Match Existing System	626	YA
1 Bridge Rectifier	2005M3		HS
1 Electric Strike - Exit Device	9500	630	HS
1 Closer - Push Side	4040XP .EDA .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
3 Silencer	608/609 as req'd		RO
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Door Release	TS-18		AK
1 Power Supply	by Security Contractor		SU

Notes: Entry by valid input at reader or Reception desk to release electric strike.
Manual key override. Free egress at all times.
Coordinate with electrical and security contractor.

Set: 4.0

Doors: [128A](#)

Description: Access Control Function x Closer x Seals - Outswing

3 Hinge, Full Mortise	TA2714 NRP (size per spec)	US26D	MK
1 Storeroom Lock	AU 5405LN	626	YA
1 Electric Strike - Lock	4500C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Closer - Push Side	4040XP .EDA .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
1 Gasketing	S773D (Head & Jambs)		PE
1 Interior Sweep	308APK TKSP		PE
1 Interior Threshold	271A FHSL14SS		PE
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Position Switch	DPS-M		SU
1 Power Supply	by Security Contractor		SU

Set: 5.0

Doors: 101, 110, 111, 112, 116, 121A, 121B

Description: Access Control Function x Closer - Inswing

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Storeroom Lock	AU 5405LN	626	YA
1 Electric Strike - Lock	4500C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Closer - Pull Side	4040XP .REGARM .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
3 Silencer	608/609 as req'd		RO
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Power Supply	by Security Contractor		SU

Notes: Entry by valid input at reader to release electric strike or manual key. Free egress at all times.
Coordinate with electrical and security contractor.
Door 112: Reader mounted inside Roll Call room.

Set: 6.0

Doors: 107C

Description: Access Control Function x Closer w/ Stop - Inswing

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Storeroom Lock	AU 5405LN	626	YA
1 Electric Strike - Lock	4500C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Track Closer w/ Stop	4040XPT-Pull .HBMP	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
3 Silencer	608/609 as req'd		RO
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Power Supply	by Security Contractor		SU

Notes:
Entry by valid input at reader to release electric strike or manual key. Free egress at all times.
Coordinate with electrical and security contractor.
Reader mounted inside Multi Training Room.

Set: 7.0

Doors: [126A](#)

Description: Access Control Function x Closer x HW Hinges x Seals - Inswing

3 HW Hinge, Full Mortise	T4A3786 (size per spec)	US26D	MK
1 Storeroom Lock	AU 5405LN	626	YA
1 Electric Strike - Lock	4500C	630	HS
1 Bridge Rectifier	2005M3		HS
1 Closer - Pull Side	4040XP .REGARM .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
1 Gasketing	S773D (Head & Jambs)		PE
1 Interior Sweep	308APK TKSP		PE
1 Interior Threshold	271A FHSL14SS		PE
1 Wiring Harness - Frame	QC-C3000P		MK
1 Kantech Reader	by Security Contractor	BLK	HD
1 Power Supply	by Security Contractor		SU

Notes:

Entry by valid input at reader to release electric strike or manual key. Free egress at all times.
Coordinate with electrical and security contractor.

Set: 8.0

Doors: [107B](#), [127B](#), [204](#), [205](#)

Description: Storeroom Function

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Storeroom Lock	AU 5405LN	626	YA
1 Door Stop	400 series as req'd	US32D	RO
3 Silencer	608/609 as req'd		RO

Notes:

Set: 9.0

Doors: [102](#), [104](#), [105](#), [106](#), [116A](#), [122](#)

Description: Office Function

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Entry Lock	AU 5407LN	626	YA

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1 Door Stop	400 series as req'd	US32D	RO
3 Silencer	608/609 as req'd		RO

Set: 10.0

Doors: [107A](#), [127A](#)

Description: Classroom Function x Closer

3 Hinge, Full Mortise	TA2714 NRP (size per spec)	US26D	MK
1 Classroom Lock	AU 5408LN	626	YA
1 Closer - Push Side	4040XP .EDA .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
1 Gasketing	S773D (Head & Jambs)		PE

Set: 11.0

Doors: [103](#), [118](#), [125](#), [127C](#)

Description: Privacy Function x Closer - Restroom

3 Hinge, Full Mortise (SS)	TA2314 (size per spec)	US32D	MK
1 Privacy Lock	AU 5402LN	626	YA
1 Closer - Pull Side	4040XP .REGARM .TBWMS	.689	LC
1 Kick Plate	K1050 10" height x CSK x BEV	US32D	RO
1 Mop Plate	K1050 4" height x BEV x CSK	US32D	RO
1 Door Stop	400 series as req'd	US32D	RO
1 Gasketing	S773D (Head & Jambs)		PE
1 Coat Hook	806	US26D	RO

Set: 12.0

Doors: [117](#)

Description: Privacy Function

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Privacy Lock	AU 5402LN	626	YA
1 Door Stop	400 series as req'd	US32D	RO
1 Gasketing	S773D (Head & Jambs)		PE
1 Coat Hook	806	US26D	RO

Set: 13.0

Doors: 108, 113, 119

Description: Passage Function

3 Hinge, Full Mortise	TA2714 (size per spec)	US26D	MK
1 Passage Latch	AU 5401LN	626	YA
1 Door Stop	400 series as req'd	US32D	RO
3 Silencer	608/609 as req'd		RO

Set: 14.0

Doors: 114A, 114B, 114C, 114D, 114E, 114F, 114G, 114H, 114J, 114K

Description: Sliding Door - Privacy Function

1 Surface Sliding Door System	Rite Slide		RI
1 Privacy Lock - Sliding Door	S9540 x Frankfort	630	RS

Set: 15.0

Doors: 116B, 120

Description: Sliding Door - Passage Function

1 Surface Sliding Door System	Rite Slide		RI
1 Passage Latch - Sliding Door	S9610 x Frankfort	630	RS

Set: 16.0

Doors: OH1, OH2

Description: Miscellaneous Doors

1 All Hardware	By Door System Mfr.		OT

END OF SECTION 08 7100

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SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Insulating glass units.
- 1.01.B. Glazing units.
- 1.01.C. Glazing compounds.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.
- 1.02.B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- 1.02.C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
- 1.02.D. Section 08 3613 - Sectional Doors: Glazed lites in doors.
- 1.02.E. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

- 1.03.A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- 1.03.B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- 1.03.C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- 1.03.D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- 1.03.E. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- 1.03.F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- 1.03.G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- 1.03.H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

- 1.03.I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- 1.03.J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- 1.03.K. GANA (SM) - GANA Sealant Manual; 2008.
- 1.03.L. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- 1.03.M. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- 1.03.N. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.05.B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- 1.05.C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- 1.05.D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- 1.06.A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

- 1.07.A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

1.08 WARRANTY

- 1.08.A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

- 1.08.B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- 2.01.A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 3. Glass thicknesses listed are minimum.
- 2.01.B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Vapor Retarders: See Section 07 2600.
- 2.01.C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

- 2.02.A. Float Glass: Provide float glass-based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.03 INSULATING GLASS UNITS

- 2.03.A. Manufacturers:
1. Guardian Glass, LLC: www.guardianglass.com/#sle.

2. Pilkington North America Inc: www.pilkington.com/na/#sle.Pilkington North America Inc: www.pilkington.com/na/#sle.
 3. PPG Industries, Inc.
- 2.03.B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- 2.03.C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 6. Purge interpane space with dry air, hermetically sealed.
- 2.03.D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: As selected by Architect from manufacturer's full range.
 - b. Solarcool Bronze #2.
 4. Metal edge spacer.
 5. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E, Pyrolytic or sputtered, on #3 surface.
 6. Total Thickness: 1 inch (25.4 mm).
 7. Thermal Transmittance (U-Value), Summer Daytime/Winter Nighttime: 0.29, nominal.
 8. Visible Light Transmittance (VLT): 44 percent, nominal.
 9. Solar Heat Gain Coefficient (SHGC): 0.52, nominal.
 10. Glazing Method: Dry glazing method, gasket glazing.
- 2.03.E. Type IG-5 - Insulating Glass Units: Safety glazing.
1. Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.

2. Space between lites filled with argon.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
4. Total Thickness: 1 inch (25.4 mm).
5. Metal edge spacer.
6. Thermal Transmittance (U-Value), Summer Daytime/Winter Nighttime: 0.29, nominal.
7. Visible Light Transmittance (VLT): 44 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.52, nominal.
9. Glazing Method: Dry glazing method, gasket glazing.

2.04 GLAZING UNITS

2.04.A. Type G-2 - Monolithic Interior Vision Glazing:

1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch (6.4 mm), nominal.

2.04.B. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.

1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch (6.4 mm), nominal.

2.05 GLAZING COMPOUNDS

- 2.05.A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.06 ACCESSORIES

- 2.06.A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- 2.06.B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- 3.01.A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- 3.01.B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- 3.01.C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- 3.02.A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- 3.02.B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- 3.02.C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- 3.03.A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- 3.03.B. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- 3.04.A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- 3.04.B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- 3.04.C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- 3.04.D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

- 3.05.A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- 3.05.B. Remove nonpermanent labels immediately after glazing installation is complete.

3.05.C. Clean glass and adjacent surfaces after sealants are fully cured.

3.05.D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

3.06.A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

3.06.B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 8000

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SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Metal stud wall framing.
- 1.01.B. Acoustic insulation.
- 1.01.C. Cementitious backing board.
- 1.01.D. Gypsum wallboard.
- 1.01.E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- 1.02.B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- 1.03.A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- 1.03.B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- 1.03.C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- 1.03.D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- 1.03.E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- 1.03.F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- 1.03.G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- 1.03.H. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

- 1.03.I. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).
- 1.03.J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- 1.03.K. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- 1.03.L. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.
- 1.03.M. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- 1.03.N. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- 1.03.O. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).
- 1.03.P. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- 1.03.Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- 1.03.R. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.05.B. Product Data:
 - 1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
 - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.06 Delivery, Storage, and Handling

- 1.06.A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

- 1.06.B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- 2.01.A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

- 2.02.A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

1. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.

- 2.02.B. Manufacturers - Metal Framing, Connectors, and Accessories:

1. ClarkDietrich: www.clarkdietrich.com/#sle.
2. MarinoWARE: www.marinoware.com/#sle.
3. SCAFCO Corporation: www.scafco.com/#sle.

- 2.02.C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).

1. Studs: C-shaped with knurled or embossed faces.
2. Runners: U shaped, sized to match studs.

- 2.02.D. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

2.03 BOARD MATERIALS

- 2.03.A. Manufacturers - Gypsum-Based Board:

1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
3. USG Corporation: www.usg.com/#sle.

- 2.03.B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use Type X for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required as indicated on drawings.
3. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).

- 2.03.C. Backing Board for Wet Areas: One of the following products:

1. Application: Surfaces behind tile in wet areas where indicated on the drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch (13 mm).

2.03.D. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Types: Type X, in locations indicated.
3. Type X Thickness: 5/8 inch (16 mm).
4. Edges: Tapered.

2.04 GYPSUM BOARD ACCESSORIES

2.04.A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches (50.8 mm).

2.04.B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

2.04.C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

2.04.D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

2.04.E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

2.04.F. Nails for Attachment to Wood Members: ASTM C514.

2.04.G. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- 3.02.A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- 3.02.B. Studs: Space studs at 16 inches on center (at 406 mm on center).
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- 3.02.C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- 3.02.D. Blocking: Install mechanically fastened steel sheet blocking for support of:
 - 1. Wall-mounted cabinets.
 - 2. Plumbing fixtures.
 - 3. Toilet accessories.
 - 4. Wall mounted accessories.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- 3.03.A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- 3.03.B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

- 3.04.A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- 3.04.B. Single-Layer Nonrated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- 3.04.C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- 3.04.D. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.

- 3.04.E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- 3.04.F. Installation on Metal Framing: Use screws for attachment of gypsum board.
- 3.04.G. Installation on Wood Framing: For nonrated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- 3.05.A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
 - 2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.
- 3.05.B. Corner Beads: Install at external corners, using longest practical lengths.
- 3.05.C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- 3.05.D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.06 JOINT TREATMENT

- 3.06.A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- 3.06.B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- 3.06.C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- 3.06.D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- 3.06.E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

- 3.07.A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 Protection

- 3.08.A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 09 2116

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SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Tile for floor applications.
- 1.01.B. Tile for wall applications.
- 1.01.C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- 1.02.B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- 1.03.A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.
- 1.03.B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2023.
- 1.03.C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.
- 1.03.D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.
- 1.03.E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- 1.03.F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.
- 1.03.G. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.
- 1.03.H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

- 1.03.I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
- 1.03.J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.
- 1.03.K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
- 1.03.L. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.
- 1.03.M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
- 1.03.N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
- 1.03.O. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
- 1.03.P. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
- 1.03.Q. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- 1.03.R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.
- 1.03.S. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.05.B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- 1.05.C. Installer's Qualification Statement:
- 1.05.D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.05.E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 25 of each type.

1.06 QUALITY ASSURANCE

1.06.A. Maintain one copy of ANSI A108/A118/A136, TCNA (HB), and TCNA (HB-GP) on-site.

1.06.B. Installer Qualifications:

1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

1.07.A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

1.08.A. Do not install solvent-based products in an unventilated environment.

1.08.B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

2.01.A. Manufacturers: All products by the same manufacturer.

1. Dal-Tile Corporation: www.daltile.com/#sle.

2.01.B. Porcelain Tile, Type PT-1, PTW-1 and PTWB-1: ANSI A137.1 standard grade.

1. Products:
 - a. Dal-Tile Corporation; Material, size and color indicated on the drawings : www.daltile.com/#sle.

2.02 TRIM AND ACCESSORIES

2.02.A. Non-Ceramic Trim: , style and dimensions as indicated on drawings, set with tile mortar or adhesive.

1. Applications:
 - a. Open edges of wall and floor tile.
 - b. Transition between floor finishes of different heights.
 - c. Floor-to-wall joints.

2. Products:
 - a. Schluter-Systems; Rondec, brushed aluminum: www.schluter.com/#sle.

2.03 SETTING MATERIALS

- 2.03.A. Provide setting and grout materials from same manufacturer.
- 2.03.B. Manufacturers:
 1. LATICRETE International, Inc: www.laticrete.com/#sle.
- 2.03.C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
 1. Products:
 - a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.

2.04 GROUTS

- 2.04.A. Provide setting and grout materials from same manufacturer.
 1. Color selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.02 PREPARATION

- 3.02.A. Protect surrounding work from damage.
- 3.02.B. Vacuum clean surfaces and damp clean.
- 3.02.C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

- 3.03.A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- 3.03.B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- 3.03.C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

- 3.03.D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- 3.03.E. Form internal angles square and external angles square.
- 3.03.F. Install non-ceramic trim in accordance with manufacturer's instructions.
- 3.03.G. Sound tile after setting. Replace hollow sounding units.
- 3.03.H. Keep control and expansion joints free of mortar, grout, and adhesive.
- 3.03.I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- 3.03.J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- 3.03.K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - WALL TILE

- 3.04.A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

3.05 CLEANING

- 3.05.A. Clean tile and grout surfaces.

3.06 PROTECTION

- 3.06.A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 3000

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SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Suspended metal grid ceiling system.
- 1.01.B. Acoustical units.

1.02 REFERENCE STANDARDS

- 1.02.A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- 1.02.B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- 1.02.C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- 1.02.D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- 1.02.E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- 1.02.F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

- 1.03.A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- 1.03.B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Provide data on suspension system components and acoustical units.
- 1.04.C. Samples: Submit two samples 3 by 3 inch (76 by 76 mm) in size illustrating material and finish of acoustical units.

- 1.04.D. Samples: Submit two samples each, 6 inches (152 mm) long, of suspension system main runner, cross runner, and perimeter molding.
- 1.04.E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 2 percent of total installed.

1.05 FIELD CONDITIONS

- 1.05.A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Acoustic Tiles/Panels:
 - 1. Armstrong: www.armstrong.com/ceilings.
- 2.01.B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- 2.02.A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. Provide product type as indicated on the drawings.

2.03 SUSPENSION SYSTEM(S)

- 2.03.A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings and hold down clips as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- 2.03.B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch (24 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.
 - 5. Products:
 - a. USG Corporation; Donn Brand DX 15/16" Acoustical Suspension System: www.usg.com/ceilings/#sle.

2.04 ACCESSORIES

- 2.04.A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- 2.04.B. Hanger Wire: 12-gauge, 0.106 inch (2.69 mm) galvanized steel wire.
- 2.04.C. Hold-Down Clips: Manufacturer's standard clips to suit application. Where indicated on the drawings.
- 2.04.D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
 - 2. Channel Molding: U-shaped, for hold-down type installations.
- 2.04.E. Suspended drywall grid system (lightwell).

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify existing conditions before starting work.
- 3.01.B. Verify that layout of hangers will not interfere with other work.

3.02 Preparation

- 3.02.A. Install after major above-ceiling work is complete.
- 3.02.B. Coordinate the location of hangers with other work.
- 3.02.C. Layout openings for penetrations centered on penetrating items.

3.03 INSTALLATION - SUSPENSION SYSTEM

- 3.03.A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- 3.03.B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- 3.03.C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size unless otherwise indicated.
- 3.03.D. Locate system on room axis according to reflected plan.
- 3.03.E. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.

- 3.03.F. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- 3.03.G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- 3.03.H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- 3.03.I. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- 3.03.J. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- 3.04.A. Install acoustical units in accordance with manufacturer's instructions.
- 3.04.B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- 3.04.C. Fit border trim neatly against abutting surfaces.
- 3.04.D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- 3.04.E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
- 3.04.F. Install hold-down clips on panels where indicated on the drawings.

3.05 TOLERANCES

- 3.05.A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- 3.05.B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- 3.06.A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- 3.06.B. Clean surfaces.
- 3.06.C. Replace damaged or abraded components.

END OF SECTION 09 5100

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Resilient tile flooring.
- 1.01.B. Resilient base.
- 1.01.C. Installation accessories.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

- 1.03.A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.
- 1.03.B. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.
- 1.03.C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.
- 1.03.D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- 1.04.C. Verification Samples: Submit two samples, 4 by 4 inch (101.6 by 101.6 mm) in size illustrating color and pattern for each resilient flooring product specified.
- 1.04.D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- 1.04.E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- 1.04.F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Wall Base: 10 linear feet (3 linear meters) of each type and color.
3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 QUALITY ASSURANCE

- 1.05.A. Installer Qualifications: Company specializing in installing specified flooring with minimum 5 years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- 1.06.A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- 1.06.B. Store all materials off of the floor in an acclimatized, weather-tight space.
- 1.06.C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- 1.06.D. Protect roll materials from damage by storing on end.
- 1.06.E. Do not double stack pallets.

1.07 FIELD CONDITIONS

- 1.07.A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 TILE FLOORING

- 2.01.A. Linoleum Tile - Type MCT-1: Linoleum tile with color and pattern throughout thickness.
1. Manufacturers: Forbo.
 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 4. Tile Size: 13.11" x 13.11" x 0.08"
 5. Total Thickness: 0.08"
 6. Color: As indicated on drawings.

2.02 RESILIENT BASE

- 2.02.A. Resilient Base: ASTM F1861, Type TS, rubber; style as scheduled.

1. Manufacturers:
 - a. Johnsonite, a Tarkett Company; Pinnacle Plus: www.johnsonite.com/#sle.
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
3. Height: 4 inches (100 mm) or as otherwise indicated on the drawings.
4. Thickness: 0.125 inch (3.2 mm).
5. Finish: Satin.
6. Length: Roll.
7. Color: As indicated on drawings.

2.03 ACCESSORIES

- 2.03.A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- 2.03.B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- 2.03.C. Moldings, Transition and Edge Strips: Same material as flooring.
 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- 3.01.B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- 3.01.C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- 3.02.A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- 3.02.B. Prohibit traffic until filler is fully cured.
- 3.02.C. Clean substrate.

3.03 Installation - General

- 3.03.A. Starting installation constitutes acceptance of subfloor conditions.
- 3.03.B. Install in accordance with manufacturer's written instructions.
- 3.03.C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- 3.03.D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.

3.04 Installation - Tile Flooring

- 3.04.A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- 3.04.B. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.05 Installation - Resilient Base

- 3.05.A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- 3.05.B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- 3.05.C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- 3.05.D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- 3.06.A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- 3.06.B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- 3.07.A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 6500

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interlocking, rubber floor tile.
- B. Related Requirements:
 - 1. Section 09 6500 "Resilient Flooring" for wall base and accessories installed with resilient athletic flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each type, color, and pattern specified, 6-inch-square in size and of the same thickness indicated for the Work.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resilient athletic flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration.

1.7 FIELD CONDITIONS

- A. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 INTERLOCKING, RUBBER TILE FLOOR TILE (RTF-1)

- A. Basis-of-Design: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by the following:
 - 1. Roppe: Recoil Fitness Flooring.
- B. Description: Athletic flooring consisting of modular rubber tiles with precision cut, interlocking edges, for free-lay installation.
- C. Material: Recycled-rubber compound.
- D. Traffic-Surface Texture: Nondirectional, stipple texture.
 - 1. Provide reversible tiles (with traffic-surface texture on both sides).
- E. Size: 34.25" x 34.25"
- F. Thickness: 3/8 inch.
- G. Color and Pattern: Refer to Material Legend on Drawings.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.3 FLOOR TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Tile Matching: Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.
- D. Free-Lay Tile: Place flooring at locations indicated with units securely interconnected and fully seated on substrate to form a smooth, level surface.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Sweep and vacuum flooring thoroughly.
 - 2. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 6566

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Carpet tile, fully adhered.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

- 1.03.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.03.B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- 1.03.C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- 1.03.D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- 1.03.E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- 1.03.F. Installer's Qualification Statement.
- 1.03.G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- 1.03.H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

- 1.04.A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

- 1.05.A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Tile Carpeting:
 - 1. Shaw Contract

2.02 MATERIALS

- 2.02.A. Tile Carpeting, Type CPT-1: Tufted, manufactured in one color dye lot.
 - 1. Product: Refer to drawings for carpet style, size and color.
- 2.02.B. Tile Carpeting, Type MAT-1: Manufactured in one color dye lot.
 - 1. Product: Refer to drawings for carpet style, size and color.

2.03 ACCESSORIES

- 2.03.A. Edge Strips: Vinyl, color as selected by Architect.
- 2.03.B. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- 3.01.B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

3.02 PREPARATION

- 3.02.A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- 3.02.B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- 3.02.C. Vacuum clean substrate.

3.03 INSTALLATION

- 3.03.A. Starting installation constitutes acceptance of subfloor conditions.
- 3.03.B. Install carpet tile in accordance with manufacturer's instructions.
- 3.03.C. Blend carpet from different cartons to ensure minimal variation in color match.
- 3.03.D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

- 3.03.E. Lay carpet tile in ashlar pattern, with pile direction parallel to next unit, set parallel to building lines.
- 3.03.F. Locate change of color or pattern between rooms under door centerline.
- 3.03.G. Fully adhere carpet tile to substrate.
- 3.03.H. Trim carpet tile neatly at walls and around interruptions.
- 3.03.I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- 3.04.A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- 3.04.B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813

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SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Surface preparation.
- 1.01.B. Field application of paints.
- 1.01.C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- 1.01.D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- 1.02.B. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

- 1.03.A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- 1.03.B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- 1.03.C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.
- 1.03.D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- 1.03.E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- 1.03.F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.04.B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- 1.04.C. Samples: Submit two paper chip samples, 8.5 x 11 inch (216 x 279 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- 1.04.D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- 1.04.E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- 1.04.F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- 1.04.G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- 1.05.B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- 1.05.C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- 1.06.A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- 1.06.B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- 1.06.C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- 1.06.D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- 1.06.E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- 2.01.B. Paints:
 - 1. Base Manufacturer: Subject to compliance with requirements, provide products by the following.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- 2.01.C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- 2.02.A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- 2.02.B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.02.C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.02.D. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - EXTERIOR

2.03.A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.

1. Two topcoats and one coat primer.
2. Topcoat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Acrylic, Semi-Gloss.

2.04 PRIMERS

2.04.A. Primers: Provide the following unless other primer is required or recommended by manufacturer of topcoats.

1. Water Based Primer for Galvanized Metal; MPI #134.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer. (MPI #134)
2. Rust-Inhibitive Water Based Primer; MPI #107.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer. (MPI #107)

2.05 ACCESSORY MATERIALS

2.05.A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.05.B. Patching Material: Latex filler.

2.05.C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

3.01.A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

3.01.B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.01.C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

3.02.A. Clean surfaces thoroughly and correct defects prior to application.

3.02.B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02.C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

3.02.D. Seal surfaces that might cause bleed through or staining of topcoat.

3.02.E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.02.F. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

3.02.G. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

3.02.H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

3.03.A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

3.03.B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

3.03.C. Apply each coat to uniform appearance.

3.03.D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.03.E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- 3.04.A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- 3.05.A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- 3.06.A. Protect finishes until completion of project.
- 3.06.B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9113

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Surface preparation.
- 1.01.B. Field application of paints.
- 1.01.C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
- 1.01.D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 9. Glass.
 - 10. Acoustical materials, unless specifically indicated.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- 1.02.B. Section 09 9113 - Exterior Painting.

1.03 DEFINITIONS

- 1.03.A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- 1.04.A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

- 1.04.B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- 1.04.C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- 1.04.D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.
- 1.04.E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- 1.04.F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- 1.04.G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.05.B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
- 1.05.C. Samples: Submit two paper chip samples, 8.5 x 11 inch (216 x 279 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- 1.05.D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- 1.05.E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- 1.05.F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- 1.06.A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- 1.07.A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- 1.07.B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- 1.07.C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- 1.08.A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- 1.08.B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- 1.08.C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
- 1.08.D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- 1.08.E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- 2.01.B. Paints:
 - 1. Base Manufacturer: Subject to compliance with requirements, provide products by the following.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- 2.01.C. Primer Sealers: Same manufacturer as topcoats.

2.02 PAINTS AND FINISHES - GENERAL

- 2.02.A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.02.B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.02.C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.02.D. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

2.03.A. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:

1. Medium duty applications include doors and door frames.
2. Two topcoats and one coat primer.
3. Topcoat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Egg-Shel. (MPI #139)
4. Topcoat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.

2.03.B. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board.

1. Two topcoats and one coat primer.
2. Topcoat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
 - a. Products:
 - 1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
3. Topcoat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154. Where epoxy paint indicated on the drawings.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #153)
4. Topcoat Sheen:

- a. Eggshell: MPI gloss level 3; use this sheen at all locations.

2.04 PRIMERS

- 2.04.A. Primers: Provide the following unless other primer is required or recommended by manufacturer of topcoats.
 1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
 - a. Products:
 2. Interior Rust-Inhibitive Water Based Primer; MPI #107.
 - a. Products:
 - 1) Sherwin-Williams Pro-Cryl Universal Primer. (MPI #107)
 3. Interior Water Based Primer for Galvanized Metal; MPI #134 or #134 X-Green.
 - a. Products:
 - 1) Sherwin-Williams Pro-Cryl Universal Primer. (MPI #134)

2.05 ACCESSORY MATERIALS

- 2.05.A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- 2.05.B. Patching Material: Latex filler.
- 2.05.C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- 3.01.B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- 3.01.C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- 3.01.D. Test shop-applied primer for compatibility with subsequent cover materials.
- 3.01.E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

- 3.02.A. Clean surfaces thoroughly and correct defects prior to application.
- 3.02.B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- 3.02.C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- 3.02.D. Seal surfaces that might cause bleed through or staining of topcoat.
- 3.02.E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- 3.02.F. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.
- 3.02.G. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- 3.03.A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- 3.03.B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- 3.03.C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- 3.03.D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- 3.03.E. Sand metal surfaces lightly between coats to achieve required finish.
- 3.03.F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- 3.03.G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- 3.04.A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- 3.05.A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

3.06.A. Protect finishes until completion of project.

3.06.B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9123

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SECTION 10 1419
DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.
 - a. Fabricated channel dimensional characters.
 - b. Illuminated, fabricated channel dimensional characters.

1.2 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.3 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least quarter size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

- C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of dimensional character.
2. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

- D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

- 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products or an entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: For the life of the business.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated; to comply with requirements of authorities having jurisdiction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

- A. Fabricated Channel Characters: Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ace Sign Systems, Inc.
 - b. ASI Signage Innovations
 - c. Best Sign Systems
 - d. FastSigns
 2. Illuminated Characters: Backlighting character construction with LED lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
 - a. Power: As indicated on electrical Drawings.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior characters. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
 3. Character Material: Sheet or plate aluminum.
 4. Material Thickness: 0.125 inch thick for face, 0.063" for returns.
 5. Character Height: As indicated on Drawings.
 6. Character Depth: As indicated on Drawings.
 7. Finishes:
 - a. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
 8. Mounting: Concealed, painted aluminum back bar or bracket assembly.
 - a. Hold characters at 1-inch distance from wall surface.
 9. Typeface: Rockwell Bold. (Confirm with Owner.)

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - b. Coordinate with metal siding manufacturer appropriate fastener type.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils . Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 1419

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Corner guards (CG-1).
 - 2. Abuse-resistant wall coverings (VWP-1).
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for steel angle corner guards (CG-2).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: 6 inches long. Include example top caps.
 - 2. Abuse-Resistant Wall Covering: 6 by 6 inches square.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Vinyl wall protection sheets: Provide four (4) full sheets of each color provided.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all wall protection products from single source from single manufacturer.

- B. Manufacturer:

1. InPro Corporation.
2. C-S Group – Acrovyn.
3. Koroseal Interior Products, LLC
4. Pawling Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

- A. Surface-Mounted, Plastic-Cover Corner Guards (CG-1): Manufacturer's standard assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following:
 - a. InPro Corporation: 150 surface mount corner guard.
 - b. Height and Color: As indicated on Drawings.

2.4 ABUSE-RESISTANT WALL COVERINGS

- A. Abuse-Resistant Sheet Wall Covering (VWP-1): Fabricated from semirigid, plastic sheet wall-covering material.
 - 1. Size: As indicated on Drawings, largest sheet or roll practical.
 - 2. Sheet Thickness: 0.060 inch.
 - 3. Color and Texture: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Trim Moldings: Extruded rigid plastic that matches sheet wall covering color.
 - 6. Mounting: Adhesive.
 - 7. Sealant: Color match caulk as required and at joint between panels, in lieu of divider bar.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- B. Adhesive: As recommended by protection product manufacturer.
- C. Caulk: Color match caulk as provided by protection product manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting and priming of walls, before installing wall protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Abuse-Resistant Wall Covering: Install top and edge moldings and corners as required for a complete installation. Joints between panels to be filled with color match caulk in lieu of joint molding.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 2600

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Commercial toilet accessories.
- 1.01.B. Commercial shower and bath accessories.
- 1.01.C. Under-lavatory pipe supply covers.
- 1.01.D. Diaper changing stations.
- 1.01.E. Utility room accessories.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

- 1.03.A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- 1.03.B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.
- 1.03.C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- 1.03.D. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- 1.03.E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.
- 1.03.F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.
- 1.03.G. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.
- 1.03.H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

- 1.04.A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- 1.05.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.05.B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- 1.05.C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation: www.bradleycorp.com/#sle.
 - 3. Bobrick Washroom Equipment, Inc. (Basis-of-Design).

2.02 MATERIALS

- 2.02.A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- 2.02.B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.
- 2.02.C. Stainless Steel Sheet: ASTM A666, Type 304.
- 2.02.D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- 2.02.E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- 2.02.F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- 2.03.A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- 2.04.A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
 - 1. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Bobrick Washroom Equipment Inc., B-2888 (Basis-of-Design).

- 2.04.B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock. (Provide 2 – Rooms 119 and 121A).
1. Capacity: 300 C-fold minimum.
 2. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Bobrick Washroom Equipment, Inc., B262 and B26212, (Basis-of-Design).
- 2.04.C. Waste Receptacle: Wall-mounted, stainless steel, reinforced panel full height of door, continuously welded bottom pan and seamless exposed flanges.
1. Liner: Removable rigid molded plastic receptacle.
 2. Products:
 - a. Bobrick Washroom Equipment, Inc., B-3644, (Basis-of-Design).
 - b. American Specialties, Inc.: www.americanspecialties.com/#sle.
- 2.04.D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with high impact-resistant ABS cover and working parts; push type soap valve, check valve, and window gauge refill indicator.
1. Products:
 - a. Bobrick Washroom Equipment, Inc., B-42 (Basis-of-Design).
- 2.04.E. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 2. Size: As indicated on drawings.
 3. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 4. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Bobrick Washroom Equipment, Inc., B-290, (Basis-of-Design).
- 2.04.F. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2) Bobrick Washroom Equipment, Inc., B-6806, (Basis-of-Design).

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

2.05.A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 2.5 inch (63.5 mm) square minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Bobrick Washroom Equipment, Inc., B-6107, (Basis-of-Design).

2.05.B. Shower Curtain:

1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 72 by 72 inches (1830 by 1830 mm), hemmed edges.
3. Grommets: Stainless steel; pierced through top hem on 6-inch (150 mm) centers.
4. Color: White.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
6. Products:
 - a. Bobrick Washroom Equipment, Inc., 204-3 and 204-1, (Basis-of-Design).

2.05.C. Robe Hook: Heavy-duty stainless steel, two-prong, and backplate for concealed attachment, satin finish.

1. Products:
 - a. Bobrick Washroom Equipment, Inc., B-211, (Basis-of-Design).

2.06 UTILITY ROOM ACCESSORIES

2.06.A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

1. Hooks: Three, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
2. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
3. Length: 36 inches (900 mm).
4. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Bobrick Washroom Equipment, Inc., B-224, (Basis-of-Design).

PART 3 EXECUTION

3.01 EXAMINATION

3.01.A. Verify existing conditions before starting work.

3.01.B. Verify exact location of accessories for installation.

3.02 PREPARATION

3.02.A. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

3.03.A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

3.03.B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated or as indicated on the drawings.

3.04 PROTECTION

3.04.A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800

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SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Fire extinguishers.
- 1.01.B. Fire extinguisher cabinets.
- 1.01.C. Accessories.

1.02 REFERENCE STANDARDS

- 1.02.A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 SUBMITTALS

- 1.03.A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- 1.03.B. Product Data: Provide extinguisher operational features.
- 1.03.C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- 2.01.A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. –
JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
- 2.01.B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. –
JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Larsen's Manufacturing Co; Architectural Series, 2409-RM-VD,
(Basis-of-Design): www.larsensmfg.com/#sle.
 - 4. Nystrom, Inc: www.nystrom.com/#sle.
 - 5. Potter-Roemer: www.potterroemer.com/#sle.

2.02 FIRE EXTINGUISHERS

- 2.02.A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- 2.02.B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound (4.54 kg).
 - 3. Finish: Baked polyester powder coat, color as selected.
 - 4. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

- 2.03.A. Cabinet Construction: Non-fire rated.
 - 1. Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.
- 2.03.B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat rolled edge, with 2 1/2 inch (63.5 mm) wide face.
 - 3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- 2.03.C. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
- 2.03.D. Door Glazing: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape and set in resilient channel glazing gasket.
- 2.03.E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- 2.03.F. Fabrication: Weld, fill, and grind components smooth.
- 2.03.G. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.

2.04 ACCESSORIES

- 2.04.A. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).
- 2.04.B. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher.
 - 1. Amerex Wall Bracket 801-00546.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- 3.02.A. Install in accordance with manufacturer's instructions.
- 3.02.B. Install cabinets plumb and level in wall openings, to height as indicated on the drawings.
- 3.02.C. Secure rigidly in place.
- 3.02.D. Place extinguishers in cabinets.

END OF SECTION 10 4400

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SECTION 10 5113
METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Law enforcement lockers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

2.2 LAW ENFORCEMENT LOCKERS

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Southwest Solutions Group; Free Style Personal Storage Locker.
 - 2. Airflow; Sentinel Law Enforcement Lockers
 - 3. Approved equal.
- B. Locker Arrangement: 30" x 24" x 72"
 - 1. Bench Drawer and Hardwood Bench – 33" total depth.
 - 2. Provide adjustable shelves with integral garment hanger.
 - 3. Louvered doors and drawers.
 - 4. Power strip rail.

2.3 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.
- D. Continuous Base: Formed into channel or zee profile for stiffness and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- E. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
- F. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.4 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top of lockers and to floor.
- B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
1. Attach door locks on doors using security-type fasteners.
 2. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
1. Attach recess trim to recessed metal lockers with concealed clips.
 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 3. Attach sloping-top units to metal lockers, with closures at exposed ends.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 5113

SECTION 10 7516
GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For each flagpole.
 - 1. Include the following:
 - a. Plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - b. Section, and details of foundation system.
- C. Delegated Design Submittals: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.
- B. Subject to compliance with requirements, provide products by one of the following:
 - 1. American Flagpoles
 - 2. Baartol Company
 - 3. Concord American Flagpole
 - 4. Ewing Flagpole Co., Inc.
 - 5. Morgan-Francis Flagpoles and Accessories
 - 6. Pole-Tech Co., Inc.
 - 7. U.S. Flag & Flagpole Supply, LLC.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design flagpole assemblies.
- B. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001.
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
- B. Exposed Height: 30 feet.
- C. Diameter: As shown on Drawings. If not shown, flagpole to be 8" diameter.
- D. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

- E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

- 1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

- 1. 0.063-inch spun aluminum, finished to match flagpole.

- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

- 1. Halyards and Cleats: One at each flagpole.
 - 2. Halyard Flag Snaps: Stainless steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

- B. Drainage Material: Crushed stone or crushed or uncrushed gravel; coarse aggregate.

- C. Sand: ASTM C33/C33M, fine aggregate.

- D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 07 9200 "Joint Sealants."

- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.
- F. Place concrete, as specified in Section 03 3000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.
- G. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 10 7516

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- 1.01.A. Countertops for architectural cabinet work.
- 1.01.B. Wall-hung counters and vanity tops.
- 1.01.C. Sinks molded into countertops.

1.02 RELATED REQUIREMENTS

- 1.02.A. Section 06 4100 - Architectural Wood Casework

1.03 REFERENCE STANDARDS

- 1.03.A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- 1.03.B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- 1.03.C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- 1.03.D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- 1.03.E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- 1.03.F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- 1.03.G. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- 1.03.H. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- 1.03.I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- 1.03.J. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

- 1.04.A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- 1.04.B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.

3. Specimen warranty.

1.04.C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

1.04.D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.04.E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.04.F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

1.05.A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

1.06.A. Store products in manufacturer's unopened packaging until ready for installation.

1.06.B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

1.07.A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

2.01.A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.01.B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.

1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.

- a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Finish: As indicated on the drawings.
 - c. Surface Color and Pattern: As indicated on drawings.
 2. Exposed Edge Treatment: Molded rubber edge with T-spline, sized to completely cover edge of panel.
 - a. Color: As selected by Architect from the manufacturer's full line.
 3. Back and End Splashes: Same material, same construction.
 4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
- 2.01.C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Sinks and Bowls: Separate units for undercounter mounting; minimum 3/4 inch (19 mm) wall thickness; comply with IAPMO Z124.
 - 1) Manufacturer, model and size as indicated on the drawings.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As indicated on drawings.
 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/2 inch (38 mm) thick; radiused edge; use marine edge at sinks.
 5. Back and End Splashes: Same sheet material, radiused top; minimum 4 inches (102 mm) high or as indicated on the drawings.
 6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

- 2.02.A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines. Use at sink locations.

- 2.02.B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- 2.02.C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- 2.02.D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- 2.02.E. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

- 2.03.A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- 2.03.B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches (102 mm), unless otherwise indicated.
- 2.03.C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 - 1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.
- 2.03.D. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- 3.01.A. Do not begin installation until substrates have been properly prepared.
- 3.01.B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- 3.01.C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- 3.02.A. Clean surfaces thoroughly prior to installation.
- 3.02.B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- 3.03.A. Install vanities in accordance with manufacturer's instructions and approved shop drawings
- 3.03.B. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- 3.03.C. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).
- 3.03.D. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).
- 3.03.E. Attach stainless steel countertops using stainless steel fasteners and clips.
- 3.03.F. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- 3.04.A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- 3.04.B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.
- 3.04.C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

- 3.05.A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- 3.06.A. Protect installed products until completion of project.
- 3.06.B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 3600

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DIVISION 22 PLUMBING

22 0000 General Requirements for Plumbing Systems

- 22 0001 Basic Plumbing Requirements
- 22 0002 Plumbing Work in Existing Buildings
- 22 0004 Firestopping for Plumbing Systems
- 22 0005 Excavation, Backfill and Surface Restoration

22 0500 Common Work Results for Plumbing

- 22 0513 Electrical Requirements for Plumbing Equipment
- 22 0519 Meters and Gauges
- 22 0520 Common Piping Materials and Methods
- 22 0523 General Duty Valves
- 22 0529 Pipe Hangers and Supports
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22 0700 Plumbing Insulation

- 22 0719 Pipe Insulation

22 1000 Plumbing Piping and Pumps

- 22 1116 Domestic Water Piping
- 22 1119 Domestic Water Piping Specialties
- 22 1123 Domestic Water Pumps
- 22 1316 Sanitary Waste and Vent Piping
- 22 1319 Sanitary Waste Piping Specialties
- 22 1323 Sanitary Waste Interceptors
- 22 1416 Interior Storm Piping
- 22 1423 Storm Drainage Piping Specialties
- 22 1613 – Natural Gas House Piping

22 3000 Plumbing Equipment

- 22 3333 Electric Domestic Water Heaters

224000 Plumbing Fixtures

- 22 4200 Plumbing Fixtures

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SECTION 22 0001 – BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Utilities
11. Workmanship
12. Protection
13. Painting
14. Record Drawings
15. Cleaning
16. Miscellaneous Equipment Connections
17. Equipment Selection
18. Shop Drawings
19. Final Inspection and Punch List
20. Operation and Maintenance Manuals
21. Warranties
22. Project Closeout
23. Operation and Adjustment of Equipment
24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

- A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.
- B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Plumbing work.
- C. A complete and functional Plumbing system installation shall be provided under this Division. Should overlap of work among trades become evident, this shall be called to the attention of the architect. In such event, none of the trades or their suppliers shall assume that he relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

- D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

- A. The scope of the Plumbing work includes furnishing, installing, testing and warranty of all Plumbing work shown on the Plumbing drawings and specified herein, including Division 00, Division 01, Division 22 and applicable provisions of other relevant Divisions..

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “provide,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.
- B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.
- C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having pipe and fittings fabricated and

delivered in advance of making actual measurements shall be sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

- D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.
- E. Equipment or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.
- F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.
- G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.
- H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

- A. Where standards (NFPA, NEC, ADTM, UL, ASPE, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

- A. Refer to Sections 01200 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

- A. Refer to Section 017300 Execution.
- B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

- A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.
- B. Except where the permit application is made by the Architect or the Engineer, the Plumbing contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the plumbing work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.
- C. Include payment of all permit and inspection fees applicable to the work in this Division.
- D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.
- E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

- A. Refer to Section 013100 Project Management and Coordination.
- B. The HVAC Contractor shall initially prepare and be responsible for ¼" scale coordination drawings. These drawings shall be reproduced and distributed to the Plumbing, Fire Suppression and Electrical Contractors for their input and revisions. Assume that all contractors work together to obtain finish coordinated drawings and no work being installed until all contractors have approved and signed-off with their approval and drawings have been submitted and reviewed by the Engineer.

1.11 TEMPORARY UTILITIES

- A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.
- B. Install new water service and piping from the new service as soon as practicable to facilitate water supply for construction purposes. Provide a water meter, piping and hoses bibbs with vacuum breaker at the site as directed by the General Contractor. Protect meter and piping from physical damage and freezing.
- C. Cost of water use for construction is not included in Division 22.
- D. Remove construction water meter and piping when no longer required.

1.12 WORKMANSHIP

- A. Refer to Section 014000 Quality Requirements.
- B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.
- C. Plumbing work shall be performed by licensed Plumbing Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

- A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.
- B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.
- C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.
- D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

- A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 22:
 - 1. Ferrous metal which is no factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.
 3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.
- B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 9 of the Specifications. All rust must be removed before application of paint.
- C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the Cutting and Patching paragraph in this Section for finishing requirements

1.15 RECORD DRAWINGS

- A. Refer to Section 017839 Project Record drawings.
- B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.16 CLEANING

- A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.
- B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.
- C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

1.17 MISCELLANEOUS EQUIPMENT CONNETIONS

- A. Certain categories of fixtures and equipment, including kitchen equipment, sterilizers, washers, laundry and laboratory equipment, require piping connections and duct connections as shown on the drawings. Equipment will be furnished and set in places by the equipment supplier.
- B. Make all final connections to these fixture and equipment, as indicated and in accordance with the manufacturer's recommendations. All piping connections shall be valved and final connections made with unions.

- C. Fixtures and equipment, unless otherwise noted, will be furnished complete with the basic plumbing supply and waste trim. The trim will generally be furnished “loose” and shall be installed under this work. Countertop sinks furnished “loose” shall also be installed by the Plumbing Contractor.
- D. Provide supplies, supply stops, traps, shut-off valves, fixture drains, continuous wastes and indirect wastes. Provide a water-hammer arrestor on the system side of each automatic (quick-closing) valve on water supply lines. Items not specifically described elsewhere in these specifications shall be of the same manufacturer as similar items specified in conjunction with the plumbing fixtures.
- E. Supply piping and devices where exposed to view in the finished space, shall be chrome plated and insulation shall be omitted.
- F. Roughing-in drawings shall be obtained for the various fixtures and items of equipment as the time approaches when such information is required; allow a reasonable period, from the time of notice, to obtain this information.
- G. Connections to equipment shall be in accordance with manufacturers’ installation guidelines. Any additional accessories recommended by the manufacturer such as gauges, shut-off valves, unions at connection points, etc., shall be provided by this Contractor.

1.18 EQUIPMENT SELECTION

- A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.
- B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:
 - 1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.
 - 2. Where the words “or approved equal: appear after a manufacturer’s name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.
 - 3. Where the words “equal to” appear, followed by a manufacturer’s name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer’s approval.

- C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.
- D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.
- E. If extensive changes in pipe, or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.19 SHOP DRAWINGS

- A. Refer to Section 016000 Product Requirements.
- B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.
- C. The review of shop drawings by the Architect or Engineer shall not relieve the Contractor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.
- D. Shop drawings for the following Plumbing equipment and materials shall be submitted:
 - 1. Pipe, fittings and joining methods for the various systems.
 - 2. Firestopping systems for pipe penetrations.
 - 3. Pipe hangers and saddles.
 - 4. Valves.
 - 5. Flexible connectors.
 - 6. Gauges.
 - 7. Vibration isolators.
 - 8. Pipe insulation
 - 9. Supply system specialties.
 - 10. Backflow preventers
 - 11. Drainage system specialties
 - 12. Oil interceptor
 - 13. Plumbing fixtures and trim
 - 14. Water heating equipment

1.20 OPERATING AND MAINTENANCE MANUALS

- A. Refer to Section 017823 Operation and Maintenance Data.

- B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.
- C. These shall be assembled into three-ring loose lead binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 WARRANTIES

- A. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.
- B. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer's recommendations.
- C. This provision shall not be construed to include maintenance items such as replacing filters, and cleaning strainers after these have been done for final close-out.
- D. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

1.22 PROJECT CLOSEOUT

- A. Refer to Section 017700 Closeout Procedures.

1.23 OPERATIONS AND ADJUSTMENT OF EQUIPMENT

- A. As each piping system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing the domestic hot water return system,
- B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician's judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer's specific instructions.
- C. Test relief valves, air vents and regulating valves to insure proper operation.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

- A. Refer to Section 017900 Demonstration and Training as well as individual Division 22 Sections for requirements.
- B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.
- C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.
- D. A minimum of 4 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:
 - 1. Show locations of items of equipment and their purpose.
 - 2. Review binder containing instructions and equipment and systems data.
 - 3. Coordinate written and verbal instructions so that personnel understand each.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION– NOT APPLICABLE

END OF SECTION 22 0001

SECTION 22 0002 – PLUMBING WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section Includes the following:
 - 1. General Requirements for Renovation Work
 - 2. Inspection of Existing Building
 - 3. Asbestos Material
 - 4. Tobacco Products
 - 5. Barriers and Signage
 - 6. Storage of Tools and Materials
 - 7. Protection of Existing Building and Equipment
 - 8. Confined Spaces
 - 9. Noise, Fumes and Dust Control
 - 10. Soldering Welding and Cutting
 - 11. Removals Disposal and Reuse
 - 12. Draining of Piping Systems
 - 13. Cutting and Patching
 - 14. Cleaning

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

- A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.
- B. Meet with the Owner, Architect and Engineer before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information requested by the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.
- C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

- A. Each bidder shall inspect the project site and the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect/Engineer any significant discrepancies which may be discovered in a timely

fashion so that direction may be provided in an addendum. After the contract is signed, no allowance will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

- A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project by a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.
- B. If, in the performance of the work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect / Engineer who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 TOBACCO PRODUCTS

- A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

- A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non-construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.
- B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

- A. Store all site material and tools in the active job site area, specific storage areas are not provided except where otherwise noted for material and tools. The contractor is responsible for security.

- B. Storage is specifically prohibited in means of egress paths and stairwells.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

- A. The Owner's property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen or other suitable barriers where dust and debris is generated. Tape ends of barriers for sealing purposes.
- B. Provide 55 gallon drums or smaller buckets as appropriate and use funnels where draining liquid systems.
- C. Provide plywood sheets for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

3.4 CONFINED SPACES

- A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.
- B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE, FUME, AND DUST CONTROL

- A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shut-off portions of the system in the work area. Provide taped visqueen covers on HVAC air supply and exhaust devices to limit migration. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.
- B. Arrange with the Owner when required to shutoff fire alarm or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to work generated dust or fumes. Minimize outages and coordinate efforts to limit the effect due to false alarms.

- C. Where significant dust or fume generating work, welding or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.
- D. Areas shall be thoroughly ventilated after completion of the work to remove residual odors and fumes before occupancy occurs the next day.
- E. Provide vacuum cleaners and other equipment to clean and restore conditions.

3.6 SOLDERING WELDING AND CUTTING

- A. For soldering, welding or cutting operations, provide insulated, fire rated barriers and blankets to isolate cover and protect remaining systems and materials, furniture, furnishings, floors, walls, ceilings, etc.
- B. Refer to noise, fume and dust control provisions in the previous paragraph.
- C. Obtain burn approval from the Owner before commencing any soldering or welding effort. Coordinate outages of fire alarm systems as noted in the previous paragraph.
- D. Provide a Fire Watch at each welding location. Fire Watch personnel shall be dedicated for the sole purpose of fire prevention during welding operations. All Fire Watch personnel shall be properly trained and equipped, including fire extinguisher, fire blanket and communication equipment for assistance request.
- E. Provide a fire extinguisher at every soldering or welding location.

3.7 REMOVALS, DISPOSAL, AND REUSE

- A. Refer to the drawings for the scope of remodeling in the existing building.
- B. Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing work which is associated with his trade and which will be superfluous when the new work is installed and made operational.
- C. Extraneous piping which is or becomes accessible shall be removed and stubs shall be capped at the first active pipe encountered. Piping that is and remains inaccessible shall be abandoned. Ends of abandoned pipe shall be capped so as to be concealed by finished surfaces. Upon completion of the work no abandoned duct. Pipe, valve or stub shall extend thru finished floors, walls or ceilings.
- D. When it is necessary to reroute a section of active piping the rerouted section shall be installed before removing the existing in order to minimize system down time. Rerouted sections shall be insulated as required for new work. Patch insulation on existing piping which has been damaged or removed in this work.

- E. Where existing piping is removed and holes are left in existing walls, finished ceilings, floors, etc., these holes shall be patched using materials to match the existing construction to restore and maintain the integrity of the existing partition.
- F. Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Turn over to the Owner and place where directed on the premises all removed material and equipment so designated by the Owner. All material and equipment which the Owner does not wish to retain shall become the property of the Contractor responsible for removal and shall be removed from the premises and properly disposed.
- G. Disposal of materials regulated by EPA shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.
- H. Remove, store and reinstall lay-in ceiling tile and grid as needed to perform work in areas where such removal and re-installation is not to be done by the General Contractor. Damaged tile and/or grid shall be replaced with new matching tile and/or grid.
- I. In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner's property by providing dust covers and temporary plastic film barriers to contain dust. Remove barriers and return equipment and furniture upon completion of the work.
- J. Refinish any surface disturbed under this work match existing, except where refinishing of that surface is included under the General Contract.

3.8 DRAINING OF PIPING SYSTEMS

- A. Existing liquid systems shall be drained as required before removal.
- B. Draining of the system shall be the responsibility of the contractor. Provide threaded connections, etc. to direct fluids to drainage points. Water systems may be drained to sanitary systems or where permitted, to storm systems. Verify any chemical treatment, inhibitors or freeze protection additives in the existing systems and obtain a permit from the local sewer authority before disposing.
- C. Provide drums or containers to accept other than water drainage and remove from the premises and properly dispose. Provide visqueen to protect Owners' property when opening pipes, even where piping has been drained to prevent damage from residual liquid that remains in the pipe.

3.9 CUTTING AND PATCHING

- A. Refer to Division 1 – General Requirements for information regarding cutting and patching.

- B. Plan the work well ahead of the general construction. Where pipes are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.
- C. Where pipes are to pass through, above, or behind existing walls, partitions, floors, roof or ceiling, cutting, patching and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.
- D. All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval of the Architect. Wall, floor and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.
- E. Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck.
- F. The Plumbing Contractor shall engage a Roofing Contractor on a subcontractor basis for roofing and roof insulation work necessitated by his work. The Roofing Contractor shall be certified for installation and repair of the roofing system so as to maintain the existing roofing warranty, if existing.

3.10 CLEANING

- A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.
- B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.
- C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of their work have accumulated on these surfaces.

END OF SECTION 22 0002

SECTION 22 0004 – FIRESTOPPING FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestopping systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Firestopping materials shall be manufactured and/or supplied by:
 - 1. Hilti, Inc.
 - 2. Johns Manville.
 - 3. Nelson Firestop Products.
 - 4. Specified Technologies Inc.
 - 5. 3M; Fire Protection Products Division.
 - 6. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING

- A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer's instructions.
- B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.
- C. Provide firestop system for every pipe at penetration of all fire resistance rated walls and horizontal assemblies.
- D. Coordinate opening size and additional framing requirements with the General Contractor for each opening to meet the firestop installation requirements.
- E. Annular space of penetrations of non-fire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a non-fire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.
- F. Smoke Barriers:
 - 1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

G. Smoke Partitions:

1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke.
Non-rated smoke partitions do not require a fire stopping system.

END OF SECTION 22 0004

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SECTION 22 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Excavating and backfilling for utility trenches.
 - 2. Excavating and backfill for in-ground tanks provided by Division 22.

1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.
- H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

- A. Excavate for all in-grade, under-floor piping, underground, exterior piping, underground tanks and incidental work which are included in the Plumbing contract. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive, and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 22 0002.
- B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.
- C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.
- D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.
- E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bedding Course: Naturally or artificially graded natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

- A. Trenches for interior and exterior piping shall be over-excavated and the pipe shall be laid on 6" minimum depth sand bed.
- B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or compacted, crushed limestone, 3/4" maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18" above the top of the piping. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.
- C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.
- D. Backfill shall be mechanically compacted in layers not over 6" deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.
- E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. Refer to Division 32 for Surface Restoration requirements. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.
- F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.
- G. All exterior underground piping shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6' wide with black letters identifying the piping service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18' above and on the centerline of the pipe.

END OF SECTION 22 0005

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SECTION 22 0513 - ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for electrical work for Plumbing equipment including single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation and other electrical equipment, devices, fuses, wire, conduit and installation methods.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.
- B. Refer to the Plumbing drawings and the Electrical drawings for requirements related to each trade. Coordinate all aspects of electrical components and wiring to complete the systems.

1.3 QUALITY ASSURANCE

- A. Equipment, devices shall be designed, constructed and installed in accordance with applicable standards of NEMA and the National Electric Code. Equipment shall be tested and listed by UL or other approved agency and installed in accordance with all instructions included as part of such listing.
- B. Electrical equipment, devices, fuses, wire, conduit and methods shall comply with applicable provisions of Division 26 - Electrical.

PART 2 - PRODUCTS

2.1 Motors

- A. General duty motors shall be induction type 1750 rpm NEMA Design "B" with copper windings, Class B or F insulation, and motor enclosure to suit the application. Service factor shall be 1.15 minimum.

- B. Two-speed motors shall be two-winding type with six leads unless otherwise specified.
- C. Motors for other than general duty application shall be furnished to suit the application and operating environment.
- D. Premium efficiency motors shall be equal to Century "E + 3", General Electric "Energy Saver Premium Efficiency", Baldor "Super E Premium Efficient" or Reliance "Premium Energy Efficient" series. Motor efficiencies shall be tested and conform to NEMA Standard Publication MG-1 and IEEE 112 Test Method B.
- E. Motors used with variable frequency controllers shall be rated for inverter service in accordance with NEMA Standard Publication MG-1, Part 31 and designed with Class F or H insulation, but with a Class B temperature rise.
- F. Motor sizes shown on the drawings are to be considered minimum. Motors furnished shall be sized so as to not operate in the service factor range. Motors for direct driven pumps and fans shall be selected so as to not operate in the service factor range at any point on the curve.
- G. The Plumbing Contractor and equipment suppliers shall compare the electrical power requirements of the intended equipment with power feeders to the equipment shown on the Electrical drawings. Verify adequacy and compatibility of voltage, phase, wiring, capacity, number and size of conductors (versus equipment connection points), fusing and other information on the electrical and mechanical drawings to that required for the equipment. If the selected equipment requires revision of the electrical, added cost must be borne by the Plumbing Contractor.

2.2 STARTERS

- A. Magnetic starters shall comply with provisions of Division 26 - Electrical Specifications and shall be NEMA construction (IEC rated not acceptable) with thermal overload element on each phase, 115-volt control voltage and hand-off-automatic switch, where appropriate. An integral control transformer shall be incorporated in the starter for each motor of 200 volt and greater. A single control transformer is acceptable for multiple motor packaged equipment, however, when such is the manufacturer's standard. Duplex type units (pumps, compressors, etc.) are not included in this exception. A control transformer shall be provided in each starter to insure standby operating capability.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Motor connections of factory assembled equipment shall be made with flexible conduit except for plug-in electric cord connections.
- B. All power wiring shall be run in conduit. Control wiring shall be run in conduit except where open wiring is permitted in other applicable specification sections.

- C. Fuses shall be furnished and installed in fuse clips of equipment and switches provided by the Plumbing Contractors.

END OF SECTION 22 0513

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SECTION 22 0519 - METERS AND GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gauges.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 THERMOMETERS

- A. Thermometers shall be 9" blue reading organic spirit filled tube column type with cast aluminum case with epoxy finish, acrylic window, aluminum scale with white background and black markings, 1% accuracy, adjustable angle hinge assembly and 3.5" aluminum insertion stem, equal to Terice BX91403.
- B. Provide a separable socket insertion thermowell shall be furnished with each thermometer. An extension neck, with appropriate increase in thermometer stem length, shall also be furnished where insulation thickness exceeds 2".
- C. Ranges of thermometers shall be selected from standard Fahrenheit scales to be consistent with anticipated temperatures, typically 0 deg.F.- 160 deg.F.

2.2 PRESSURE GAUGES

- A. Pressure gauges, including compound gauges and vacuum gauges, shall be Bourdon tube type with 4-1/2" dial and cast aluminum case, equal to Terice 600C Series. Accuracy shall be 1% at mid-range.
- B. Pressure gauges for low pressure application, calibrated in inches of water gauge, ounces per sq. in. or 0-5 psi, as appropriate, shall be equal to Terice 860.

- C. Pressure gauges at pumps shall be liquid filled Bourdon tube type with 4" dial and stainless-steel case and internals, equal to Trerice 700 Series.
- D. A brass cock or bronze ball valve and a pressure snubber shall be furnished with each pressure gauge.
- E. Ranges of pressure gauges shall be selected to be consistent with anticipated pressures. Range shall be approximately twice the normal system working pressure at the gauge location.

2.3 TEST PLUGS

- A. Pressure-temperature test plugs for insertion of pressure gauge or thermometer shall be a brass fitting with neoprene or Nordel self-sealing insert and knurled brass cap with plastic capture tab. Fittings shall be equal to Peterson "PT". Furnish two thermometers and two pressure gauges with integral insertion stem appropriate for use with the test plugs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Thermometers shall be installed where shown on the drawings and also at:
- B. Pressure gauges shall be installed where shown on the drawings, where required by applicable codes and also at:
- C. Thermometers and gauges shall be positioned to be read with unobstructed view from the floor. Pressure-temperature test plugs shall be installed where shown, located in a position to be most readable.
- D. Install thermometer wells in piping tees in the vertical position. Fill the well with oil or graphite and secure the thermometer in position

END OF SECTION 22 0519

SECTION 22 0520 – COMMON PIPING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Dielectric fittings.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Piping Systems - Common Requirements.
7. Equipment installation requirements common to equipment sections.

1.2 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- B. Welders shall be qualified and fully certified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
- C. Welding procedures and testing shall comply with ANSI Standard B31.1.0 Standard Code for Pressure Piping, Power piping and The American Welding Society Welding Handbook.
- D. All pressure piping systems regulated by the Ohio Pressure Piping Systems Code, Chapter 4101:8 shall conform to applicable requirements of the Code. Welders shall carry a current State of Ohio, Pressure Piping Board Certification. Each welder shall submit a copy of their signed performance qualification record to the Engineer for approval prior to beginning work on any pressure piping system.
- E. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 DIELECTRIC CONNECTORS

- A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:
 - 1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. "V-line" Dielectric fitting on services 180 degrees and less.
 - 2. Dielectric flange with non-metallic bolt hole grommets and gasket.
 - 3. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

2.2 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Plastic. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 SLEEVES

- A. Schedule 40 black steel pipe or 18 gauge galvanized steel poured concrete floors, walls and roof decks.
- B. 26 gauge galvanized sheet or Schedule 40 black steel pipe in the other than poured concrete.
- C. Combination pre-set floor sleeve and firestopping assembly equal to Hilti CP 680.
- D. Concrete curbs may be formed and poured around multiple pipe risers in rooms with waterproofing floor membrane, in lieu of the Smith 1720 riser sleeve and clamping ring. Curbs shall be 4" wide x 4" high with chamfered corners. Membrane and curbing shall be arranged to maintain the integrity of the membrane. Pipe sleeves shall be as described for normal areas or extended to the top level of the curb where the concrete is full depth throughout the curbed area.
- E. Piping and conduits extending thru the roof may be fitted with a manufactured pipe curb weatherproofing assembly equal to Pate pca, as an alternative to riser sleeves with clamping rings specified above.

2.4 ESCUTCHEONS

- A. Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve. Plates shall be installed on exposed piping in finished rooms and areas where pipes penetrate walls, floors, ceilings or overhead structure.

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Install piping to permit valve servicing.
- H. Install piping adjacent to equipment and specialties to permit servicing and maintenance.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.

- K. Install piping to allow application of insulation.
- L. Select system components with pressure rating equal to or greater than system operating pressure.
- M. Install escutcheons for penetrations of walls, ceilings, and floors.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- O. Verify final equipment locations for roughing-in.

3.2 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.3 PIPE SLEEVES

- A. Pipe sleeves, floor and wall openings, water protective curbing and escutcheon plates shall be provided as described below. Pipe sleeves shall be placed in all floor slabs, poured concrete roof decks, walls and partitions, except as noted below, to allow new piping to pass thru and allow for expansion, contraction and normal movement of the pipe. Sleeves are also required for all existing piping related to the various trades in new walls, partitions, floors and roof slabs, same as for new piping.
- B. Sleeves are not required in the following:
 - 1. In floor slabs on grade.
 - 2. In stud and gypsum board or plaster walls and partitions which are not fire rated.
 - 3. For uninsulated pipe passing thru masonry walls and partitions and stud and gypsum board or plaster walls and partitions.
 - 4. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling thru hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.
 - 5. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after pipe are set.
- C. Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall

project a minimum of 1" above finished floor. Pipe sleeves shall be sized to allow insulation to pass thru the sleeve, for insulation requiring continuous vapor barrier (domestic cold water, chilled water refrigerant, etc.). Where vapor barrier continuity is not needed, the sleeve may be sized to pass the pipe only or the insulation as well. Refer to the following paragraph for qualification and exceptions relating to firestopping.

- D. Pipe sleeves which are part of firestopping assemblies shall conform to the requirements of the assembly with particular emphasis regarding size, annular space, length, passage or non-passage of insulation and the installation of the sleeves.
- E. Where firestopping is not required, the annular space between the sleeve, core drilling or opening and the pipe or pipe insulation shall be closed with caulking to retard the passage of smoke.
- F. Where uninsulated pipes requiring no pipe sleeves pass thru non-fire rated floor, wall or partition, the annular space shall be closed with material and methods compatible with the wall or partition material (Type M masonry grout, drywall joint compound, plaster, etc.).

3.4 Mechanical Seals

- A. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- B. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.

- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 22 0520

SECTION 22 0529 – PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Hanger Rods and Attachments.
 - 5. Pipe Riser Supports
 - 6. Roof Supports

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design seismic-restraint hangers and supports for piping and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

- A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:
1. General service - clevis type - Fig. 260.
 2. Uninsulated copper tubing - copper plated clevis type - Fig. CT-65 (or plastic coated clevis, or fiberglass construction).
 3. Where the length of the hanger rod between the top of the hanger and the attachment is 3" or less, clevis type hangers with rollers, Fig. 181, shall be used to allow for expansion travel
- B. Hangers on insulated horizontal piping shall be oversized to surround the pipe insulation. To protect the insulation from damage or inordinate compression due to concentrated weight, the following shall be provided at each hanger:
1. Pipe 2" and smaller – Anvil Fig. 168 18 ga. sheet metal rib-lock shield with belled ends, 12" long.
 2. Pipe 2-1/2" and larger – wood blocking to prevent crushing insulation, with Anvil Fig. 168 18 ga. Sheet metal rib-lock shield with belled ends, 12" long.
 3. Pipe 2-1/2" and larger – Factory fabricated assembly equal to Pipe Shields, Inc. A1000.
- C. The first two hangers on piping connecting to motor driven equipment shall be fitted with a steel spring and neoprene vibration isolation section similar to Mason Industries, No. 30N.

2.2 TRAPEZE HANGERS

- A. Trapeze hangers for numerous pipes run in parallel may be utilized. Horizontal support members shall be unistrut type section with pipe rollers (to allow for expansion travel) and spring and nut connectors, suspended with hanger rods and attachments similar to individual pipe hanger suspension.

2.3 HANGER RODS AND ATTACHMENTS

- A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below or matching manufacturer's provisions. A hanger attachment device (for attachment to the structure) and locking nuts at the hanger attachment shall be provided on each hanger. Locking nuts shall be provided at each clevis hanger.

Pipe Size

Min. Rod Dia.

1" and smaller	1/4"
1-1/4" to 3"	3/8"
4" to 6"	1/2"
8"	5/8"
10"	3/4"
12" and larger	7/8"

B. Hanger rod attachment devices for attachment to the structure shall be:

1. Pre-set concrete inserts.
2. After-set steel expansion type concrete inserts.
3. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.
4. Side beam bracket for wood construction equal to Anvil Fig. 206.
5. Channel support system equal to Unistrut or Hilti.

2.4 PIPE RISER SUPPORTS

A. Riser clamps on cold service insulated piping shall be:

1. Insulated Pipe size 1-1/2" and smaller shall be factory (Pipe Shields E1000) or shop fabricated assembly Fig. 261 with high density calcium silicate insulation and galvanized steel jacket.
2. Insulated Pipe size 2" and greater shall be factory fabricated assembly Pipe Shields, Inc. E1000.
3. Un-insulated copper tubing – Anvil Fig CT-121 or CT-121C
4. Un-insulated steel piping – Anvil Fig. 261.

2.5 ROOF SUPPORTS

- A. Pipe supports for pipe running across the roof shall be manufactured by Advanced Support Products, requiring no penetration of the roofing membrane. The support system shall consist of round injection molded polypropylene bases, 12 gauge hot dipped galvanized Unistrut framing and adjustable hot dipped galvanized or cadmium plated hangers and cadmium plated hanger rods as detailed. Furnish protective slip sheets of roofing membrane for installation under the bases.
- B. Pipe supports for pipe running across the roof shall be equal to Pate Model "PRS" roof support curb and "RAC" roller support assembly. Supports shall be heavy gauge galvanized steel roof curb with base plate, continuous welded corner seams, integral raised cant to match roof insulation, wood nailer, counterflashing and roller pipe supports. Units shall be field insulated on the inside with batt insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Vertical:
 - a. At the base and 15 ft. maximum spacing unless otherwise shown.
2. Steel pipe - Horizontal:
 - a. 2" size and smaller – 8 ft. intervals
 - b. 2-1/2" thru 6" – 10 ft. intervals
 - c. 8" and larger – 12 ft.. intervals.
3. Cast iron pipe - Vertical
 - a. At the base and 15 ft. maximum spacing unless otherwise shown.
4. Cast iron pipe – Horizontal
 - a. At 10 ft. intervals.
 - b. Support each length of pipe not more than 18" from the joint.
 - c. Support terminal ends of horizontal runs and branches and each change in direction.
 - d. 5" and larger provide bracing to prevent horizontal movement in accordance with CISPI "Soil Pipe and Fittings Handbook"
5. Copper Tubing - Vertical
 - a. At the base and 10 ft. maximum spacing unless otherwise shown.
6. Copper Tubing – Horizontal
 - a. 1-1/4" size and smaller – 6 ft. intervals
 - b. 1-1/2" thru 2" – 8 ft.. intervals
 - c. 2-1/2" and larger – 10 ft. intervals
7. Plastic pipe
 - a. Per manufacturer's recommendations.

B. In piping systems with mechanical joint couplings, pipe hangers shall be provided on horizontal piping at normal specified intervals and, in addition, so that no pipe shall be left unsupported between any two couplings nor left unsupported whenever a change in direction takes place. Vertical piping shall be supported at normal specified intervals or every other pipe length, which ever is more frequent. The base of the riser or base fitting shall be supported.

C. Attachment of pipe hangers to the structure shall be with:

1. Pre-set concrete inserts in concrete construction of 4" minimum depth.
2. After-set concrete inserts, in 4" minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.
3. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

4. Side beam bracket in wood construction, secured to the wood joist with lag screws set in drilled pilot holes.
 5. Unistrut channels with spring and nut rod connection may be utilized where a number of pipes are run parallel. Channel shall be attached to the structure with inserts or clamps.
 6. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical.
- D. Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer's recommendations. Refer to the architectural and structural drawings for type of engineered structural systems being used. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional support with supplemental steel shapes when spacing between structural members exceeds specified distances.
- E. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position before pipe insulation is installed.
- F. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within the pipe chase. Ensure that adequate support is still maintained.
- G. Hanger assemblies which will remain exposed on completion of the project shall be painted before installation.
- H. Pipe supports manufactured by Advanced Support Products for pipe running across the roof shall be installed in accordance with the manufacturer's instructions and as detailed. Install protective slip sheets of roofing membrane under the bases to satisfy the requirements of both the roofing manufacturer and the support system manufacturer.

END OF SECTION 22 0529

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SECTION 22 0530- EQUIPMENT BASES AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Equipment Supports
- B. See Division 22 Section "Vibration Control" for vibration isolation devices.
- C. See Division 22 Section "Seismic Control for Plumbing Systems".

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Equipment hangers and supports.
 - 2. Equipment bases.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 CONCRETE BASES

- A. Concrete bases and pads with anchor bolts cast-in-place. Bases shall be formed on all sides and hand troweled to a smooth, dense finish with neatly chamfered corners. Large concrete pads on grade shall be constructed with reinforcing steel or reinforcing roadway mesh.

2.2 STEEL SUPPORTS

- A. Structural steel angles, beams or channels, unistrut type channels or pipe. Supports shall be fabricated into a rigid framework with welded or bolted connections and cross-bracing or sway bracing. Supports shall be set on slab with base plates, or attached to the building structure as required. Brackets for relatively lightweight equipment may be attached to the wall. Equipment shall be set on and attached to the framework.
- B. Solid steel hanger rods supported from the structure above similar to pipe hangers. Provide sway bracing for equipment supported in this manner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- B. Field Welding: Comply with AWS D1.1.
- C. Concrete bases for plumbing equipment are included in the Plumbing Contract. The Plumbing Contractor shall provide exact dimensions, locations and other detail for the specific equipment provided. The Plumbing Contractor shall set anchor bolts as required for the equipment.

END OF SECTION 22 0530

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Warning markers.
4. Valve tags.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Each item or major equipment shall be labeled. This shall include water heaters, pumps, and other similar equipment consistent with tags on drawings.
- B. Labeling shall be:
1. Permanently attached engraved brass or plastic laminated signs with 1" high lettering. Signs on exterior equipments shall be brass.
 2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

2.2 PIPE LABELS

- A. Pipe markings shall be applied to all piping.
- B. Labeling shall be:

1. Snap-On Type – Plastic, semi-rigid snap-on type, manufacturer's standard pre-printed pipe markers or pressure-sensitive vinyl pipe markers.
2. Adhesive Type – Strip-type markers fastened to the bare pipe or insulation with laminated or bonded application or plastic tape not less than 1-1/2" wide. On piping and insulation 6" and greater diameter provide full band.
3. Lettering heights shall be as specified by manufacturer for indicated pipe/pipe plus insulation size.
4. Markers shall extend fully around pipe and insulation or full circle at both ends of the marker.
5. Markers shall be color coded for service.
6. Flow direction arrows provided integral with the pipe marker or separate at each marker.
7. Service pressure for compressed air and natural gas piping systems.
8. In areas where exposure to water or high humidity is anticipated, provide washdown, fade-resistant style labels.

2.3 WARNING MARKERS

- A. Underground line marker tape shall be permanent, bright-colored, plastic with continuous identification lettering. Tape over service lines that cannot be detected by a metal detector shall be multi-ply with an aluminum foil core.

2.4 VALVE TAGS

- A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2" x 11" paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).
- B. Valve tags shall be polished brass or plastic laminate with solid brass S hook. Tags shall be engraved with "P" for Plumbing and the designated number.

2.5 ACCEPTABLE MANUFACTURERS

- A. Labels, markings and tags shall be manufactured by:
 1. W.H. Brady
 2. Seton
 3. Allen
 4. Industrial Safety Supply
 5. McMaster-Carr

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identification marking and tagging shall be applied after insulation and painting has been completed.
- B. Coordinate names, abbreviations and other designations used in plumbing identification work, with corresponding designations shown, specified, or scheduled on drawings.
- C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.
- D. Equipment labeling shall consist of unit designation as shown on the drawings.
- E. Pipe markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.
- F. Refer to appropriate sections of this specification for installation of underground line marker tape.
- G. Service pressure markings to be placed upstream and downstream of regulators at each pipe service label.
- H. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 22 0553

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SECTION 22 0719 - PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Fiberglass.
 - b. Flexible Elastomeric.
2. Protective Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.
2. Thickness and covering table.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

- B. Thicknesses shall be in compliance with ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 INSULATION GENERAL

- A. Refer to insulation schedule on the Drawings for piping material and applications.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be done by tradesmen specializing in insulation work in strict accordance with the manufacturer's recommendations.
- B. Overlap and seal all longitudinal joints. Staples and adhesive may be used as stated above. Tape and seal cross joints. Vapor barrier shall be continuous on insulation of all cold services. Vapor barrier type mastic shall be used where needed to maintain a vapor seal.
- C. Where insulation is terminated, insulation shall be beveled at 45 degrees and the beveled surface sealed with vapor barrier mastic. PVC caps over straight cut ends which have been vapor sealed may be used in lieu of beveling.
- D. Mechanical joint fittings and couplings shall be considered as a part of the pipe line and shall be insulated. Bidders on the insulation work are cautioned to verify during the bidding period the extent of this work.
- E. Insulation on cold service piping shall be run through floor and wall sleeves to maintain vapor barrier continuity. Insulation on other services may likewise be run continuous when sleeve size permits. Refer to Section 22 0529 for non-compressible insulation or blocking material and sheet metal saddles required at pipe hangers. Coordinate with the contractor on the furnishing, installation and detailed requirements of these. Provide insulation and vapor barrier on and around supports for pipe risers of services which require vapor seal so as to prevent sweating.
- F. Verify that piping has been tested before applying insulation materials and that piping surfaces are clean and dry, with foreign material removed.
- G. Fittings, valves, flanges and other devices, both exposed and concealed, requiring insulation shall be covered same thickness as pipe insulation with:
 - 1. Factory molded fitting insulation cover with PVC one-piece fitting cover.
 - 2. Miter-cut segments of pipe insulation, held in place with adhesive and/or wire, filled with insulating cement smoothed to shape and covered with PVC one-piece fitting cover.
 - 3. Fiberglass blanket insulation, held in place and covered with PVC one-piece fitting cover.
 - 4. Oversized pipe insulation, where applicable, finished same as straight run pipe insulation.

END OF SECTION 22 0719

SECTION 22 1116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Unions and Flanges.

1.2 SUBMITTALS

- A. Product Data: For each type of product used.

1.3 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIAL

- A. Refer to piping and valve schedules on the Drawings for piping materials, valves, and applications.

2.2 UNIONS AND FLANGES

- A. Unions on copper tubing, all bronze construction 150 lb., solder ends.
- B. Unions on steel pipe 2" and smaller, malleable iron with ground seat, bronze to steel, 300 lbs., screwed ends.
- C. Flanges on steel pipe with welded or screwed joints, 2-1/2" and larger. Gaskets shall be 1/16" thickness full face compressed sheet suitable for temperature and pressure ranges of the application.

- D. Mechanical joints associated with grooved end pipe are acceptable in lieu of unions and flanges.

2.3 DIELECTRIC FITTINGS

- A. Refer to Division 22 Section "Common Piping Materials and Methods" for dielectric fitting requirements.

2.4 PIPE SLEEVES

- A. Refer to Division 22 Section "Common Piping Materials and Methods" for sleeve requirements.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Refer to Division 22 Section "Common Piping Materials and Methods" for basic piping installation requirements.
- B. Mechanically formed tee fittings and couplings of the T-Drill type on copper tubing shall be formed in a continuous operation using equipment specifically designed for the application in strict adherence to the manufacturer's instructions. Cutting debris shall be removed from the piping completion. Joints shall be brazed.
- C. Piping shall be pitched for drainage. The low points shall be fitted with a ¾" drain valve (with hose thread adapter if not piped to a floor drain) except that on piping 1-1/4" and smaller where a drain valve is not shown, a drain plug is acceptable. Hose thread adapters on drain valves of potable water piping shall be fitted with a non-removable vacuum breaker.
- D. Piping shall be installed consistent with good piping practice and run concealed wherever possible. Coordinate with other trades to attain a workmanlike installation.
- E. Piping shall be supported as specified in Section 22 0529 Pipe Hangers. Piping with mechanical joints for grooved end pipe shall be supported in accordance with the manufacturer's recommendations. Pipe alignment in both the horizontal and vertical must be tightly maintained. Misalignment must be corrected to the satisfaction of the Engineer before insulation is applied and the system accepted.
- F. Inform the Insulation sub-contractor during the bid period as to the extent of use of mechanical joints so that sub-contractor can price the work accurately.
- G. Internals of sweat end valves shall be removed when damage or warping could occur due to applied heat of soldering. Where silver brazing is specified, solder connection of valves shall be used to reduce the danger of damage. Close open ends of piping during installation to keep interior of the pipe clean.

- H. Install strainers as indicated on the drawings. Provide a nipple and ball valve in the blow down connection of each strainer 2" and larger.
- I. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.
- J. Refer to Division 22 Section "Common Piping Materials and Methods" for dielectric fitting requirements.
- K. Refer to Division 22 Section "Common Piping Materials and Methods" for sleeve requirements.
- L. Refer to Division 22 Section "Pipe Hangers and Supports" for basic hanger and support requirements
- M. Refer to Division 22 Section "Common Piping Materials and Methods" for escutcheon requirements.
- N. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.2 FIELD QUALITY CONTROL

A. Piping Inspections:

- 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Piping Tests:

- 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

4. Domestic water piping – hydrostatic at 125 psig for 6 hours at the low point of the system. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and for corrective action required.
- C. Domestic water piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.3 PIPE CLEANING

- A. Before placing each water piping system in operation, the piping system shall be thoroughly flushed out with clean water.

3.4 DISINFECTION OF PIPING

- A. All new domestic water piping shall be disinfected by a company or personnel regularly engaged in the performance of this service.
- B. Disinfection shall be performed in accordance with AWWA C651- 86 Standards. Disinfection shall be means of a chlorine solution injected into the water system near the source. Outlets throughout the system shall be tested to prove presence of minimum chlorine concentration. Flush out the system with clean water until the residual chlorine content is not greater than .2 parts per million or until approved by the Health Department.
- C. Disinfection procedures shall be witnessed by the Architect, Engineer or other qualified representative.

3.5 DOMESTIC HOT WATER RETURN SYSTEM BALANCING

- A. The domestic hot water return shall be balanced and or adjusted to provide proper operation or function in accordance with the drawings, specifications and manufacturer's recommendations.
- B. Submit balance report. Report to include:
1. Project name and location.
 2. Contractor's name and address.
 3. Report date.
 4. Location and information data for each recirculation pump.
 5. Location and information data for each balancing valve.
 6. Pump design and final pump performance settings.
 7. Balance valve design and final valve settings.
 8. Notes to explain why final data varies from indicated values.

END OF SECTION 22 1116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Backflow preventers.
2. Water pressure-reducing valves.
3. Temperature-actuated water mixing valves.
4. Strainers.
5. Wall hydrants.
6. Drain valves.
7. Water hammer arresters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1001.
3. Size: 1/4" to 3", as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.
 - d. FEBCO; SPX Valves & Controls.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1001.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.

- d. FEBCO; SPX Valves & Controls.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
- 2. Standard: ASSE 1012.
 - 3. Operation: Continuous-pressure applications.
 - 4. Size: 1/2"
 - 5. Body: Bronze.
 - 6. End Connections: Union, solder joint.
 - 7. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.
 - d. FEBCO; SPX Valves & Controls.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
- 2. Standard: ASSE 1013.
- 3. Operation: Continuous-pressure applications.
- 4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
- 5. Size: 3/4" to 3", as required to match connected piping or as noted on drawings.
- 6. Body: Bronze for 2" and smaller; steel with interior lining complying with AWWA C550 or that is FDA approved/stainless steel for 2-1/2" and larger.
- 7. End Connections: Threaded for 2" and smaller; flanged for 2-1/2" and larger.
- 8. Configuration: Designed for horizontal, straight through flow.
- 9. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of 2" and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of 2-1/2" and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Backflow-Preventer Test Kits

- 1. Manufacturers Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.
 - d. FEBCO; SPX Valves & Controls.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Plumbing Products Group; Wilkins Div.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Size: 1/2" to 3", as required to match connected piping or as noted on drawings.
4. Body: Bronze with chrome-plated finish.
5. End Connections: Threaded.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Digital Hot Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.
 - d. Caleffi Hydronic Solutions "Legiomix."
2. Valves shall be digital of lead free stainless steel/polymer construction.
3. Valve shall have all of the following operational capabilities:
 - a. +/- 2F water temperature control
 - b. 2F minimum inlet to outlet water temperature differential
 - c. Automatic shutoff of hot water flow upon cold water inlet supply failure.
 - d. Automatic shutoff of hot water flow in the event of a power failure
 - e. Programmable set point range of 81-158°F (27-70°C)
 - f. Programmable thermal disinfection mode
 - g. Programmable 1st level hi/lo temp alarm display
 - h. Programmable temperature error level for safety shutdown
4. Valve shall have all of the following connectivity capabilities:
 - a. SPCO relay outputs which are energized during operation.

- b. LCD display which indicates: set point, delivered temperature, error codes and alarm conditions.
 - c. MODBUS 485 port for remote set point adjustment and remote operating temperature visibility.
 - d. RS485 Serial Port for connection to a performance matched hot water monitoring system.
 - e. BACnet protocol card.
5. Valve shall be compliant with ASSE Standard 1017 and CSA B125 and so certified and identified.
6. Valve shall be UL listed and identified.

B. Point of Use Thermostatic Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bradley Corporation
 - b. Lawler Manufacturing Company, Inc.
 - c. Leonard Valve Company.
 - d. Powers; a Watts Industries Co.
 - e. Symmons Industries, Inc.
2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Exposed mounting thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, thermometer on outlet, temperature-control handle.
8. Tempered-Water Setting: 105 deg F .
9. Tempered-Water Design Flow Rate: 0.5 gpm minimum.
10. Valve Finish: Rough bronze.
11. Piping Finish: Copper.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers.

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for 2" and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for 2-1/2" and larger.
3. End Connections: Threaded for 1/2" and smaller; flanged for 2-1/2" and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
 - a. Strainers 2" and Smaller: 0.020 inch.
 - b. Strainers 2-1/2" to 4": 0.045 inch.
 - c. Strainers 5" and Larger: 0.10 inch.

6. Drain: Pipe plug/Factory-installed, hose-end drain valve.

2.6 WALL HYDRANTS

A. Nonfreeze Wall Hydrants

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Woodford Manufacturing Company.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.3M for concealed -outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: 3/4".
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Stainless Steel
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Include operating key with each key operated hose bibb

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves.

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: 3/4".
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. PPP Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products Inc.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet. Install thermometers and water regulators if specified.
- F. Install Y-pattern strainers for water where shown on the drawings.

- G. Install water hammer arresters on each quick closing valve in water piping according to PDI-WH 201.
- H. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- I. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Reduced-pressure-principle backflow preventers.
 - 2. Water pressure-reducing valves.
 - 3. Primary, thermostatic, water mixing valves.
- J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following all-bronze and bronze-fitted centrifugal pumps for domestic hot-water recirculation:
 - 1. Close-coupled, in-line, seal less centrifugal pumps.
- B. See Division 22 Section "Domestic-Water Packaged Booster Pumps" for booster systems.

1.2 SUBMITTALS

- A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, sealless centrifugal pumps as defined in HI 5.1-5.6.
 - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
 - 2. Casing: Bronze, with threaded companion-flange connections.
 - 3. Impeller: Corrosion-resistant material.
 - 4. Motor: Single 3-speed. Comply with requirements in Division 22 Section "Electrical Requirements for Plumbing Equipment."

B. Capacities and Characteristics:

1. Capacity: Refer to Drawings.r
2. Total Dynamic Head: Refer to Drawing for
3. Maximum Operating Pressure: 125 psig.
4. Maximum Continuous Operating Temperature: 220 deg F .
5. Inlet and Outlet Size: Refer to Drawings
6. Motor Horsepower: Refer to Drawings
7. Electrical Characteristics: Refer to Drawings

C. Acceptable Manufacturers:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Industries.
3. Grundfos Pumps Corp.
4. Taco, Inc.

2.2 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion sensor, for installation in hot-water circulation piping.
2. Range: 50 to 125 deg F.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120 V, ac.
6. Settings: Start pump at 115 deg F and stop pump at 120 deg F.
7. Acceptable Manufacturers:
 - a. Honeywell International, Inc.
 - b. Square D.
 - c. White-Rodgers Div.; Emerson Electric Co.

B. Timers: Electric time clock for control of hot-water circulation pump shall be thru the building control system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with HI 1.4.
- B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

- D. Install in-line, seal less centrifugal pumps with motor and pump shafts horizontal.
- E. Install continuous-thread hanger rods and spring hangers of sufficient size to support pump weight. Fabricate brackets or supports as required. Hanger and support materials are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- F. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- G. Install piping adjacent to pumps to allow service and maintenance.
- H. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles. Refer to Division 22 Section "Domestic Water Piping."
 - 1. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves for domestic water piping and Division 22 Section "Domestic Water Piping Specialties" for strainers.
 - 2. Install test plugs for pressure gage at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and test plugs.
 - 3. Install thermometer at suction of pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometer.
- I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- J. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 221123

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SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.3 SUBMITTALS

- A. Product Data: For each type of product used.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Cast iron pipe, fittings, and standard duty no-hub couplings shall be listed by NSF International and marked with "NSF" demonstrating certification.
- C. Plastic piping and components shall comply with NSF 14, "Plastics Piping Systems Components and Related Materials,". Include marking with "NSF-DWV" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to piping schedule on the Drawings for piping material and applications.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. Basic piping installation requirements are specified in Division 22 Section "Common Piping Materials and Methods. "
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- D. Piping suspended 18" or more shall be provided with sway bracing as required by CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- E. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use the proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow for piping smaller than 3" and; 1 percent downward in direction of flow for piping 3" and larger.
 - 2. Vent Piping: slope down toward vertical fixture vent or toward vent stack.
- H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- J. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- K. Refer to Division 22 Section "Common Piping Materials and Methods" for sleeve requirements.
- L. Refer to Division 22 Section "Pipe Hangers and Supports" for basic hanger and support requirements

- M. Refer to Division 22 Section "Common Piping Materials and Methods" for escutcheon requirements.
- N. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.2 JOINT CONSTRUCTION

- A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- B. PVC Non pressure Piping Joints: Join piping according to ASTM D 2665.

3.3 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code or indicated on the drawings.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections **2-1/2"** and larger.

3.4 FIELD QUALITY CONTROL

- A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
 - 1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 2. Prepare reports for tests and required corrective action.

3.5 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during the remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Plug the ends of uncompleted piping at end of day and when work stops.

3.6 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 1316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.
6. Oil interceptors.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Floor drains shall be as indicated on the drawings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 - g. Wade Manufacturing Company Division of Tyler Pipe
 - h. Sioux Chief Manufacturing Company

2.2 CLEANOUTS

A. Cast-Iron Floor Cleanouts:

1. Manufacturer shall be same as floor drains.
2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Inside calk.
8. Closure: Plastic plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Cast-Iron Wall Cleanouts

1. Manufacturer shall be same as floor drains.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thaler Metal Industries Ltd.
 - b. Oatey Co.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch, lead flashing collar and skirt extending at least 8 inches] from pipe, with galvanized-steel boot reinforcement and counterflashing fitting. Open-Top Vent Cap: Without cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Maintenance Device:

1. Description: Device inserted into the drain body or adjustable strainer that opens to allow water to pass thru and closes to prevent sewer gases from entering the room from the drainage system.
2. Must conform to ASSE 1072.
3. Size: Same as floor drain outlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.5 OIL INTERCEPTORS

A. Oil Interceptors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. Zurn Plumbing Products Group.
 - c. Streim Co.
2. Standard: IAPMO IGC 325 High Efficiency Oil/Water Separators.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to 4". Use 4" for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 100 feet.

4. Locate at base of each vertical soil and waste stack.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain the integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- G. Install roof flashing assemblies on vent stacks that extend through roof.
- H. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- I. Install floor-drain, trap-seal maintenance device on inlet to floor drains where noted.
 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install oil interceptors, including trapping, and venting according to authorities having jurisdiction and with clear space for servicing.
- L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Oil Interceptors: Connect inlet and outlet to unit, and vent to unit inlet piping.

3.3 PROTECTION

- A. Protect drains during the remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

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SECTION 22 1613 – NATURAL GAS HOUSE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators 100 psig minimum unless otherwise indicated.

B. All gas piping work shall be in accordance with Gas Company requirements. Verify materials selected are in conformance before installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Welding certificates.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Materials and installation shall conform to standards and requirements of the Gas Company and the Ohio Building Code including the referenced International Fuel Gas Code.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to piping and valve schedules on the Drawings for piping materials, valves, and applications.

2.2 PIPING SPECIALTIES

- A. Gas Pressure Regulators:
 - 1. Gas pressure regulator shall be self-operating spring loaded type. Valve body shall be cast iron, 125 psi construction with screwed or flanged connections. Spring and diaphragm casings shall be aluminum. Regulator shall have an internal relief valve assembly, tapped vent connection with removable screen on the spring casing and an external pilot operator to afford a 5% maximum droop. Over-pressure protection shall be ten times the inlet pressure (or higher as may be required by the gas company).
- B. Regulator shall be Sensus equal by Fisher, Sprague or Equimeter. Refer to the drawings for capacity, inlet and outlet pressures and installation detail.
- C. Transition Fittings:
 - 1. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 2. Anodeless Service-Line Risers: Factory fabricated and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
 - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering Vent casing aboveground.
 - c. Aboveground Portion: PE transition fitting.
 - d. Outlet shall be threaded or suitable for welded connection.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Piping Materials and Methods."

B. Outdoor Piping

1. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
2. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
3. Install a single, highly molecular weight polyethylene (HMWPE) 14 AWG conductor, insulated tracer wire along run of natural gas piping. Wire shall have yellow insulation. Terminate wire above grade at each end of piping in a NEMA-3R weatherproof junction box. ASTM D-1248 for use polyethylene piping and UL 83 for conductor.
4. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.
5. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.
6. Install underground, PE, natural-gas piping according to ASTM D 2774.
7. Install fittings for changes in direction and branch connections.
8. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
9. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
10. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Division 22 Section "Meters and Gages.
11. Piping installed above ground and outdoors shall be painted to protect it from corrosion.
12. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

C. Indoor Piping Installation

1. Valves, unions and threaded joints are not permitted in inaccessible locations. Valves shall not be located in ceiling air plenums and or other air plenums or ducts.
2. Comply with Gas Company for installation and purging of natural-gas piping.
3. A shutoff valve and dirt and moisture leg with screwed end cap shall be provided on the pipe drop to each item of equipment.

4. Gas pressure regulators shall be installed in accordance with the manufacturer's instructions. Provide valved gauge taps upstream and downstream of the regulator. Provide pilot regulator piping and miscellaneous valves, devices and piping to complete the installation.
5. Vent piping shall be extended individually from each regulator and gas venting device to outside the building in an approved location.
6. Piping installed above ground and outdoors shall be painted to protect it from corrosion.
7. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.
8. Refer to Division 22 Section "Common Piping Materials and Methods" for sleeve requirements.
9. Refer to Division 22 Section "Pipe Hangers and Supports" for basic hanger and support requirements
10. Refer to Division 22 Section "Common Piping Materials and Methods" for escutcheon requirements.
11. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.1 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 2. Cut threads full and clean using sharp dies.
 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 2. Bevel plain ends of steel pipe.
 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.1 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance.
- B. Install regulator with maintenance space adequate for servicing and testing.

3.2 CONNECTIONS

- A. Connect to utility's gas service according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valves within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Dirt Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.3 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction. Test pressure shall be 3 psi or 1.5 times the working pressure whichever is greater.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 22 1613

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SECTION 22 3333 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Commercial, storage electric water heaters.
 - 2. Water heater accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.

- b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
- 2. Warranty Period(s): From date of Substantial Completion:
 - a. Tanks: 10 years.
 - b. Components: 1 year.

PART 2 - PRODUCTS

2.1 COMMERCIAL ELECTRIC WATER HEATERS

- A. Description: Comply with UL 174 for household, storage electric water heaters.

- 1. Storage-Tank Construction: 316 Stainless steel, vertical arrangement.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
- 2. Factory-Installed Storage-Tank Appurtenances:
 - a. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
 - b. Drain Valve: ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1-2004.
 - d. Jacket: Steel with enameled finish.
 - e. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - f. Heating Elements: Three; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
 - g. Temperature Control: Adjustable thermostat for each element.
 - h. Safety Control: High-temperature-limit cutoff device or system.
 - i. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
- 3. Special Requirements: NSF 5 construction with legs for off-floor installation.
- 4. Refer to the drawings for capacity and characteristics.
- 5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - a. HTP, Ariston Group.
 - b. Lochinvar Corporation.
 - c. Rheem Water Heater Div.; Rheem Manufacturing Company.
 - d. Smith, A. O. Water Products Company.
 - e. State Industries, Inc.

2.2 WATER HEATER ACCESSORIES

- A. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than 3/4".
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases. Concrete base construction requirements are specified in Division 22 Section "Equipment Bases and Supports."
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- F. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- G. Fill water heaters with water.

3.2 CONNECTIONS

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 22 3300

SECTION 22 4200 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Faucets for lavatories showers and sinks.
 - 2. Flushometers.
 - 3. Drinking Fountains
 - 4. Toilet seats.
 - 5. Protective shielding guards.
 - 6. Fixture supports.
 - 7. Disposers.
 - 8. Water closets.
 - 9. Urinals.
 - 10. Lavatories.
 - 11. Individual showers.
 - 12. Kitchen sinks.
 - 13. Service sinks.
 - 14. Laundry trays.

1.2 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. FRP: Fiberglass-reinforced plastic.
- C. PMMA: Polymethyl methacrylate (acrylic) plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities and Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- B. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- D. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Plastic Laundry Trays: ANSI Z124.6.
 - 3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 4. Stainless-Steel Residential Sinks: ASME A112.19.3.
 - 5. Vitreous-China Fixtures: ASME A112.19.2M.
 - 6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
 - 7. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- E. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 4. Faucets: ASME A112.18.1.
 - 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 6. Hose-Coupling Threads: ASME B1.20.7.
 - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 8. NSF Potable-Water Materials: NSF 61.
 - 9. Pipe Threads: ASME B1.20.1.
 - 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 - 11. Supply Fittings: ASME A112.18.1.
 - 12. Brass Waste Fittings: ASME A112.18.2.
- F. Comply with the following applicable standards and other requirements specified for shower valves:
 - 1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 - 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 - 3. Faucets: ASME A112.18.1.
 - 4. Hand-Held Showers: ASSE 1014.

5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 10. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- G. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Dishwasher Air-Gap Fittings: ASSE 1021.
 4. Manual-Operation Flushometers: ASSE 1037.
 5. Plastic Tubular Fittings: ASTM F 409.
 6. Brass Waste Fittings: ASME A112.18.2.
 7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- H. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Dishwasher Air-Gap Fittings: ASSE 1021.
 3. Flexible Water Connectors: ASME A112.18.6.
 4. Grab Bars: ASTM F 446.
 5. Hose-Coupling Threads: ASME B1.20.7.
 6. Hot-Water Dispensers: ASSE 1023 and UL 499.
 7. Off-Floor Fixture Supports: ASME A112.6.1M.
 8. Pipe Threads: ASME B1.20.1.
 9. Plastic Toilet Seats: ANSI Z124.5.
 10. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 Fixtures and Trim

- A. Refer to the notes/schedule on the drawings for fixture and associate trim specifications.
- B. All waste and supply trim exposed to view shall be chrome plated brass.
- C. Toilet Seats:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bemis Manufacturing Company.
 - b. Centoco Manufacturing Corp.
 - c. Church Seats.
 - d. Olsonite Corp.

- e. Beneke Div, Sanderson Plumbing Products, Inc.
 - f. Sperzel.
- 2. Description: Toilet seat for water-closet-type fixture.
 - a. Material: Molded, solid plastic.
 - b. Configuration: Open front without cover.
 - c. Size: Elongated.
 - d. Hinge Type: check/ self-sustaining.
 - e. Class: Heavy-duty commercial.
 - f. Color: White.

2.2 FIXTURE CARRIERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Josam Company.
 - 2. MIFAB Manufacturing Inc.
 - 3. Smith, Jay R. Mfg. Co.
 - 4. Tyler Pipe; Wade Div.
 - 5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
 - 6. Zurn Plumbing Products Group; Specification Drainage Operation.
- B. Urinal Carriers:
 - 1. Description: Urinal carrier with hanger and bearing plates for wall-mounting, urinal-type fixture. Include rectangular steel uprights with feet.
- C. Lavatory Carriers:
 - 1. Description: Lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include rectangular steel uprights with feet.
- D. Sink Carriers:
 - 1. Description: Sink carrier with exposed arms and tie rods/, Sink carrier with hanger plate, bearing studs, and tie rod/, Sink carrier with hanger plate and exposed arms for sink-type fixture. Include steel uprights with feet.
- E. Drinking Fountain Carriers:
 - 1. Description: Carrier with hanger and bearing plates for wall-mounted fixture. Include rectangular steel uprights with feet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install feet and anchor lugs of carriers securely affixed to floor using all bolt holes provided.
- C. Install fixtures level and plumb according to roughing-in drawings.
- D. Attach supplies to supports or substrate within pipe spaces behind fixtures to prevent loose piping fitting piping thru walls. Install -supply stop on each water supply to each fixture connected to water distribution piping. Install stops in locations where they can be easily reached for operation.
- E. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- I. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- J. Set showers in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."
- K. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Adjust flow regulators for proper flow and stream height and adjust water cooler temperature settings for drinking fountains.
- F. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224200

DIVISION 23 HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

23 0000 General Requirements for HVAC Systems

- 23 0001 Basic HVAC Requirements
- 23 0002 HVAC Work in Existing Buildings
- 23 0004 Firestopping for HVAC Systems

23 0500 Common Work Results for HVAC

- 23 0513 Electrical Requirements for HVAC Equipment
- 23 0529 Pipe Hangers Supports, & Penetrations
- 23 0530 Equipment Bases and Supports
- 23 0548 Vibration Control
- 23 0553 Identification for HVAC Systems
- 23 0593 Testing, Adjusting and Balancing

23 0700 HVAC Insulation

- 23 0713 Duct Insulation
- 23 0719 Pipe Insulation

23 0900 Instrumentation and Control for HVAC

- 23 0913 Instruments and Control Devices
- 23 0914 Control Wiring and Cabling
- 23 0923 Direct Digital Control System

23 3000 HVAC Air Distribution

- 23 3113 Ductwork
- 23 3300 Air Duct Accessories
- 23 3400 Fans
- 23 3600 Air Terminal Units
- 23 3713 Diffusers, Registers, Grilles, And Louvers

23 5000 Central Heating Equipment

- 23 5100 Breechings, Chimneys and Stacks
- 23 5533 Fuel-Fired Unit Heaters

23 7000 Central HVAC Equipment

- 23 7413 Packaged, Outdoor, Air Handling Units

23 8000 Decentralized HVAC Equipment

- 23 8239 Unit Heaters

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SECTION 23 0001 – BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section Includes the following:
 - 1. General Requirements
 - 2. Definitions
 - 3. Scope of Work
 - 4. Drawings and Specifications
 - 5. Reference Standards
 - 6. Allowances, Unit Prices and Alternates
 - 7. Site Visit
 - 8. Permits, Regulations and Inspections
 - 9. Project Management and Coordination
 - 10. Temporary Utilities
 - 11. Workmanship
 - 12. Protection
 - 13. Painting
 - 14. Cleaning
 - 15. Miscellaneous Equipment Connections
 - 16. Equipment Selection
 - 17. Shop Drawings
 - 18. Final Inspection and Punch List
 - 19. Operation and Maintenance Manuals
 - 20. Record Drawings
 - 21. Warranties
 - 22. Project Closeout
 - 23. Operation and Adjustment of Equipment
 - 24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

- A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.
- B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this HVAC work.
- C. A complete and functional HVAC system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

- D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

- A. The scope of the HVAC work includes furnishing, installing, testing and warranty of all HVAC work shown on the HVAC drawings and specified herein, including Division 00, Division 01, Division 23 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “proved,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.
- B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.
- C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having ductwork, pipe and fittings fabricated and delivered in advance of making actual measurements shall be sufficiently in advance as

to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

- D. The Architect/Engineer shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.
- E. Equipment, ductwork or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.
- F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.
- G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, dampers and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.
- H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

- A. Where standards (NFPA, NEC, ADTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

- A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

- A. Refer to Section 017300 Execution.
- B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

- A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.
- B. Except where the permit application is made by the Architect or the Engineer, the HVAC contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the HVAC work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.
- C. Include payment of all permit and inspection fees applicable to the work in this Division.
- D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.
- E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

- A. Refer to Section 013100 Project Management and Coordination.
- B. The HVAC Contractor shall initially prepare and be responsible for 1/4" scale coordination drawings. These drawings shall be reproduced and distributed to the Plumbing, Fire Suppression and Electrical Contractors for their input and revisions. Assume that all contractors work together to obtain finish coordinated drawings and no work being installed until all contractors have approved and signed-off with their approval and drawings have been submitted and reviewed by the Engineer.

1.11 TEMPORARY UTILITIES

- A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.
- B. The use of the permanent HVAC system for temporary heating and ventilation during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period. Provide and maintain temporary air filters to protect coils and ducts. Replace temporary filters with the specified filters (clean) when the systems are placed on permanent duty. Air filters specified for the systems and units, including specified spare filters, are not to be used for temporary service.
- C. Cover all return duct openings with temporary filter media when recirculating air. Stop fans during heavy dust generating operations. Before turning the system over to the Owner, the Contractor shall clean duct interiors and interior surfaces and components with the air handling equipment if dirt, dust and debris have accumulated on these surfaces.

- D. Warranty periods on equipment, materials and system shall commence upon Owner acceptance of the building or system. Temporary heat use shall not jeopardize or alter the warranty requirements.

1.12 WORKMANSHIP

- A. Refer to Section 014000 Quality Requirements.
- B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.
- C. HVAC work shall be performed by licensed HVAC Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

- A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.
- B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.
- C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.
- D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

- A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 23:

1. Ferrous metal which is not factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.
 2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.
 3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.
 4. Inside of ducts, behind grilles and registers, shall be painted flat black to eliminate the viewing of shiny surfaces.
- B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.
- C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the "Cutting and Patching" paragraph in this Section for finishing requirements.

1.15 CLEANING

- A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.
- B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.
- C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.
- D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.
- E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 MISCELLANEOUS EQUIPMENT CONNECTIONS

- A. Certain categories of fixtures and equipment, including kitchen equipment, sterilizers, washers, laundry and laboratory equipment, require piping connections and duct connections as shown on the drawings. Equipment will be furnished and set in places by the equipment supplier.

- B. Make all final connections to these fixture and equipment, as indicated and in accordance with the manufacturer's recommendations. All piping connections shall be valved and final connections made with unions.
- C. All steam supplies shall be dripped immediately ahead of the valves. Automatic valves, where required, will generally be furnished with the equipment but installed by the HVAC Contractor. Return traps shall be furnished by this Contractor in accordance with details shown on the drawings. Steam pressure reducers and relief valves, where required, shall be furnished by this HVAC Contractor.
- D. Supply piping and devices connecting to equipment, where exposed to view in the finished space, shall be chrome plated and insulation shall be omitted.
- E. Roughing-in drawings shall be obtained for the various fixtures and items of equipment as the time approaches when such information is required; allow a reasonable period, from the time of notice to obtain this information.
- F. Connections to equipment shall be in accordance with the manufacturer's installation guidelines. Any additional accessories recommended by the manufacturer such as gauges, shut-off valves, unions at connection points, etc., shall be provided by this Contractor.

1.17 EQUIPMENT SELECTION

- A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.
- B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:
 - 1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer's listed.
 - 2. Where the words "or approved equal: appear after a manufacturer's name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.
 - 3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval.
- C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

- D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.
- E. If extensive changes in pipe, duct or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.18 SHOP DRAWINGS

- A. Refer to Section 016000 Product Requirements.
- B. One set of shop drawings, in electronic format (.pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.
- C. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.
- D. The review of shop drawings by the Architect or Engineer shall not relieve the Contractor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.
- E. Shop drawings for the following HVAC equipment and materials shall be submitted:
 - 1. Pipe, fittings and joining methods for the various systems.
 - 2. Firestopping systems for pipe penetrations.
 - 3. Pipe Hangers and Supports.
 - 4. Expansion Fittings, Joints and Guides.
 - 5. Vibration Isolators.
 - 6. Pipe Insulation.
 - 7. Equipment and Breeching Insulation.
 - 8. Ductwork Insulation.
 - 9. Ductwork and Sealing Systems.
 - 10. Air Duct Accessories.
 - 11. Prefabricated Stacks and Flues.
 - 12. Unit Heaters.
 - 13. Central Air Handling Units.
 - 14. Fans.
 - 15. Fire Dampers.
 - 16. Sound Attenuators.
 - 17. Air Control Terminal Units.
 - 18. Variable Air Volume/Temperature Control System.
 - 19. Diffusers, Registers and Grilles.
 - 20. Louvers.

21. Temperature Controls System.

1.19 FINAL INSPECTION AND PUNCH LIST

- A. Refer to Section 017700 Closeout Procedures.
- B. As the time of work completion approaches, the Contractor shall survey and inspect his work and develop his own punch list to confirm that it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.
- C. Requests to the Architect, Engineer or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these; this is in the interest of expediting acceptance for beneficial occupancy.
- D. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completing or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.20 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Section 017823 Operation and Maintenance Data.
- B. Two copies each of operating and maintenance manuals shall be assembled for the HVAC work by the Contractors.
- C. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. Air and water balance reports shall also be included. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.
- D. These shall be assembled into three-ring loose lead binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 RECORD DRAWINGS

- A. Refer to Section 017839 Project Record Drawings.
- B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.22 WARRANTIES

- A. Refer to Section 017700 Closeout Procedures.
- B. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.
- C. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer's recommendations.
- D. This provision shall not be construed to include maintenance items such as replacing filters, re-tightening or repacking glands, greasing, oiling belt tightening and cleaning strainers after these have been done for final close-out.
- E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.
- F. Extended warranties shall be provided where indicated in the equipment specification sections.

1.23 PROJECT CLOSEOUT

- A. Refer to Section 017700 Closeout Procedures.
- B. The following schedule summarizes actions to be taken or submittals to be completed by Contractor prior to issuance of the Contract Completion Certificates. Refer to applicable paragraphs of the Division 23 Sections and other applicable trade Divisions for additional requirements. This information should be submitted at least thirty days in advance of request for final inspection. Where possible, the information shall be bound in 8 – ½' x 11" hard back binders.
 - 1. Material / Suppliers List
 - 2. Record Drawings
 - 3. Certificate of Inspection
 - 4. Tests and Adjustments
 - 5. Operating Instructions and Maintenance Manuals
 - 6. Equipment and Piping Identification
 - 7. Receipt of spare pump seals
 - 8. Receipt of spare filters
 - 9. Completed Punchlist
 - 10. Waiver of Liens
 - 11. Affidavit of Wage Compliance
 - 12. Change Orders and Allowance Adjustments

1.24 OPERATION AND ADJUSTMENT OF EQUIPMENT

- A. As each piping system and air distribution system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing air and water systems, adjusting fan speeds, belts, pulleys, tightening packing glands, and adjusting all operating equipment.
- B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician's judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer's specific instructions.
- C. Test relief valves, air vents and regulating valves to insure proper operation.

1.25 OPERATING DEMONSTRATION AND INSTRUCTIONS

- A. Refer to Section 017900 Demonstration and Training as well as individual Division 23 Sections for requirements.
- B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.
- C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.
- D. A minimum of 16 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:
 - 1. Show locations of items of equipment and their purpose.
 - 2. Review binder containing instructions and equipment and systems data.
 - 3. Coordinate written and verbal instructions so that personnel understand each.
 - 4. Separate instructions shall be given by manufacturer's representatives for the temperature control systems.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 23 0001

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SECTION 23 0002 – HVAC WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section Includes the following:
 - 1. General Requirements for Renovation Work
 - a. Inspection of Existing Building
 - b. Asbestos Material
 - c. Work Hours
 - d. Tobacco Products
 - 2. Execution
 - a. Barriers and Signage
 - b. Storage of Tools and Materials
 - c. Protection of Existing Building and Equipment
 - d. Confined Spaces
 - e. Noise, Fumes, and Dust Control
 - f. Soldering, Welding, and Cutting
 - g. Removals, Disposal, and Reuse
 - h. Draining, Flush, and Refill of Piping Systems
 - i. Continuity of Systems
 - j. Wall, Floor, and Roof Openings – Existing Construction

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

- A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.
- B. Meet with the Owner, Architect and Engineer before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information requested by the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.
- C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

- A. Each bidder shall inspect the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect/Engineer any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance

will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

- A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project by a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.
- B. If, in the performance of the mechanical work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect / Engineer who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 WORK HOURS

- A. Work hours for construction shall be as defined in Section 01150 – Project Phasing or other specification sections or drawing notes.
- B. Where allowed, contractors may work normal hours except after hours is required for operations that are noisy, generate obnoxious fumes or dust, require shut down of ventilation systems, etc. The Owner reserves the right to stop normal hour work where the Owner deems the effort to be disruptive to their ongoing operations.
- C. Any work that creates hazards in or requires closure of corridors, exit pathways or stairwells work in corridors must be performed after hours when the building is not occupied.
- D. All occupied areas, corridors exit pathways and stairwells must be left clean, lighted (including emergency egress and exit signage) usable and safe at the end of each work shift.
- E. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.6 TOBACCO PRODUCTS

- A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

- A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non-construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.
- B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

- A. Store all site material and tools in the active job site area or on-site areas, to be coordinated with Owner. Specific storage areas are not provided except where otherwise noted for material and tools.
- B. Storage is specifically prohibited in means of egress paths and stairwells.
- C. The contractor is responsible for the security of tools, equipment, and materials.
- D. On-site storage areas should be in locked trailers.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

- A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen plastic sheeting or other suitable barriers where dust and debris is generated. Tape or zipper ends of barriers for sealing purposes.
- B. Provide 55-gallon drums or smaller buckets as appropriate and use funnels when draining liquid systems.
- C. Provide plywood sheets for heavy duty for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.
- D. Provide ram board floor protection in occupied areas adjacent to construction areas.

3.4 CONFINED SPACES

- A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.
- B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE, FUME, AND DUST CONTROL

- A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shutoff portions of the system in the work area. Provide taped visqueen covers on HVAC air supply and exhaust devices to limit migration. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.
- B. Fire Alarm System Coordination – Arrange with the Owner when required to shut off fire alarm system devices and/or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to dust or fumes generated. Minimize outages and coordinate efforts to limit the effect due to false alarms.
- C. Ventilation – Where significant dust or fume generating work, welding, or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.
- D. Daily Ventilation – Areas shall be thoroughly ventilated after completion of the work daily to remove residual odors and fumes before occupancy occurs the next day.
- E. Cleaning – Provide walk off sticky construction pads at entrances to construction site and vacuum cleaners and other equipment to clean and restore conditions.

3.6 SOLDERING, WELDING, AND CUTTING

- A. For soldering, welding, or cutting operations, provide insulated, fire rated curtains or barriers and blankets to isolate cover and protect remaining systems and materials, furniture, furnishings, floors, walls, ceilings, etc.
- B. Refer to noise, fumes, and dust control provisions in the previous paragraph.
- C. Obtain burn approval from the Owner before commencing any soldering or welding effort. Coordinate outages of fire alarm systems as noted in the previous paragraph.
- D. Provide a Fire Watch at each welding location. Fire Watch personnel shall be dedicated for the sole purpose of fire prevention during welding operations. All Fire Watch personnel shall be properly trained and equipped, including fire extinguisher, fire blanket and communication equipment for assistance request.
- E. Provide a fire extinguisher at every soldering or welding location.

3.7 REMOVALS, DISPOSAL, AND REUSE

- A. Refer to the drawings for the scope of remodeling in the existing building.
- B. General – Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing utilities and equipment which is associated with their trade, and which will be superfluous when the new work is installed and made operational.
- C. Protection – In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner's property by providing adequate dust covers and temporary plastic film barriers to contain dust. Provide filters on return/exhaust grilles and ductwork. Existing materials and finishes are to be protected and restored to match adjacent finishes. Remove barriers and return equipment and furniture upon completion of the work.
- D. Ceiling Removals – The H.C. shall remove, store and reinstall lay-in ceiling tile and grid as required to perform work in areas where such removal and re-installation is not to be done by the General Contractor. Damaged tile and/or grid shall be replaced with new matching tile and/or grid.
- E. Supports & Hanger Removals – Where piping, ductwork, equipment, and other materials are noted to be removed the removal shall include all hangers and supports for these items. Remaining active piping, ductwork and equipment shall be re-supported as required. New supports shall utilize approved and recognized materials and methods and be installed in accordance with the drawings.
- F. Removals – Extraneous ductwork, piping, wiring, or equipment which is or becomes accessible shall be removed and stubs shall be capped at the first active duct or pipe encountered. Piping that is and remains inaccessible shall be abandoned. Ends of abandoned pipe shall be capped so as to be concealed by finished surfaces. Upon completion of the work, no abandoned pipe, valve, or stub shall extend through finished floors, walls, or ceilings.
 - 1. Wall Removals –
 - a. Recessed devices – Devices to be abandoned in existing walls which are to remain shall be covered by suitable blank cover plates to match other devices cover plates or painted to match wall color.
 - b. Surface Mounted Devices - Where removals are completely removed from the face of wall, patch and finish wall consistent with adjacent finish. Surface mounted devices to be removed shall have surface repaired and finished to match adjacent existing or new architectural finishes.
 - 2. Roof Removals – Devices, services, supports and equipment removed from the roof shall leave the roof consistent with the existing or new roof. Patch the roof decking per the Patching section. The Contractor shall engage a roofing contractor to patch roofing consistent with the roof warranty.
 - 3. Floor Removals – Devices removed from concrete floors shall be patched and finished according to the patching section.
- G. Rerouting of Services – Where it is necessary to reroute a section of active piping or ductwork, the rerouted section shall be installed before removing the existing to minimize system down time. Rerouted sections shall be insulated as required for new work. Patch insulation on existing piping which has been damaged or removed in this work.

- H. Service Disruption – If any existing equipment or devices to remain in service in adjacent spaces are made inactive by removal of devices, wiring, piping or ductwork within the area of work shall be re-fed as required to make devices or equipment operational.
- I. Material & Equipment Removal & Reuse – Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Items noted in the drawings shall be turned over to the Owner and placed where directed on the premises. All material and equipment which the Owner does not wish to retain shall become the property of the Contractor responsible for removal and shall be removed from the premises and properly disposed.
- J. Disposals – The Contractor is responsible for the proper disposal of removed materials from the construction site. Provide dumpsters as required in locations coordinated with the Owner. Disposal of materials regulated by EPA shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.
- K. Damaged Services & Insulation – Existing piping and ductwork to remain with damaged insulation encountered in area of work shall have damaged insulation removed and replaced with new. Insulation thickness shall match new thicknesses indicated on drawings. Work to be performed on a time and material basis as encountered. Services damaged during construction shall be replaced at the expense of the Contractor.
- L. Openings & Patching – Openings left where existing equipment, ductwork, piping and supports are to be removed in existing walls and ceilings to remain shall be patched using materials to match the existing construction, which may include fire stopping of rated walls and ceilings. Refer to Section 3.10 for patching methods.

3.8 DRAINING, FLUSHING, AND REFILL OF PIPING SYSTEMS

- A. Existing liquid systems shall be drained as required before removal or connection of new piping extensions.
- B. Draining of the system shall be the responsibility of the contractor. Provide threaded connections, etc. to direct fluids to drainage points. Water systems may be drained to sanitary systems or where permitted, to storm systems. Verify any chemical treatment, inhibitors or freeze protection additives in the existing systems and obtain a permit from the local sewer authority before disposing.
- C. Provide drums or containers to accept other than water drainage and remove from the premises and properly dispose. Provide visqueen to protect Owners' property when opening pipes, even where piping has been drained to prevent damage from residual liquid that remains in the pipe.
- D. After new piping is connected and tested, flush and clean all existing piping that has been drained and new piping as specified in Section 23 0001, Basic HVAC Requirements. Provide full port, 0.75" ball valves with hose connectors as described to facilitate flushing operations.
- E. Inspect and clean any new or existing strainers at coils, heat exchangers, etc. that may become clogged due to debris that may dislodge from interior pipe surfaces due to the draining, flushing and detergent cleaning operations.

- F. During refilling and startup operations, vent all air from the system at high points. This air venting effort shall extend beyond the refill and initial startup where flow blockage due to air binding occurs.

3.9 CONTINUITY OF SYSTEMS

- A. Coordination –
 - 1. Work shall be planned and executed without the occupation of the Owner. Continuity of systems is not required or is required for designated areas only until the Owner reoccupies the building spaces as coordinated.
- B. Sequence of Operations – Submit, on request, a written step-by-step sequence of operations proposed to accomplish the work. The outline shall include tentative dates, times of day for disruption, downtime, and restoration services. Submit the outline sufficiently in advance of the proposed work to allow the Architect or Engineer to review the information with the Owner. Upon approval, final planning and the work shall be done in close coordination with the Owner.
- C. Shutdown of system and work undertaken during shutdowns shall be bid as being done during normal working hours. If the Owner should require such work be performed outside of normal working hours, reimbursement shall be made for premium time expenses only.

3.10 WALL, FLOOR, AND ROOF OPENINGS – EXISTING CONSTRUCTION

- A. Refer to Division 1 – General Requirements for information regarding cutting and patching.
- B. Coordination – Plan the work well ahead of the general construction. Where pipes and ducts are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.
- C. Cutting – Where pipes and ducts are to pass through, above or behind existing walls, partitions, floors, roof, or ceiling, cutting, patching, and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.
- D. Structural Support – Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck. Consult with a structural engineer to provide adequate size and shapes for loading.
- E. Roofing Work – The HVAC Contractor shall engage a Roofing Contractor on a subcontractor basis for roofing and roof insulation work necessitated by his work. The Roofing Contractor shall be certified for installation and repair of the roofing system to maintain the existing roofing warranty.
- F. Patching & Refinishing – All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval if

the Architect. Wall, floor, and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

1. CMU Walls – Grout small penetrations closed. Tooth in new blocking for holes large than one CMU.
2. Brick Masonry Walls – Tooth in with existing brick if possible, or new brick and mortar to match color and finish pattern.
3. Gypsum Board Walls & Ceilings – Replace with new gypsum board and finish to match existing or new condition, respectively.
4. Structural Metal Roof/Floor Decking – Replace with new decking, same as existing size. Insulation thickness and roofing materials to match existing roof system.
5. Concrete Floors & Walls – Grout penetrations closed, or place new concrete and rebar as required for large openings.
6. Wood floors & Walls – Patch consistent with type of wood.

END OF SECTION 23 0002

SECTION 23 0004 – FIRESTOPPING FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections:
 - 1. 23 0529 Pipe Hangers, Supports, and Penetrations

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Shop drawings shall be certified to ASTM E814 (ANSI/UL 1479).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

- A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. Where required, these shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer's instructions.
- B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.
- C. Provide firestop system for every pipe or duct at penetration of all fire resistance rated walls and horizontal assemblies.
 1. Firestop system is not required around flanges of fire dampers; dampers shall be installed per the manufacturers UL listed installation requirements. Where ducts penetrate fire rated assemblies and fire dampers are not indicated, the penetration shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 (ANSI/UL 1479).
 2. For rated new construction horizontal assemblies, provide cast-in-place combination pre-set floor sleeve equal to Hilti CP 680.
- D. Provide rigid supports for ducts or pipes on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.

- E. Coordinate opening size and additional framing requirement with the General Contractor for each opening to meet the firestop installation requirements.
- F. Annular space of penetrations of nonfire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a nonfire-resistant rated roof/ceiling assembly shall be sealed with a firestopping system to resist the free passage of flame and products of combustion.
- G. Smoke Barriers:
 - 1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.
- H. Smoke Resistive Partitions:
 - 1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke.
Non-rated smoke partitions do not require a fire stopping system.

3.2 BUILDING STRUCTURE FIRE STOPPING

- A. Where building structural members have a fire stopping system installed and portions of this fire stopping system are removed to install new systems hangers, the H.C. shall provide new fire stopping system onto portions of the building structure and hanger where fire stopping was removed. The fire stopping system shall be equal to the existing system and be 2-hour rated.

END OF SECTION 23 0004

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SECTION 23 0513 - ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for electrical work for HVAC equipment including single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation and other electrical equipment, devices, fuses, wire, conduit and installation methods.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.
- B. Refer to the Mechanical drawings and also the Electrical drawings for requirements related to each trade. Coordinate all aspects of electrical components and wiring to complete the systems.

1.3 QUALITY ASSURANCE

- A. Equipment, devices shall be designed, constructed and installed in accordance with applicable standards of NEMA and the National Electric Code. Equipment shall be tested and listed by UL or other approved agency and installed in accordance with all instructions included as part of such listing.
- B. Electrical equipment, devices, fuses, wire, conduit and methods shall comply with applicable provisions of Division 26 - Electrical.

PART 2 - PRODUCTS

2.1 MOTORS

- A. General duty motors shall be induction type 1750 rpm NEMA Design "B" with copper windings, Class B or F insulation, and motor enclosure to suit the application. Service factor shall be 1.15 minimum.
- B. Two-speed motors shall be two-winding type with six leads unless otherwise specified.

- C. Motors for other than general duty application shall be furnished to suit the application and operating environment.
- D. Premium efficiency motors shall be equal to Century “E + 3”, General Electric “Energy Saver Premium Efficiency”, Baldor “Super E Premium Efficient” or Reliance “Premium Energy Efficient” series. Motor efficiencies shall be tested and conform to NEMA Standard Publication MG-1 and IEEE 112 Test Method B.
- E. Motors used with variable frequency controllers shall be rated for inverter service in accordance with NEMA Standard Publication MG-1, Part 31, designed to handle 1600V at a 0.1 micro-second rise time and include Class F or H insulation, but with a Class B temperature rise. Motors shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings.
- F. Electronically Commutated Motors – Fans
 1. Motor enclosures: Open Drip Proof, Totally Enclosed Fan Cooled, Totally Enclosed Air Over, Totally Enclosed Non-Vented
 2. Electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
 3. Motors are permanently lubricated, heavy duty ball bearing type to match with the equipment load and pre-wired to the specific voltage and phase.
 4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor or integrated variable frequency drive.
 5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
 6. Motors can achieve up to 95% efficiency, model and horsepower dependent.
- G. Motor sizes shown on the drawings are to be considered minimum. Motors furnished shall be sized so as to not operate in the service factor range. Motors for direct driven pumps and fans shall be selected so as to not operate in the service factor range at any point on the curve.
- H. The HVAC Contractor and equipment suppliers shall compare the electrical power requirements of the intended equipment with power feeders to the equipment shown on the Electrical drawings. Verify adequacy and compatibility of voltage, phase, wiring, capacity, number and size of conductors (versus equipment connection points), fusing and other information on the electrical and mechanical drawings to that required for the equipment. If the selected equipment requires revision of the electrical, added cost must be borne by the HVAC Contractor.

2.2 STARTERS

- A. Magnetic starters shall comply with provisions of Division 26 - Electrical Specifications and shall be NEMA construction (IEC rated not acceptable) with thermal overload element on each phase, 115 volt control voltage and hand-off-automatic switch, where appropriate. An integral control transformer shall be incorporated in the starter for each motor of 200 volt and greater. A single control transformer is acceptable for multiple motor packaged equipment, however, when

such is the manufacturer's standard. Duplex type units (pumps, compressors, etc.) are not included in this exception. A control transformer shall be provided in each starter to insure standby operating capability.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Motor connections of factory assembled equipment shall be made with flexible conduit except for plug-in electric cord connections.
- B. All power wiring shall be run in conduit. Control wiring shall be run in conduit except where open wiring is permitted in other applicable specification sections.
- C. Fuses shall be furnished and installed in fuse clips of equipment and switches provided by the Mechanical Contractors.
- D. If a non-basis of design manufacturer is provided by the HVAC contractor and the specific unit has a powered component with a MCA and/or MOCP greater than the basis of design, the HVAC contractor shall be responsible to provide all required electrical changes required to power the non-basis of design unit. The HVAC contractor shall coordinate with the Electrical Contractor any variances in the MCA and/or MOCP of the units provided.

END OF SECTION 23 0513

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SECTION 23 0529 – PIPE HANGERS, SUPPORTS, AND PENETRATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Hanger Rods and Attachments.
 - 4. Pipe Riser Supports
 - 5. Pipe Roof Supports
 - 6. Pipe Sleeves, Openings, Penetrations, Escutcheons, and Curbs
- B. Refer to Division 23 Section “Ductwork” for duct hangers and supports.
- C. Related sections
 - 1. 23 0004 Fire Stopping for HVAC Systems

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

- A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:
1. General Service – clevis type – Anvil Fig. 260.
 2. Uninsulated Copper Tubing - copper plated clevis type – Anvil Fig. CT-65 (or plastic-coated clevis).
 3. Where the length of the hanger rod between the top of the hanger and the attachment is 3" or less, clevis type hangers with rollers, Anvil Fig. 181, shall be used to allow for expansion travel.
- B. Hangers on insulated horizontal piping shall be oversized to surround the pipe insulation. To protect the insulation from damage or inordinate compression due to concentrated weight, the following shall be provided at each hanger:
1. Pipe 2" and smaller – Anvil Fig. 168 18 ga. sheet metal rib-lock shield with belled ends, 12" long.
 2. Pipe 2-1/2" and larger – Factory fabricated assembly equal to Pipe Shields, Inc. A1000.

2.2 TRAPEZE HANGERS

- A. Trapeze hangers for numerous pipes run in parallel may be utilized.
- B. Horizontal support members shall be unistrut type section with pipe rollers (to allow for expansion travel) and spring and nut connectors, suspended with hanger rods and attachments similar to individual pipe hanger suspension.

2.3 HANGER RODS AND ATTACHMENTS

- A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below. A hanger attachment device (for attachment to the structure) and locking nuts at the hanger attachment shall be provided on each hanger. Locking nuts shall be provided at each clevis hanger.

- B. Pipe Hanger Rod Size Schedule

<u>Pipe Size</u>	<u>Min. Rod Dia.</u>
1" and smaller	1/4"
1-1/4" to 3"	3/8"
4" to 6"	1/2"
8"	5/8"
10"	3/4"
12"	7/8"
14" to 16"	1"
18" to 20"	1-1/4"

C. Hanger rod attachment devices for attachment to the structure shall be:

1. After-set steel expansion type concrete inserts.
2. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.
3. Side beam bracket for wood construction equal to Anvil Fig. 206.

2.4 PIPE RISERS SUPPORTS

1. Insulated Pipe size 1-1/2" and smaller shall be factory (Pipe Shields E1000) or shop fabricated assembly Anvil Fig. 261 with high density calcium silicate insulation and galvanized steel jacket.
2. Insulated Pipe size 2" and greater shall be factory fabricated assembly Pipe Shields, Inc. E1000 or approved equal.
3. Un-insulated copper tubing – Anvil Fig CT-121 or CT-121C
4. Un-insulated steel piping – Anvil Fig. 261.

2.5 PIPE ROOF SUPPORTS

- A. Pipe supports for pipe running across the roof shall be manufactured by Advanced Support Products #REC-SA or approved equal, requiring no penetration of the roofing membrane. The support system shall consist of round injection molded polypropylene bases, 12 gauge hot dipped galvanized Unistrut framing and adjustable hot dipped galvanized or cadmium plated hangers and cadmium plated hanger rods as detailed. Furnish protective slip sheets of roofing membrane for installation under the bases.

2.6 PIPE SLEEVES, OPENINGS, PENETRATIONS, ESCUTCHEONS AND CURBS

A. Piping Wall Penetrations and Floor Sleeves – Non-Fire Rated Assemblies:

1. New Piping – New or Existing Walls and Floors
 - a. Poured Concrete - Schedule 40 black steel pipe of 18-gauge galvanized steel
 - b. Assemblies other than poured concrete – schedule 40 black steel pipe or 26-gauge galvanized sheet.
2. Existing Piping – New Walls and Floors
 - a. Poured Concrete Floors – 18-gauge Galvanized sheet metal
 - b. New walls and partitions – 26-gauge Galvanized sheet metal

B. Piping Wall Penetrations and Floor Sleeves – Rated Assemblies

1. Refer to Specification 23 0004 Firestopping for HVAC Systems, for requirements.

C. Pipe Wall Penetrations – Exterior, Concrete Walls Below Grade

1. Cast iron pipe or Schedule 40 galvanized steel pipe in exterior walls below grade, with intermediate wall stop and anchor collar set in place before concrete pouring. Sleeve shall be a part of the sealing assembly. When the wall opening is core drilled the wall sleeve may be omitted. A mechanically compressed rubber sealing assembly equal to Thunderline Corp. “Link-Seal” shall be placed in the annular space between pipe and sleeve or core drilling.

D. Pipe Roof Penetrations – Roof Deck or Waterproof Floor Membrane

1. J.R. Smith 1720, or equal, riser sleeve with clamping ring and auxiliary pipe sleeve extending 4” above finished floor or 8’ above finished roof. Waterproofing membrane for roof and floor construction shall be secured by the clamping ring. These are to be used in areas having special membrane waterproofing in or on the floor slab and at roof decks.
2. Concrete curbs may be formed and poured around multiple pipe risers in rooms with waterproofing floor membrane, in lieu of the Smith 1720 riser sleeve and clamping ring. Curbs shall be 4” wide x 4” high with chamfered corners. Membrane and curbing shall be arranged to maintain the integrity of the membrane. Pipe sleeves shall be as described for normal areas or extended to the top level of the curb where the concrete is full depth throughout the curbed area.
3. Piping and conduits extending through the roof may be fitted with a manufactured pipe curb weatherproofing assembly equal to Sigrist Pipe Chase Housing or approved equal as an alternative to riser sleeves with clamping rings specified above. Provide 14” roof curb and all required piping exit seals.

E. Escutcheon Plates

1. Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve. Plates shall be installed on exposed piping in finished rooms and areas where pipes penetrate walls, floors, ceilings or overhead structure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Horizontal:
 - a. 2” and smaller – 8 ft. intervals
 - b. 2-1/2” thru 6” – 10 ft. intervals
 - c. 8” and larger – 12 ft. intervals.
2. Copper Tubing – Horizontal
 - a. 1-1/4” and smaller – 6 ft. intervals

- b. 1-1/2" – 2" – 8 ft. intervals
 - c. 2-1/2" and larger – 10 ft. intervals
- B. Refer to hanger installation details on drawings for installation information supplemental to this specification section.
- C. Attachment of pipe hangers to the structure shall be with:
 - 1. After-set concrete inserts, in 4" minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.
 - 2. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.
 - 3. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical. This does not apply to steel deck with concrete slab poured deck. Refer to notes 1 and 2 above.
- D. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position before pipe insulation is installed.
- E. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within the pipe chase. Insure that adequate support is still maintained.
- F. Hanger assemblies which will remain exposed on completion of the project shall be painted before installation.
- G. Pipe supports manufactured by Advanced Support Products or the approved equal for pipe running across the roof shall be installed in accordance with the manufacturer's instructions and as detailed. Install protective slip sheets of roofing membrane under the bases to satisfy requirements of both the roofing manufacturer and the support system manufacturer.
- H. Pipe supports manufactured by Pate or the approved equal shall be installed per the manufacturer's instructions and flashed into place by a certified roofing contractor.

3.2 PIPE SLEEVES

- A. Pipe sleeves shall be placed in the initial stages of construction before concrete, masonry and other general construction activity. Means shall be taken to assure that the sleeve will not move during or after construction. Beams, columns and other structural members shall not be sleeved except upon approval of the Architect.
- B. Sleeves are not required in the following:
 - 1. In floor slabs on grade.
 - 2. In stud and gypsum board or plaster walls and partitions which are not fire rated.
 - 3. For uninsulated pipe passing thru masonry walls and partitions and stud and gypsum board or plaster walls and partitions. Sleeves are required however, for uninsulated

condenser water piping, hydronic heat pump piping for which expansion, contraction and other pipe movement can be expected.

4. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling thru hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.
 5. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after pipe are set.
- C. Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall project a minimum of 1" above finished floor. Pipe sleeves shall be sized to allow insulation to pass thru the sleeve, for insulation requiring continuous vapor barrier (domestic cold water, chilled water refrigerant, etc.). Where vapor barrier continuity is not needed, the sleeve may be sized to pass the pipe only or the insulation as well. Refer to the following paragraph for qualification and exceptions relating to firestopping.
- D. Pipe sleeves which are part of firestopping assemblies shall conform to the requirements of the assembly with particular emphasis regarding size, annular space, length, passage or non-passage of insulation and the installation of the sleeves.
- E. Where firestopping is not required per this section and specification 23 0004, the annular space between the sleeve, core drilling or opening and the pipe or pipe insulation shall be closed with caulking to retard the passage of smoke.
- F. Where uninsulated pipes requiring no pipe sleeves pass through non-fire wall or partition, the annular space shall be closed with material and methods compatible with the wall or partition material (Type M masonry grout, drywall joint compound, plaster, etc.).

END OF SECTION 23 0529

SECTION 23 0530- EQUIPMENT BASES AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Concrete Bases
 - 2. Roof Curbs
 - 3. Structural Steel Supports

1.2 QUALITY ASSURANCE

- A. Coordinate exact dimensions, locations, and other details for the specific equipment provided with other trades.

PART 2 - PRODUCTS

2.1 CONCRETE BASES

- A. Concrete base pad with steel reinforcement as detailed on the drawings. Bases shall be formed on all sides and hand troweled to a smooth, dense finish with neatly chamfered corners. Large concrete pads on grade shall be constructed with reinforcing steel or reinforcing roadway mesh.

2.2 ROOF CURBS

- A. Rooftop equipment shall be supported with a heavy gauge, galvanized steel support curb with a baseplate, continuously welded corner seams, integral raised cant to match roof insulation, internal insulation, wood nailer, and counter flashing.
- B. Curb height shall be minimum 24" above roof deck unless otherwise noted.
 - 1. Grease duct exhaust fans curb height shall be coordinated to achieve fan discharge 42" above roof deck.

2.3 STRUCTURAL STEEL SUPPORTS

- A. Structural steel angles, beams, or channels, Unistrut channels, or pipe supports shall be fabricated into a rigid framework with welded or bolted connections and cross / sway bracing.
- B. Supports shall be set of slab with baseplates or attached to permanent building structure.
- C. Wall brackets shall be anchored to steel framing members or masonry walls.

PART 3 - EXECUTION

3.1 WIND LOAD ANALYSIS

- A. HVAC Equipment, ductwork, piping, conduits, etc. exposed to wind shall have positive attachment to the building structure or ground to comply with wind load requirements of the building and mechanical codes.
- B. Wind speed design: 120 MPH.
 - 1. Refer to structural drawings for additional information.
- C. The contractor shall retain a specialty consultant to perform wind load calculations in accordance with the code and additional requirements in this section. A professional engineer experienced in wind load attachment design and installation shall be responsible for calculations, attachment selections, and installation details.
- D. The Wind Load Analysis consisting of attachment design, calculations, attachment selection, installation details including anchoring methods, fastener specifications, embedment and/or welded length, etc. shall be submitted for review and record. The submittal shall be signed and sealed by a professional engineer, as stated above. This submittal shall become part of the project design calculations, included in the project records, and when required, will be submitted to the Authority Having Jurisdiction (AHJ).
- E. The wind load attachment design shall clearly indicate the attachment points to the building structure and design forces in all horizontal and vertical axes at the attachment points. The wind load attachment engineer shall coordinate all attachments with the project structural engineer of record, who shall verify the attachment methods and the ability of the building structure to accept the loads imposed.
- F. The wind load attachment design shall be based on actual equipment data (dimensions, weight, center of gravity, etc.) obtained from submittals or the manufacturers. The equipment manufacturer shall verify that the attachment points on the equipment can accept the combination of wind load, weight, and other loads imposed.
- G. At the project Engineer of Record's discretion, equipment submittals may not be approved until the Wind Load Analysis has been submitted. It is the contractor's responsibility to schedule and coordinate the process in a timely manner, including revised Wind Analysis submittals for equipment approved pending Wind Analysis submittals.

3.2 INSTALLATION

- A. Roof curbs shall be installed, shimmed level, and secured to the roof deck/structure. Roof insulation and roofing shall be installed around each curb by the Roofing Contractor.
- B. Equipment Bracing & Attachment

1. All equipment and curbs exposed to wind shall be installed and attached to structure in strict accordance with the Wind Load Analysis design. Attachment shall conform to the applicable building codes and manufacturers installation instruction.
 2. No rigid connections between equipment and the building shall be made that would degrade vibration isolation.
 3. Each manufacturer of equipment shall furnish a statement stamped by a professional engineer indicating that the equipment is designed and constructed to withstand wind loads required by the building codes. Statement shall include supporting documentation, calculations, etc.
- C. Attachment to manufactured trusses, joists, purlins, and other engineered structural members and supports shall be done in accordance with the structural engineer's or manufacturer's recommendations. Refer to the architectural and structural engineer drawings for type of engineered structural system being used. Connections to these structural members shall be made with connection devices and methods approve by the structural engineer or manufacturer. Provide additional supports with supplemental steel shapes when spacing between structural members exceed specified distances. In cases of existing trusses, the structural engineer shall review and approve hanger attachment methods.

END OF SECTION 23 0530

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SECTION 23 0548 - VIBRATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vibration Isolators
 - a. Mounts & Pads
 - b. Hangers
 - c. Concrete Inertia Bases

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Indicate inertia bases and locate vibration isolators.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Mounts & Pads

1. Unhoused Spring Isolator Mounts
 - a. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 - b. Spring Mounts: Provide with leveling devices, 0.25-inch neoprene sound pads and zinc chromate plated hardware.
 - c. Mason Industries Series "SLFH"
2. Housed Spring Isolator Mounts
 - a. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 - b. Spring Mounts: Provide with leveling devices, 0.25-inch neoprene sound pads and zinc chromate plated hardware.
 - c. Restraint Housing: Cast steel housing with non-adjustable neoprene sponge inserts
 - d. Mason Industries Series "C".
3. Neoprene Mounts
 - a. Mount: Double deflection neoprene with a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered to prevent corrosion and have friction pads both top and bottom.

- b. Mason Industries Series “ND”
 - 4. Neoprene Pad Isolators
 - a. Pad shall be 1” thick sandwich type consisting of a 0.5” cork center with 0.25” neoprene waffle pad top and bottom.
 - b. Mason Industries Series “NK”.
- B. Hangers
 - 1. Spring Hanger
 - a. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
 - b. Housings: Neoprene in shear or double deflection LDS rubber upper and lower elements.
 - c. Mason Industries Series “30N”
 - 2. Neoprene in Shear Hanger
 - a. Element: Double deflection LDS rubber isolator color coded for load carrying capacity.
 - b. Mason Industries Series “HD”.
- C. Concrete Inertia Bases
 - 1. Forms: Rectangular concrete pouring forms including minimum 0.5” bars welded in place on 6” centers running both ways.
 - 2. Templates: Forms shall be furnished with steel templates to hold the anchor bolt sleeves and anchor bolts while concrete is being poured.
 - 3. Springs: Springs shall be as specified in Open Springs above.
 - 4. Mason Industries Series “K” or “BMK”

2.2 MANUFACTURERS

- A. Mason Industries.
- B. Kinetics Noise Control
- C. Amber Booth

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Isolators installed outside shall be furnished weather protected, with springs PVC coated, and other ferrous parts hot dip galvanized, or cadmium plated.
- B. Isolators for chillers, cooling towers, boilers and other equipment with significant water capacity shall be equipped with vertical limit stops.

3.2 INSTALLATION

- A. Follow manufacturer's instructions in setting and adjusting isolators. Ensure that no direct hard surface to surface contact occurs. Fasten device to floor as recommended by the isolation supplier.
- B. Where electrical connections are to be made to equipment mounted on isolators, inform the Electrical Contractor to connect to the equipment with flexible conduits.
- C. See Specification Section 23 0529 Pipe Hangers and Supports for spring hanger locations and hanger installation requirements.
- D. Adjust isolators after piping system is at operating weight.
- E. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- F. Adjust active height of spring isolators.
- G. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 0548

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SECTION 23 0553 - IDENTIFICATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment Labels.
 - 2. Pipe Labels.
 - 3. Warning Markers.
 - 4. Valve Tags.
 - 5. Duct Labels.
 - 6. Controls Equipment Labels.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Each item or major equipment shall be labeled. This shall include boilers, chillers, pumps, air handling units, fans, condensers, deaerators, cooling towers, heat exchangers, rooftop units, tanks and other similar equipment.
- B. Labeling shall be:
 - 1. Permanently attached engraved brass or plastic laminated signs with 1" high lettering. Signs on exterior equipments shall be brass.
 - 2. In addition to the labeling attached to each VAV terminal unit, provide a colored sticker on the ceiling grid below each VAV to mark it's location.

2.2 PIPE LABELS

- A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Plastic semi-rigid snap-on type, manufacturer's standard pre-printed color coded pipe markers extending fully around the pipe and insulation or pressure-sensitive vinyl pipe markers similar to above.
2. On piping and insulation 6" and greater diameter, full band as specified above or strip-type markers fastened to the pipe or insulation with laminated or bonded application or by color-coded plastic tape not less than 1-1/2" wide, full circle at both ends of the marker.

C. Identification markings shall include service (e.g. hot, chilled, steam) and arrows indicating direction of fluid flow provided integral with the pipe marker or separate at each marker.

2.3 WARNING MARKERS

- A. Underground line marker tape shall be permanent bright-colored, plastic with continuous identification lettering. Tape over service lines that cannot be detected by a metal detector shall be multi-ply with an aluminum foil core.

2.4 VALVE TAGS

- A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2" x 11" paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).
- B. Valve tags shall be polished brass or plastic laminate with solid brass S hook. Tags shall be engraved with "H" for HVAC and the designated number.

2.5 DUCT LABELS

- A. Duct markings shall be applied to all ductwork.
- B. Identification markings shall include service (e.g. supply, return, exhaust, outside air) and direction of air flow provided integral with duct marker or separate at each marker.
- C. Duct markings shall be laminated plastic color-coded pressure sensitive vinyl tape, 2-1/2" width, 3 mil minimum thickness.

2.6 CONTROLS EQUIPMENT LABELS

- A. Each controls device or major controls equipment shall be labeled to match controls drawings. This shall include thermostats, switches, sensors, controllers, panels and other similar equipment.

1. Equipment labels - Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.
2. Device labels - Marker Tape: Self-laminating, clear polyester, 3/8" high tape with black lettering.

B.

2.7 ACCEPTABLE MANUFACTURERS

- A. Labels, markings and tags shall be manufactured by:
1. W.H. Brady
 2. Seton
 3. Allen
 4. Industrial Safety Supply

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identification marking and tagging shall be applied after insulation and painting has been completed.
- B. Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled on drawings.
- C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.
- D. Equipment labeling shall consist of unit designation as shown on the drawings. Exhaust labeling shall also indicate service of room or area of service.
- E. Pipe and duct markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.
- F. Refer to appropriate sections of this specification for installation of underground line marker tape.
- G. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 23 0553

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SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
 - 1. Air Systems:
 - a. Constant-volume air systems.
 - b. Variable-air-volume systems.
 - c. Multizone systems.
 - 2. Hydronic Piping Systems:
 - a. Constant-flow systems.
 - b. Variable-flow systems.
 - 3. HVAC equipment quantitative-performance settings.
 - 4. Kitchen hood airflow balancing.
 - 5. Existing systems TAB.
 - 6. Verifying that automatic control devices are functioning properly.
 - 7. Reporting results of activities and procedures specified in this Section.

1.2 SUBMITTALS

- A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.3 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.
- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing."

- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1.
- E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.4 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 - 1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- D. Examine system and equipment test reports.
- E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- G. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

- H. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.
- I. Examine strainers for clean screens and proper perforations.
- J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine system pumps to ensure absence of entrained air in the suction piping.
- M. Examine equipment for installation and for properly operating safety interlocks and controls.
- N. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - 4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 - 5. Sequence of operation for control modes is according to the Contract Documents.
 - 6. Controller set points are set at indicated values.
 - 7. Interlocked systems are operating.
 - 8. Changeover from heating to cooling mode occurs according to indicated values.
- O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.
 - 1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling unit components.
- L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
 1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
 2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 3. Measure total system airflow. Adjust to within indicated airflow.
 4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
 5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
 6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
 7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
 8. Record the final fan performance data.

- C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Balance systems similar to constant-volume air systems.
 2. Set terminal units and supply fan at full-airflow condition.
 3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
 4. Readjust fan airflow for final maximum readings.
 5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
 6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
 7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
 8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
- D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
 2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
 3. Set terminal units at full-airflow condition.
 4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
 5. Adjust terminal units for minimum airflow.
 6. Measure static pressure at the sensor.
 7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

3.7 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer, model, and serial numbers.
 2. Motor horsepower rating.
 3. Motor rpm.

4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Water Coils: Measure the following data for each coil:
 1. Entering- and leaving-water temperature.
 2. Water flow rate.
 3. Water pressure drop.
 4. Dry-bulb temperature of entering and leaving air.
 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 6. Airflow.
 7. Air pressure drop.
- B. Electric-Heating Coils: Measure the following data for each coil:
 1. Nameplate data.
 2. Airflow.
 3. Entering- and leaving-air temperature at full load.
 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 5. Calculated kilowatt at full load.
 6. Fuse or circuit-breaker rating for overload protection.
- C. Refrigerant Coils: Measure the following data for each coil:
 1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.
 4. Air pressure drop.
 5. Refrigerant suction pressure and temperature.

3.10 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.11 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 - 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 - 3. Check the refrigerant charge.
 - 4. Check the condition of filters.
 - 5. Check the condition of coils.
 - 6. Check the operation of the drain pan and condensate drain trap.
 - 7. Check bearings and other lubricated parts for proper lubrication.
 - 8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished.
 - 1. New filters are installed.
 - 2. Coils are clean and fins combed.
 - 3. Drain pans are clean.
 - 4. Fans are clean.
 - 5. Bearings and other parts are properly lubricated.
 - 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 - 1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan, speed, filter, and coil face velocity.
 - 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 - 3. If calculations increase or decrease the airflow and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated airflow and water flow rates. If 5 percent or less, equipment adjustments are not required.
 - 4. Air balance each air outlet.

3.12 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Check free travel and proper operation of control devices such as damper and valve operators.
- F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- G. Check the interaction of electrically operated switch transducers.
- H. Check the interaction of interlock and lockout systems.
- I. Check main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.13 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.
 - 3. Heating-Water Flow Rate: 0 to minus 10 percent.
 - 4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.14 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
 - 1. Pump curves.

2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.

END OF SECTION 23 0593

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SECTION 23 0713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Fiberglass.
2. Protective Metal Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated:
 - a. Thermal performance ratings.
 - b. Thickness and covering table.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

2.2 INSULATION MATERIALS

- A. Refer to 'Ductwork Insulation Schedule'.

2.3 PROTECTIVE METAL JACKETING

- A. Protective jacketing shall be:
 - 1. 0.016" Aluminum

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Workmanship – Installation shall be done by tradesmen specializing in insulation work in strict accordance with manufacturer's recommendations.
- B. Duct Sealing – Ductwork joints shall be sealed prior to installation of insulation.
- C. Duct Supports – Duct insulation shall be installed around ductwork supports where moisture may condense on surface of cold ductwork in direct contact with supports. Extend past edge of ductwork 4" for trapeze style supports.
- D. Performance Markings – Insulation shall be marked with manufacturer, "R-Value", and flame spread and smoke development.
- E. Blanket Insulation –
 - 1. Blanket insulation shall be wrapped tight to the duct.
 - 2. Insulation shall be secured to ducts 20" wide and greater with weld pins and fasteners, 18" on center maximum.
 - 3. Adhesive shall be applied to the duct as an aid to installation and adhesion.
 - 4. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3" wide FSK pressure sensitive tape.
- F. Board Insulation –
 - 1. Insulation with factory applied jacket shall be secured to the duct with weld pins and fasteners, 12" on center maximum.
 - 2. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3" wide ASJ pressure sensitive tape.
- G. Internally Lined Ductwork –
 - 1. Ductwork which is internally lined with acoustic insulation, flexible ductwork with factory applied insulation and fiberglass ductwork need not be further insulated.
 - 2. Required internal lining is shown on the drawings.
 - 3. Refer to Section 23 3113 Ductwork and coordinate with the various trades.
 - 4. Ductwork that is to be internally lined shall provide the free inside clear dimensions noted on the contract drawings excluding insulation thickness.

- H. Duct Accessories Insulation – Equipment and devices in supply ductwork which could potentially condense moisture shall be insulated. This includes but is not limited to:
 - 1. Duct coils
 - 2. Air terminal unit reheat coils
 - 3. Air control dampers and valves
 - 4. Fire dampers
 - 5. Smoke dampers
 - 6. Final filter housings
- I. Protective Metal Jacketing – Insulation on specified systems shall have field applied protective metal jacket firmly attached and secured to afford protection against physical abuse.
- J. Damaged Insulation – Reinsulate existing ductwork where existing insulation has been damaged or removed in the performance of work in this project.
- K. Painting – All exposed insulation shall be painted to match base material colors.
- L. System Identification – Install markings for service and flow direction for each ductwork system on ductwork insulation. Refer to Section 23 0553 “Identification for HVAC Systems”.

END OF SECTION 23 0719

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SECTION 23 0719 – PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Fiberglass.
2. Protective Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated on 'Pipe Insulation Schedule' notate which product submitted is intended for the type indicated on schedule.
2. Thickness and covering table, thermal performance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Thicknesses shall comply with most current version of ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 INSULATION GENERAL

A. Environmental and Hazardous Material Restrictions

1. Products shall not contain asbestos, lead, mercury, or mercury compounds.
2. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

- B. Stainless Steel Pipe Insulation Products
 - 1. Products intended to be in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.
 - 2. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.
- C. Refer to “Pipe Hanger Detail” on drawings for required hanger components.

2.2 INSULATION MATERIALS

- A. Refer to ‘Pipe Insulation Schedule’ on drawings.
- B. Refer to Section 23 0529 Pipe Hangers, Supports, and Penetrations for insulation products at piping supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Workmanship – Installation shall be done by tradesmen specializing in insulation work in strict accordance with manufacturer's recommendations.
- B. Joints
 - 1. Overlap and seal all longitudinal joints. Staples and adhesives may be used as stated above. Tape and seal cross joints. Vapor barrier shall be continuous on insulation of all cold services. Vapor barrier type mastic shall be used where needed to maintain a vapor seal.
 - 2. Where insulation is terminated, insulation shall be beveled at 45° and the beveled surface sealed with vapor barrier mastic. PVC caps over straight cut ends which have been vapor sealed may be used in lieu of beveling.
- C. Hangers, Supports & Penetrations –
 - 1. Insulation shall be run continuously through wall penetrations.
 - 2. Insulation on cold service piping shall be run through floor and wall sleeves to maintain vapor barrier continuity. Insulation on other services may likewise be run continuous when sleeve size permits.
 - 3. Refer to the Piping Material and Methods Section for special considerations which must be given at fire-rated wall and floor penetrations.
 - 4. Support Saddles – Refer to Section 230529 - Pipe Hangers and Supports for non-compressible insulation or blocking material and sheet metal saddles required at pipe hangers and supports. Coordinate with the piping contractor on the furnishing, installation and detailed requirements of these at all hanger and support locations.
 - 5. Pipe Risers – Provide insulation and vapor barriers on and around pipe riser supports of services which require vapor seal to prevent sweating.
 - 6. Vertical Supports – Vertical pipe supports shall attach directly to pipe. Insulate support and all other surfaces with flexible closed cell insulation, same thickness as system insulation on cold service pipes to prevent condensation.

- D. Damaged Insulation –
 - 1. Re-insulate piping where existing insulation has been damaged or removed in the performance of work in this project at no additional cost.
 - 2. Prior to start of project, identify any areas of damaged insulation outside of the scope of work within the work area. Provide quotes for time and materials of any such damaged insulation to be replaced, if any instances exist.
- E. Pipe Testing – Verify that piping has been tested before applying insulation materials and that piping surfaces are clean and dry, with foreign material removed.
- F. Exposed Locations – Fittings, valves, flanges and other devices, both exposed and concealed, requiring insulation shall be covered same thickness as pipe insulation with:
 - 1. Factory molded fitting insulation cover with PVC one-piece fitting cover.
 - 2. Miter-cut segments of pipe insulation, held in place with adhesive and/or wire, filled with insulating cement smoothed to shape and covered with PVC one-piece fitting cover.
 - 3. Fiberglass blanket insulation, held in place and covered with PVC one-piece fitting cover.
 - 4. Oversized pipe insulation, where applicable, finished same as straight run pipe insulation.
- G. Insulation Exceptions – Omit insulation on:
 - 1. Hot water valves, devices, specialties and related items, 2” size and smaller, except as stated in paragraph 3 below.
 - 2. Hot water piping in cabinetry of fan coil units, unit ventilators, unit heaters, convectors and thru-wall A.C. units.
 - 3. Hot water piping between the coil and control valve when the control valve is located within 4 feet of the coil and the pipe size is 1” or less.
 - 4. Steam traps and associated unions.
 - 5. Blow-down piping and safety relief valve discharge piping.
- H. Location Schedule – Refer to ‘Pipe Insulation Schedule’ on drawings for locations, type, and thicknesses required for each system.
- I. Refrigerant Piping – Refrigerant piping shall be insulated per ‘Pipe Insulation Schedule’.

END OF SECTION 23 0719

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SECTION 23 0913 - INSTRUMENTS AND CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes instruments and control devices for HVAC Direct Digital Control (DDC) systems and components.
 - 1. Electronic Sensors and Transmitters
 - a. Thermostats
 - b. Thermistor Temperature Sensors & Transmitters
 - c. Humidistats
 - d. Humidity Sensors
 - e. Pressure Transmitters & Transducers
 - 2. Status Sensors & Switches
 - 3. Electrical Controls Devices
 - 4. Surge Protection Devices
 - 5. Flow Measuring Devices
 - 6. Detection Equipment
 - 7. Actuators
 - 8. Control Valves
 - 9. Dampers
- B. Related Sections:
 - 1. Section 23 0914 – Control Wiring and Cabling
 - 2. Section 23 0923 – Direct Digital Control System
 - 3. Section 23 0950 – Variable Frequency Motor Controllers

1.2 SUBMITTALS

- A. Product Data: For each control component indicated.
- B. Shop Drawings:
 - 1. Each component shall be labeled for proposed usage and its corresponding item tag per the control drawing, diagram and sequence of operation submittal.
 - 2. Damper schedule.
 - 3. Valve schedule.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Where a list of manufacturers is not provided, products offered by the controls system contractor or their preferred vendor may be incorporated, subject to compliance with the specification.
- B. Where a list of manufacturers is provided under components below, the product shall be selected only from the list of manufacturers provided.

2.2 CONTROL SYSTEM COMPONENTS

- A. Refer to Section 23 0923 “Direct Digital Control System” for manufacturers and specifications for the DDC system, including operator workstation, distributed controllers, network requirements, accessories, control software and graphic requirements.
- B. Refer to Section 23 0914 “Control Wiring and Cabling” for power wiring, control cabling, transformers, fusing power distribution cabinets and power line filtering for the DDC system.
- C. Control system components specified in this Section include sensors, detection equipment, indicators, thermostats, humidistats, air flow measuring stations, meters, actuators, control valves and dampers.

2.3 ELECTRONIC SENSORS AND TRANSMITTERS

- A. Thermostats
 - 1. Low-Voltage Space Thermostat – Shall be 24V, bimetal-operated type with either adjustable or fixed anticipation heater. Provide subbase with manual or automatic switching as required to perform the specified functions.
 - a. Concealed Set Point adjustment
 - b. 55°F to 85°F setpoint range
 - c. 2°F maximum differential
 - d. Vented ABS plastic cover
 - e. Single or multi-stage or modulating as required.
 - 2. Line-Voltage Space Thermostat – Shall be bimetal-actuated, open contact or bellows actuated. Provide subbase with manual or automatic switching as required to perform the specified functions.
 - a. Enclosed snap-switch type, or equivalent solid-state type
 - b. Heat anticipator

- c. UL Listed for electrical rating
 - d. Concealed Set Point adjustment
 - e. 55°F to 85°F setpoint range
 - f. 1°F maximum differential
 - g. Vented ABS plastic cover
 - h. Single or multi-stage or modulating as required.
- 3. Low-Limit Thermostats – Low limit airstream thermostats shall be UL listed, vapor pressure type with an element 20-foot minimum length. Element shall cover the face of the coil at 1-foot centers and shall respond to the lowest temperature sensed by any 1-foot section. When one low limit stat cannot meet this requirement, provide multiple thermostats.
 - a. Low Limit Thermostat shall be manually reset.
 - b. Provided with one (1) set of normally closed contacts wired directly to the fan circuit.
 - c. Provide one (1) set of normally open contacts to provide an alarm to the DDC system.

B. Thermistor Temperature Sensors & Transmitters

1. General

- a. Temperature sensors shall be thermistors or Resistance Temperature Device (RTD) and be suitable for the application. Where feasible, provide the same sensor type throughout the project. Avoid using transmitters unless necessary and approved by the engineer.
- b. Precision thermistors may be used in applications below 200°F. Sensor accuracy over the application range shall be 0.36°F or less between 32 to 150°F.
- c. Provide RTD sensors with platinum elements compatible with digital controllers. Encapsulate sensors in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32°F. Temperature sensor stability error over five years shall not exceed 0.25°F cumulative. Direct connection of RTD's to digital controllers without transmitters is preferred. When RTDs are connected directly, lead resistance error shall be less than 0.25°F. The total error for an RTD circuit shall not exceed 0.5°F.
- d. Provide matched temperature sensors for differential temperature measurement.

2. Duct Sensors

- a. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 5 feet in length per 10 sq ft of duct cross section.
- b. Mixed Air and Discharge Air sensors shall be averaging type.

3. Immersion Sensors

- a. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the design water velocities in the pipe.

4. Space Sensors

- a. Space sensors shall be equipped with a setpoint adjustment, occupancy mode override switch, display, and communication port. Sensor cover shall be rectangular high impact ABS plastic in a neutral color.

5. Outdoor Sensors

- a. Outdoor temperature sensors shall be platinum type and have a minimum accuracy of +/- 0.5°F from -40°F to 140°F, and measuring range from -20°F to 120°F. Outdoor temperature sensor shall be within a ventilated enclosure that protects the sensor from thermal building mass biasing, solar radiation and precipitation without affecting performance.

C. Humidity Sensors

1. Duct and room sensors shall have a sensing range of 10% to 90%. Accuracy shall be +/- 3% of range.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 0% to 100% RH. Accuracy shall be +/- 5% of range. Sensors should be suitable for ambient conditions of -40°F to 170°F. Outdoor humidity sensors shall be within a ventilated enclosure that protects the sensor from thermal building mass biasing, solar radiation and precipitation without affecting performance.
4. Humidity sensors drift shall not exceed 1% of full scale per year.

D. Pressure Transducers

1. Transducers shall have a linear output signal. Zero and span shall be field-adjustable.
2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than the calibrated span without damage.
3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 1 – 5 Vdc or 4 to 20 mA output, required mounting brackets, and block and bleed valves.
4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be complete with 1 – 5 Vdc or 4 to 20 mA output, required mounting brackets, and five-valve manifold.
5. Air velocity pressure sensors shall use differential pressure to determine airflow rate and have repeatability within 1% of reading and an accuracy of +/- 5% of range. The velocity range shall be from 0 to 3250 FPM.

2.4 STATUS SENSORS & SWITCHES

A. Flow Switches

1. Flow-proving switches shall be either paddle or differential pressure type.

2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA enclosure suitable for location.
3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure suitable for location, with scale range and differential suitable for intended application, or as specified.

B. Current Switches

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

2.5 ELECTRICAL CONTROL DEVICES

A. Relays

1. Control relays shall be UL Listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for the application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable +/- 200% (minimum) from setpoint shown on plans. Contact rating, configuration, and coil voltage shall be suitable for the application. Provide NEMA enclosure suitable for location when not installed in local control panel.

B. Override Timers

1. Override timers shall be electronic or spring-wound line voltage UL Listed, with contact rating and configuration as required by the application. Provide 0 to 6 hour calibrated dial for spring-wound type or LCD display for electronic type unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and or wall as shown.
2. Push button with D.O. and lighted button.

C. Current Transformers

1. AC current transformers shall be UL/CSA recognized and completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for +/- 1% accuracy at 5 A full scale output.
3. Transformers shall be split-core type for installation on new or existing wiring.

D. Voltage Transmitters

1. AC voltage transmitter shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 300 VAC, and 400 to 600 VAC full-scale, adjustable, with 1% +/- full-scale accuracy with 500-ohm maximum burden.

3. Transmitters shall be UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

E. Voltage Transformers

1. AC voltage transformers shall be UL/CSA recognized, 600 VAC rated, complete with built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 40 to 130 degrees F, and shall provide +/- 0.5% accuracy at 24 VAC and a 5VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

2.6 SURGE PROTECTIONS DEVICES

A. Surge and Transient Protection

Provide each digital controller with surge and transient power protection. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

B. Power Line Surge Protection

1. Provide surge suppressors on the incoming power at each controller or grouped terminal controllers. Surge suppressors shall be rated in accordance with UL 1449, have a fault indicating light, and conform to the following.
 - a. The device shall be a transient voltage surge suppressor, hard-wire type individual equipment protector for 120 VAC/1 phase/2 wire plus ground.
 - b. The device shall react within 5 nanoseconds and automatically reset.
 - c. The voltage protection threshold, line to neutral, shall be no more than 211 volts.
 - d. The devices shall have an independent secondary stage equal to or greater than the primary stage joule rating.
 - e. The primary suppression system components shall be pure silicon avalanche diodes.
 - f. The secondary suppression system components shall be silicon avalanche diodes or metal oxide varistors.
 - g. The device shall have an indication light to indicate the protection components are functioning.
 - h. All system functions of the transient suppression system shall be individually fused and not short circuit the AC power line at any time.
 - i. The device shall have an EMI/RFI noise filter with a minimum attenuation of 13dB at 100 kHz to 300 MHz.
 - j. The device shall comply with IEEE C62.41, Class "B" requirements and shall be tested according to IEEE C62.45.
 - k. The device shall be capable of operating between -20 degrees F and +122 degrees F.

C. Telephone and Communications Line Surge Protection

1. Provide surge and transient protection for DDC controllers and DDC network related devices connected to phone and network communication lines, in accordance with the following:
 - a. The device shall provide continuous, non-interrupting protection, and shall automatically reset after safely eliminating transient surges.
 - b. The protection shall react within 5 nanoseconds using only solid-state silicon avalanche technology.
 - c. The device shall be installed at the distance recommended by its manufacturer.

D. Controller Input/Output Protection

1. Provide controller inputs and outputs with surge protection via optical isolation, metal oxide varistors (MOV), or silicon avalanche devices. Fuses are not permitted for surge protection.

2.7 FLOW MEASURING DEVICES

A. Water Flow Meters

1. Water flow meters shall be insertion electromagnetic type which provide current and voltage analog output for a flow rate, a high-resolution frequency output drive to peripheral devices, a scalable pulse output for totalization, and a master alarm signal.
2. Materials: Wetted metal components shall be 316 Stainless Steel. Sensor head shall be XAREC.
3. Liquid temperature range: 15°F to 250°F.
4. Ambient Temperature range: -20 °F to 150°F.
5. Max. Operating pressure: 400 psi.
6. Pressure Drop: 0.1 psi at 12 ft/sec in 3" pipe, decreasing as line size increases.
7. Accuracy shall be +/- 1% of reading from 2 – 20 ft/sec, and +/- 0.02 ft/sec below 2 ft/sec.
8. Analog Output – One (1) 4-20 ma, and one (1) 0-10 V or 0-5 V.
9. Frequency Output – 0-15 V peak pulse, 0-500 Hz.
10. Scalable Output – Isolated solid-state dry contact, rated at 30 V at 1.2 A, pulse duration 0.5, 1, 2 or 6 seconds.
11. Electronics Enclosure – Weathertight NEMA 4 aluminum enclosure.
12. Onicon Model FT-3400 series or approved equal.

B. Air Flow Measuring Stations

1. The probe assembly shall consist of one or more electronic air flow measuring units capable of continuously monitoring airflow. Each probe shall contain multiple electronic flow sensors and be thermal dispersion type. They shall be mounted in an array format to produce a true velocity profile. The sensors shall operate over a 350 to 7500 fpm velocity range and the velocity measured by each sensor shall output a signal directly proportional to flow to the supporting electronics. The output signal shall be fully isolated. The signal transmitter shall be an electronic device capable of receiving airflow probe signals over the probe interconnecting cables, linearizing each signal and then summing and averaging them. Finally, the signals shall be converted to a 4 to 20 MA output signal for automatic transmission to any suitable remote input and/or recording device. A 24-volt AC power supply is required for each transmitter. The control panel shall be provided with integral diagnostics including on-line zero and on-line sensor

verification. It shall have an integral reference standard for field calibration of transmitter output. The output span shall be adjustable from a minimum 0 to 1000 to a maximum 7500 fpm. The transmitter assembly shall be housed in a metal enclosure having a hinged door and lock. This unit shall not require recalibration. System accuracy shall be +/- 2% of rate plus +/- 0.55 of full scale.

2. Each supply and return fan shall have an independent air flow measurement station. Multiple fan arrays shall sum flow of each fan to report a total fan array air flow.
3. The outdoor air intake damper shall have an independent air flow measuring station.
4. Air flow measuring station shall be manufactured by:
 - a. Ebtron Gold Series
 - b. Paragon Controls
 - c. Air Monitor
 - d. Tek-Air
 - e. Kurz

- C. Antifreeze tapes shall be self-regulating plastic insulated resistance cables, having a heating density as recommended by the manufacturer for the application. Heat tape shall have an outer braid of tinned-copper and an outer jacket of modified polyolefin. Install in strict accordance with the manufacturer's recommendations, including wrapping with insulating tape. Furnish a relay under control of an outdoor thermostat to energize the tape when the outdoor temperature drops below 34 degrees F. Wire into the 120-volt outlet with is provided under the electrical contract for this purpose. Provide a pilot light on the inside wall near the exit door which indicates that the heat tape is energized. Provide where indicated on the drawings.

- a. Manufacturers:
 - 1) Raychem (XL-TRACE)
 - 2) Easy Heat
 - 3) Or approved equal.

2.8 DETECTION EQUIPMENT

- A. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104°F; with 2 factory-calibrated alarm levels at 50 and 100 ppm.
- B. Carbon Dioxide Sensor and Transmitter: Solid-state non-dispersive infrared (NDIR) sensors
1. Temperature range: 32 to 122°F.
 2. Measuring range: 0-2000 ppm
 3. Accuracy: 5% + or - or 75 ppm max.
 4. Calibration: required for span only (automatic zero adjustment)
 5. Digital display: 4-digit LED
 6. Output: 0-10 VDC, 4-20 mA, selectable
 7. Alarm relay: 1000 ppm, field adjustable from 700-1300 ppm
 8. Enclosure: High impact plastic enclosure, white approx. 5"W x 2.5"H x 2"D
 9. Duct mounted models: Sampling inlet/outlet ports, filter, tubing, mounting hardware

10. Calibration kit: Canister of gas, regulator and digital calibration readout
- C. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.
- D. NO₂ & CO Gas Detection System:
 1. System shall be complete with digital transmitters and a multi-channel controller.
 2. Transmitters:
 - a. Rugged PVC enclosure with hinged door
 - b. 24V DC power
 - c. Auto reset thermal fuse
 - d. LED indicator for power, alarm and fault
 - e. RS 485 communication bus to the central controller
 - f. Electrochemical sensors
 - g. CETCI model DST-ECO Carbon Monoxide transmitter, 0-200 ppm (fan start at 25 ppm, alarm at 100 ppm, adj.)
 - h. DST-END transmitter for Nitrogen Dioxide, 0-10 ppm (fan start at .7 ppm, alarm at 1.5 ppm, adj.)
 - i. Equal to Critical Environmental Technologies DST-W Digital Transmitter
 3. Multichannel Controller:
 - a. Field programmable, 8 analog transmitter capacity via RS485 communication to remote digital transmitters
 - b. BacNet output module
 - c. Eight SPDT relays
 - d. Audible alarm with silence button with remote combination 103 dB horn/4" diameter strobe light
 - e. 24 V power supply
 - f. Automatic reset thermal fuse
 - g. Two-line LCD display readings
 - h. UL certified
 - i. Equal to Critical Environmental Technologies PDC Multi-Channel Controller.
 4. Provide all power and communication cabling required in conduit. Utilize eight SPDT relays to hard wire fan actuation. Monitor on DDC system via BACnet communication.
 5. Calibration kit: Canister of gas, regulator and digital calibration readout.
- E. Refrigerant Gas Detection Equipment System:
 1. Provide a stationary refrigerant gas leak detection system designed to alarm at a specified level of refrigerant gas in monitoring areas. The instrument shall be a wall mounted device with onboard sensor, using a pump to draw aspirated samples through tubing to the sensor, from the areas where refrigerant gases are most likely to concentrate. The instrument shall be capable of sampling from an area and report data specific to each monitored channel. The refrigerant gas monitor shall meet the following specifications:
 2. Coverage: single sensor onboard
 3. Sensor type: Non-dispersive infrared (NDIR) sensor)
 4. Gases detected: HFC, HFO, HCFC, CFC
 - a. The detector shall have an on-board gas library containing calibration data for >50 refrigerant gases, configurable to select a specific refrigerant for optimized accuracy of measurement
 5. Accuracy: ± 1 ppm $\pm 10\%$ of reading from 0-1,000 ppm (± 10 ppm $\pm 15\%$ of reading from 0-1,000 ppm for R-11, R-21, R-32, R-113)

6. Response time: T90 = 5 seconds plus sample transport time
7. Sample transport time: 19 seconds per 100 ft
8. Minimum detectable level: One part per million (1 ppm)
9. Automated zero-point calibration: The instrument shall periodically sample clean air and automatically perform a zero-point calibration
10. Number of channels: 1
11. Operating Temperature: 32°-122°F / 0°-50°C
12. Ambient Humidity: 5% to 90% RH (non-condensing).
13. Sampling Mode: sequential per channel
14. Pump rate: 6 liters per minute
15. Monitoring distance: 1,200 ft max. for combined length of sample and exhaust tubing (each channel)
16. User interface: Display screen and keypad; gas reading simultaneously displayed per channel for all channels a. Optional: Remote Display
17. Alarms: 3 levels
18. Power Status Indicator: Green LED
19. Alarm Status Indicator: Red LED, audible alarm, Modbus register, relay, display screen
20. Fault Status Indication: Yellow LED, Modbus register diagnostics, relay
21. Alarm reset: user selectable to be either manual or automatic.
22. Power: 100 to 240 VAC, 50/60 Hz, 20 W
23. Communications:
24. Modbus RTU: Baud rate 9,600 or 19,200, configurable
 - a. 4 x SPDT relays: low alarm, medium alarm, high alarm, fault
 - b. Optional: dual channel analog output; 4-20mA
 - c. Optional: BACnet
25. Certification: UL 61010-1, CAN/CA 22.2 No. 61010-1; EN61010-1, EN61326, EN14624; CE Mark
26. Manufacturer: Bacharach, SenTech, MSA Chillgard.
27. Warranty: One (1) year.

F. Manufacturers:

1. Brasch
2. ACME
3. Critical Environment Technologies

2.9 ACTUATORS

A. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers: Belimo Aircontrols (USA), Inc.
2. Listing: Actuators shall have ISO 9001 quality certification and be UL listed under standard 873.
3. Characteristics: Actuators shall be fully modulating/proportional, pulse width, floating/tri-state or two-position as required and be factory or field selectable. Each actuator shall have visual position indicators. Proportional actuators shall accept a 0-10VDC or 0-20mA input signal with 2-10VDC and 4-20mA operating range,

respectively. Actuators shall be capable of operating on 24, 120 or 230VAC or 24VDC and Class 2 wiring as required by the application. Power consumption shall not exceed 10VA for 120V actuators and 8 watts for DC actuators. Actuators shall be capable of being mechanically and electrically parallel to increase torque if required

4. Fail-Safe Operation: Mechanical, spring-return mechanism shall be provided on all dampers and valves except where noted otherwise. Provide external, manual gear release on non-spring return actuators.
5. Valves: Size for torque required for valve close off at maximum pump differential pressure plus 25% safety factor.
6. Dampers: Size for running torque calculated as follows:
 - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
 - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
 - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
 - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
 - e. Dampers with 2- to 3-Inch w.g. (of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
 - f. Dampers with 3- to 4-Inch w.g. of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
 - g. Coupling: V-bolt and V-shaped, toothed cradle.
7. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
8. Run Time: 12 seconds open, 5 seconds closed.

2.10 CONTROL VALVES

- A. Control Valves: Factory fabricated, of type, body material, and pressure class based on fluid system, maximum pressure and temperature rating of piping system, unless otherwise indicated.
- B. Valves shall be equipped with a manual positioner to allow positioning of the valve in the absence of power.
- C. Sizing – Hydronic system control valves shall be sized as follows:
 1. Two-Position: Line Size
 2. Two- or Three-Way Modulating: 10 ft. hd. water pressure drop or as otherwise noted on the plans.
- D. Ball Valves 2" and smaller
 1. Body:
 - a. Cast Bronze or Brass
 - b. ANSI B16.5 Class 150
 - c. Threaded or soldered pipe connection
 2. Trim:
 - a. Stem: Stainless Steel

- b. Ball: Stainless with an equal percentage flow characteristic or modified equal percentage flow characteristic for 2-way, linear for 3-way.
 - 3. Bonnet
 - a. Brass
 - b. Packing: Reinforced Teflon or carbon filled Teflon and EPDM O-Ring.
 - c. Seat: Reinforced Teflon or carbon filled Teflon.
- E. Butterfly Valves 2.5” – 12”
 - 1. Body:
 - a. Cast Iron with extended neck or flange and insulation clearance.
 - b. Flanged with full lugged connections.
 - 2. Trim:
 - a. Stem: Stainless Steel
 - b. Disc: Stainless Steel, Nickel Plated Ductile Iron, or Ductile Iron coated with Nylon 11, equal percentage flow characteristics or modified equal percentage flow characteristics, bubble tight shut off.
 - c. Seat: EPDM
- F. Globe Valve 2” and Smaller
 - 1. Body
 - a. ANSI B16.5 Class 125 and 250
 - b. Cast Bronze or Brass
 - c. Threaded (FNPT), union sweat, or flared connections
 - 2. Bonnet
 - a. Brass
 - b. Packing: Self-adjusting Ethylene Propylene Rubber (EPR) ring pack u-cups, spring loaded PTFE and Elastomer v-rings, or spring-loaded Teflon cone.
 - 3. Brass Trim
 - a. Stem: Stainless Steel
 - b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
 - c. Replaceable Seat: Brass against molded Elastomeric disc, or bronze.
 - 4. Stainless Steel Trim (Steam Applications)
 - a. Stem: Stainless Steel
 - b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
 - c. Replaceable Seat: Stainless Steel.
- G. Globe Valves 2.5” and Larger
 - 1. Body
 - a. ANSI B16.5 Class 125 and 250
 - b. Cast Iron with black lacquer finish
 - c. Flanged Connections

2. Bonnet
 - a. Brass
 - b. Packing: Ethylene Propylene Terpolymer (EPT) ring packs, EDPM O-ring, or spring-loaded Teflon cone.
3. Trim
 - a. Stem: 316 Stainless Steel
 - b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
 - c. Replaceable Seat: bronze.

H. Pressure-Independent Characterized Control Valves (PIV)

1. Body
 - a. Brass rated at no less than 360 psi at 250°F.
2. Bonnet
 - a. Brass
 - b. Packing: Reinforced Teflon or carbon filled Teflon and EPDM O-ring.
3. Trim
 - a. Stem: Brass or Stainless Steel
 - b. Ball: Plated brass or Stainless Steel, equal percentage flow characteristic or modified equal percentage flow characteristic for 2-way, linear for 3-way.
 - c. Disc: Thrust-bearing Teflon disc with double O-ring design.
 - d. Seat: Reinforced Teflon or carbon filled Teflon with EPDM O-rings
 - e. Packing: EPDM O-ring.

I. Close-off Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings.

1. Water Valves:
 - a. Two-Way: 150% of total system pump head.
 - b. Three -Way: 300% of pressure differential between ports A and B at design flow rate or 100% of total system pump head.

2.11 DAMPERS

- A. Dampers: AMCA-rated, parallel and opposed blade design as required by the application.
- B. Outside air and relief air dampers (exposed to outside air) shall be severe cold option design with the following features:
 1. Frame: Extruded aluminum, 4" x 0.08" thickness with polystyrene foam insulation.
 2. Blades: Extruded aluminum, double wall profile with expanded polyurethane foam insulation filled cores and thermally broken. Insulation factor of R-2.29
 3. Seals: Blade and frame edge seals are extruded silicon, secured in an integral slot.
 4. Bearings: Celcon inner bearing fixed to a 7/16" aluminum hexagonal blade pin, rotating within a polycarbonate outer bearing without metal-to-metal or metal-to-plastic bearing contact.

5. Linkage: Hardware mounted within the frame, aluminum and zinc plated steel construction.
 6. Operating temperature: -40 to 155°F.
 7. Leakage: 4.9 cfm/sq. ft. at 4" w.g., maximum
- C. Return and other control dampers not exposed to outside air shall be constructed with the following features:
1. Frame: Extruded aluminum, 5" x 0.125" thickness.
 2. Blades: Extruded aluminum, airfoil profile.
 3. Seals: Blade seals shall be extruded EPDM. Frame seals shall be extruded TPE thermoplastic, secured in an integral slot.
 4. Bearings: Molded synthetic
 5. Linkage: Hardware mounted within the frame, aluminum and zinc plated steel construction.
 6. Operating temperature: -72 to 275°F.
 7. Leakage: 3 cfm/sq. ft. at 1.0" w.g. max.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify location of wall mounted sensors with drawings and room details before installation. Install devices to match rough in height of light switches provided by the Electrical Contractor, Coordinate location and placement with other wall mounted devices, cabinets, etc.
- B. Room temperature sensors shall be installed on concealed metal junction boxes properly supported by the wall framing.
- C. Install averaging elements in ducts and plenums in a serpentine pattern.
- D. Low limit sensors shall be installed in a serpentine manner horizontally across the coil. Each bend shall be supported with a capillary clip. Provide 1 foot of sensing element for each 1 square foot of coil area.
- E. All pipe mounted sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
- F. Install outdoor air temperature/humidity/enthalpy sensors on a north wall with a sun shield.
- G. Local control panels shall be provided for the equipment being controlled. The panel shall be mounted in the mechanical room with the equipment it serves. Mount panels on wall or independent support structure. Do not mount on equipment.
- H. Install guards on room temperature sensors and or thermostats in the following locations:
 1. Entrances.
 2. Public areas, such as lobbies.
 3. Gymnasiums & Weight Rooms.

4. Corridors.
 5. Racquet Ball Courts
 6. Where indicated on drawings.
- I. Automatic dampers shall be furnished by the control's subcontractor, installed by the HVAC Contractor in accordance with Section 23 3300 "Air Duct Accessories."
 - J. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
 - K. Damper linkages shall be through frame hardware; linkage attachments to blades are not acceptable.
 - L. Damper jack shafting is not permitted, provide an actuator for each damper section.
 - M. Identification of Hardware and Wiring:
 - a. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination, with the DDC address or termination number.
 - b. Permanently label or code each point/object of field terminal strips to show the instrument or item served.
 - c. Identify control panels with minimum ½" letters on laminated plastic nameplates.
 - d. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
 - e. Identify room sensors relating to terminal units or valves with adhesive stickers.
 - f. All identifiers shall match the naming convention on the drawings and within the DDC graphics.

3.2 SCHEDULES

A. Control Valves

System Type	Valve Type(s) (Per 2.6)	Fail Position
AHU Chilled Water Coil – 2" & Smaller	Ball, Globe	Closed
AHU Chilled Water Coil – 2.5" & Larger	Globe	Closed
AHU Hot Water Coil – 2" & Smaller	Ball , Globe	Open

AHU Hot Water Coil – 2.5” & Larger	Globe	Open
VAV Terminal Unit	Ball, PIV	In-Position
Unit Ventilators Chilled Water Coil	Ball, PIV	Closed
Unit Ventilators Hot Water Coil	Ball , PIV	Open
Unit Heaters	Ball , PIV	In-Position
Finned Tube	Ball , PIV	In-Position
Convectors	Ball , PIV	In-Position
Duct Mounted Heating Coils – 2” & Smaller	Ball, Globe	Open
Duct Mounted Heating Coils – 2.5” & Larger	Globe	Open
Chiller Isolation	Ball, Butterfly	Closed
Chiller Modulating Control – 2” & Smaller	Ball, Globe	Closed
Chiller Modulating Control – 2.5” & Larger	Globe	Closed
Boiler Isolation	Ball, Butterfly	Closed
Minimum Flow Bypass – 2” & Smaller	Ball, Globe	Open
Minimum Flow Bypass – 2.5” & Larger	Globe	Open

B. Damper Actuators

System Type	Fail Position
Outside Air	Closed
Exhaust Air	Closed
Return Air	Open

Supply Air	Open
Storm Shelters	Open

END OF SECTION 23 0913

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SECTION 23 0914 – CONTROL WIRING AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control wiring, both line and low voltage, transformers, power distribution, fusing and panels, power filtering and communication cabling which is required to perform the automatic control functions described.
- B. Related Sections:
 - 1. 23 0913 Instruments and Control Devices
 - 2. 23 0923 Direct Digital Control System

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Wiring, both line and low voltage, shall comply with NEC and shall be subject to approval by the local code enforcing authorities.
- C. Wire, conduit and installation methods shall conform to applicable provisions of Division 26 - Electrical except that wiring smaller than No. 12 and conduit smaller than 3/4" are permitted as appropriate for the application.
- D. Communication cabling shall conform to applicable provisions of Division 27- Section "Communications Horizontal Cabling".
- E. All wiring and cabling insulation in air return plenums shall not exceed maximum flame spread rating of 25 and smoke development rating of 50 as established by NFPA 255 test methods.

PART 2 - PRODUCTS

- A. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
 - 1. Output ripple of 5.0 mV maximum peak to peak.
 - 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
 - 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

- B. Power Line Filtering: Provide internal or external transient voltage and surge suppression for workstations or controllers with the following:
 - 1. Minimum dielectric strength of 1000 V.
 - 2. Maximum response time of 10 nanoseconds.
 - 3. Minimum transverse-mode noise attenuation of 65 dB.
 - 4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.
- C. Power distribution, fusing and panels:
 - 1. Power distribution transformers, fuses, termination strips etc. shall be organized in NEMA 1 enclosure panels. Panels shall be 16-gauge steel construction, with removable front cover and various size removable knockouts, arranged for surface mounting and polyester powder coat finish inside and outside, UL listed. Arrange and bundle wiring inside of panels neatly with cable ties. Panel and internal devices shall be permanently marked to correspond to power wiring diagram shop drawings provided in the operating and maintenance manual.
- D. Cabling:
 - 1. Primary Ethernet IP Cabling – Provide white colored, CAT 6A Ethernet shielded plenum-rated cabling to interconnect major controllers and workstation computer or Web server to establish the primary network configuration as determined by the direct digital control system architecture. Provide excess cabling at each connection for servicing by looping cable near the panel.
 - 2. Secondary Cabling – Secondary LON or BACnet MS/TP RS-485 3-conductor shielded plenum-rated bus wiring to secondary controllers such as unitary controllers serving VAV boxes shall be as required by the communication protocol.
 - 3. Plenum Rated – All cabling insulation shall be approved and labeled for use in air plenums where installed in these locations.

PART 3 - EXECUTION

3.1 ELECTRICAL POWER SUPPLIES

- A. The Electrical Contractor will provide a power source to motors through his starters only. Where power sources are required beyond these starters, or beyond sources explicitly shown on the electrical drawings, these shall be provided by the Controls Contractor. Where auxiliary contacts are required on starters to perform the required functions, these too shall be provided by the Controls Contractor, where not provided under the Electrical Contract. Auxiliary relays may be provided in lieu of auxiliary contacts.
- B. Dedicated Circuiting – Circuits serving control panels, transformers for low voltage service, and other control equipment and devices shall be independent and used for no other purpose. These shall originate from the nearest appropriate emergency electrical panel. Circuit wiring from the electrical panel shall be included in this contract. These circuits shall be clearly identified at the panels.

3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install all work in accordance with the following:
1. All wiring to be ran in a neat, workmanlike manner. All wiring to be tie wrapped or in conduit as per specifications. Wiring or conduit to be ran parallel or at right angles to building structure. Install all wiring free of sags. Bundle wiring together that follows a common path.
 2. All conduit, plenum wiring, and panels shall be supported directly from the building structure with beam clamps and bridle ring. Do not support from pipe, pipe hangers, threaded rod, ductwork, ductwork strapping or other conduit.
 3. Do not lay conduit or plenum wiring on acoustic ceiling tiles, grid members or uninsulated water piping. Conduit and wiring should be installed in such a way as to not interfere with removing ceiling tiles for above ceiling access.
 4. Do not run wiring near lighting ballasts or other high voltage devices that could cause interference.
 5. All line voltage wiring must be kept separate from low voltage wiring. Line and low voltage wiring may not be run in the same conduit. Line and low voltage wiring must be kept separate in control panels.
 6. Label all wire jackets at control panel/controller and at device with tag as shown on wiring details and flow diagrams.
 7. Observe proper polarity as shown on wiring diagrams when connecting 24VAC power and ground controllers and other devices. Note that all transformer secondary grounds must be tied to chassis ground as shown in wiring diagrams unless otherwise noted.
 8. Coordinate with General Contractor and all trades to perform rough-ins for temperature control sensors and devices.
 9. Coordinate with General Contractor and all trades to confirm mounting locations for temperature control panels.
 10. Completely seal all duct, unit and wall penetrations. Avoid ceiling penetrations if at all possible. Completely seal any ceiling penetrations that are absolutely necessary.
 11. All network communication wires shall be labeled at each controller with the designation or the controller that the communication wire originates from and terminates to
 12. Verify network communications and correct any issues.
 13. Clean all construction debris from inside temperature control panels before operation.
- B. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."
- C. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." All line voltage wiring and low voltage wiring (except as stated below) shall be run in conduit. Low voltage wiring concealed above accessible ceilings and in hollow walls for drops to thermostats may be run without conduit. Open wiring dropping into walls shall be run in conduit. Thermostats shall be installed on a single gang box and conduit shall be installed to extend into the plenum. Open wiring shall be bundled and supported at 3 ft. maximum intervals with a system of J-hooks or equivalent means. Open wiring in air plenums shall be rated for such use and so labeled.
- D. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."
1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway.
3. Cabling concealed above accessible ceilings may be run without conduit. Cabling dropping into walls shall be run in conduit. Wall mounted sensors shall be installed on a single gang box and conduit shall be installed to extend to above an accessible ceiling location. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

END OF SECTION 23 0914

SECTION 23 0923 – DIRECT DIGITAL CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. A complete system of computer based, direct digital automatic temperature controls shall be installed under this contract as required to accomplish the sequence of control for various items of equipment and systems indicated on the drawings and as specified in Division 23.
- B. Direct Digital Controls (DDC) upgrade for the existing building controls is part of the scope of work. Refer drawings for systems sequence of operations. Controllers, system architecture, communication cabling and network, software, graphics, etc. shall be seamlessly integrated as part of the new system.
- C. This Section includes Direct Digital Control (DDC) components, including operator work station, controller/server, equipment specific and generic controllers, I/O interface, software and graphics.
- D. See Sections 23 0913 “Instruments and Control Devices”, Section 23 0914 “Control Wiring and Cabling” and Section 23 0993 “Sequence of Operations for Controls” for requirements that relate to this Section.

1.2 SUBMITTALS

- A. Product Data: For all hardware and software.
- B. Shop Drawings:
 - 1. Schematic air and fluid flow control diagrams.
 - 2. Sequence of operations descriptions and points list.
 - 3. Power and communication wiring diagrams.
 - 4. DDC System Hardware components, including controllers, actuators, sensors, valves, dampers, cabinet enclosures, power and communications wiring and devices, misc. controls devices, etc.
 - 5. Control System Software
 - 6. Graphics – Screen examples specific to the project for:
 - a. Air handling units
 - b. Packaged Rooftop Units
 - c. Fan Coil/Blower Coil Units
 - d. Fans
 - e. VAV Air Terminal Units
- C. Software and firmware operational documentation.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Each control subcontractor must be an authorized temperature control contractor in the business of installing and servicing direct digital temperature control systems for over five (5) years. The bidder must have installed and successfully completed at least ten (10) DDC systems of similar size using the same hardware that is proposed.
- B. Subcontractor installation and service office must be located within 75 miles (90 minute travel time maximum) of the building site.
- C. Design and installation of the digital control system shall be performed by employees trained and certified by the equipment supplier. Electrical power work other than low voltage shall be performed by licensed electricians.
- D. The temperature controls subcontractor shall provide all necessary engineering support for a complete and functional system, including but not limited to engineering, programming, installation, supervision, commissioning and troubleshooting.
- E. Refer to 23 0801 Mechanical Systems Commissioning.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- G. ANSI/ASHRAE Standard 135 BACnet – A Data Communication Protocol for Building Automation and Control Networks.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

- A. The DDC control system shall operate on the Tridium Niagara 4 supervisor platform.
- B. Manufacturers:
 - 1. Tridium
 - 2. Distech
 - 3. Alerton
 - 4. Honeywell
 - 5. Vykron
- C. Complete DDC system shall consist of operator workstation, sensors, indicators, actuators, final control elements, interface equipment, wiring, cabling, power supplies and power distribution, other apparatus, accessories, software and graphics connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems as specified here and in related Division 23 Sections.

2.2 LICENSING AGREEMENT AND OPEN PROTOCOL

- A. A true Open Licensing Agreement shall be provided and executed with the Owner to permit total and open access to the system for servicing and software revisions by other qualified servicing contractors.
- B. The supplied system must incorporate open protocol with the ability to access all data using Java base Web enabled browsers without requiring proprietary operator interface and configuration programs.
- C. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. The software shall utilize a Java Database Connectivity (JDBC) compatible database such as MySQL, Oracle, IBM Db2, or Microsoft SQL Server databases, and HTTP/HTML/XML, CSV or text formats. This data shall reside on a server. Proprietary database and user interface programs are not acceptable (except for unitary controllers as noted below).
- D. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135, BACnet and LonMark to assure interoperability between all present and future system components is required.
- E. Proprietary programming shall not be utilized. In addition, all required programming software and graphics shall be embedded in the server or controllers without the need for external software to execute queries or revisions. All graphics shall reside in the server. Remote access via LAN or Web shall not require external software to provide complete access to all data, graphics, alarms, programming, etc.
- F. The licensing agreement shall provide a 5-year Software Maintenance Agreement (SMA) for the system supervisor and all controllers.

2.3 NIAGARA INFORMATION AND CONFORMANCE STATEMENT (NICS)

- A. The Niagara Information and Conformance Statement for all Niagara Software shall allow open access and be set as follows: `accept.station.in="*"; accept.station.out="*"; accept.wb.out="*"; accept.wb.in="*"`. In any case, the end user shall maintain the right to instruct the contractor to modify any software license, regardless of supplier, as desired by the end use. The contractor shall not install any "brand-specific" software, applications, or utilities on Niagara Framework-based devices unless accessible by any brand of Niagara tools.
- B. All hardware and field-level devices installed shall not be limited in their ability to communicate with a specific brand of Niagara Framework JACE. They shall also be constructed in a modular fashion to permit the next generation and support components to be installed, in replacement of or parallel with existing components. All controllers must be able to be programmed with Niagara Workbench.
- C. At the completion of the project, the owner shall be given all existing platform and station login credentials to include; super user (admin) usernames; passwords and passphrases.

2.4 DDC ARCHITECTURE

- A. DDC system shall be complete with an Operators Workstation/Server, Configurable Controllers, Unitary Controllers, required I/O modules for controller expansion, communication cards in controlled devices such as chillers, boilers, ECM fan arrays, packaged rooftop units, variable frequency drives (furnished with the equipment, coordinate card requirements), etc., arranged for a completely integrated building automation system network.
- B. Communication Wiring:
 - 1. Physical connection between the operator station and the owners Local Area Network (LAN) shall be via ethernet CAT-6 cable.
 - 2. Physical connection between Configurable Controllers / Servers (JACE 9000) and the LAN shall be via BACnet IP with CAT-6 cable.
 - 3. Unitary controllers shall be physically connected via BACnetIP. Daisy chains shall follow the specified Networking Protocol.
 - 4. Networking Protocol: Network Time Protocol (NTP4)
- C. Where data drops are not shown for the Configurable Controllers or Operator Station/Server, the temperature control subcontractor shall be responsible to provide the IP data drop to each network controller location for controller connectivity. Installation shall be subcontracted to the division 27 technology contractor; coordinate connection requirements. In addition, provide an additional IP data drop to each controller, or group of controllers to provide local access to data acquisition for the HVAC service technician.
 - 1. If the project does not include a division 27 technology contractor, the temperature controls contractor shall still be responsible to provide the IP data drops to their controllers. Work shall be contracted out to a certified technology company capable of providing this scope of work.
- D. All components and controllers supplied under this contract shall be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer’s internal Intranet network. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.
- F. DDC system accessibility over the LAN or the Internet shall be username and password protected. Provide separate user name/password for multiple level hierarchy to restrict access to appropriate personnel at the different levels (view, programming, etc.). The system must be set up to have at least 3 access levels: guest, user and administrator. Guest privileges shall be limited to view only. Users shall be able to make setpoint and schedule changes. Administrators shall have all privileges as users in addition to being able to assign passwords.

2.5 NIAGARA SUPERVISOR

- A. The DDC control system shall be integrated into the City's Niagara Supervisor. Supervisor provided under separate contract. Coordinate with the owners IT department to provide this integration. The contractor shall provide all additional licenses and shall include time in their scope of work to provide this integration.

2.6 OPERATOR WORKSTATION/SERVER

- A. An operator workstation is not required at this facility. The owner will utilize the new Niagara Supervisor platform hosted on a central server.

2.7 JACE FIELD INTEGRATION CONTROLLER

- A. Controller: JACE-9000
- B. Provide a Niagara-4 embedded controller / server platform controller (JACE-9000) to operate as the primary field integration and supervisory node for the HVAC control system.
- C. The JACE shall integrate multiple HVAC subsystems and various communication protocols.
 - 1. Individual HVAC equipment, such as AHU's, Chillers, Boilers, air control box terminals, fan coils, unit heaters, etc shall utilize local Unitary Controllers (Refer to Section 2.8 Below).
- D. Controllers shall be capable of functioning in either a standalone capacity or integrated into the building network.
- E. Controllers shall be fully configurable type with both control and server capabilities including integrated control and management of external devices, supervision, data logging, alarming, scheduling, network management functions, Internet connectivity, web serving. The controller shall include software technology capable of integrating a variety of devices, interoperable networks and protocols such as LonWorks, BACnet, ModBus, etc into a seamless operating platform.
- F. The controller shall be expandable to add additional BACnet integration points. Each JACE-9000 shall meet the following minimum hardware features. Where required for functionality provide additional communication or memory cards:
 - 1. 1.6GHz NXP iMX8M+ Quad Core CPU
 - 2. 2GB LPDDR4 RAM
 - 3. 8GB onboard EMMC Storage
 - 4. 8GB Micro-SD card (backup media)
 - 5. Two (2) Ethernet Port -10/100/1000 Mbps
 - 6. USB type C connector
 - 7. Two (2) RS-485 ports
 - 8. BACnet driver (IP),
 - 9. Power Supply 24VAC power supply module,

- G. The JACE must be capable of operation over a temperature range of -20 to 60°C and storage temperatures of between -45 and 85°C. The controller/server must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.
- H. The controller/server shall support standard Web browser access via the Intranet/Internet.
- I. System Action Archive: Where acting as a server, provide and maintain an Audit Log that tracks all activities performed on the controller/server. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the controller/server), to another controller/server on the network, or to a server. For each log entry, provide the following data: Time and date, User ID, Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.
- J. System Backup: The JACE shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval. Copies of the current database and, at the most recently saved database shall be stored in the controller/server. The age of the most recently saved database is dependent on the user-defined database save interval. The controller/server database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.
- K. Controllers shall be fully programmable with “drag and drop” graphic representations of control algorithms and easy to use “wizards” that automate controller configurations.
- L. Controllers shall be “Native” BACnet devices with interoperable native BACnet IP, LON and BACnet MS/TP communication support.
- M. If the system size exceeds 80 BACnet devices across 2 network trunks with 4,000 total points, a second JACE shall be provided, and the control system shall be segmented accordingly.

2.8 CONFIGURABLE UNITARY CONTROLLERS

- A. Individual, configurable controllers shall be provided for each central HVAC equipment or system (AHU, Boiler, Chiller, etc.) Controllers designed specifically for VAV reheat air terminal units, fan coil, unit heater, etc., shall be used for each distributed HVAC equipment item. Local controllers shall be capable of functioning in a standalone capacity but shall be integrated into the building network.
- B. Controllers shall be equal to that of Distech Eclipse Connected controllers.
- C. Controllers shall be fully configurable type with both control and server capabilities including integrated control and management of external devices, supervision, data logging, alarming, scheduling, network management functions, Internet connectivity, web serving. The controller shall include software technology capable of integrating a variety of devices, interoperable networks and protocols such as LonWorks, BACnet, ModBus, etc into a seamless operating platform.
- D. I/O modules shall connect to the controller with a single multi pin plug, powered through the controller with a minimum of eight (8) universal inputs, four (4) analog outputs and four (4)

relay outputs, Form A contacts. Do not exceed maximum I/O modules recommended by the manufacturer.

- E. Controllers shall be capable of functioning integrated into the building network or in a standalone state if communication with the JACE or Supervisor is lost.
- F. Each controller with I/O modules shall include input/output capabilities with, as a minimum, sufficient universal inputs, digital inputs, universal outputs and digital outputs to perform the required function and include an additional spare two (2) universal inputs, (2) analog outputs and two (2) relay outputs for future upgrade capability (spare points are not required for unitary controllers).
- G. For VAV reheat air terminal units:
 - 1. The controller shall include, where required, a digital communication to:
 - 2. The remote, space temperature and/or humidity wall sensor,
 - a. The remote wall sensor shall include a communication jack for connecting a laptop to the terminal unit controller for air/water balance purposes.
 - 3. Velocity pressure pneumatic input via polyethylene tubing for supply air flow reading,
 - 4. Supply air flow sensor,
 - 5. Flow balancing software (damper adjustment, set point monitoring and adjustment, flow validation and calibration, sequence/calibration/control set point logs)
 - a. Terminal unit supply air temperature sensor
 - 6. Integral controller/damper actuator is acceptable.
- H. Controllers used for remote temperature and humidity sensing, adjustment and override such as VAV air terminal unit controllers and fan coil units shall include S-link communication via two wire, unshielded cable (non polarity sensitive) to provide power and communication interface for remote sensors.

2.9 CONTROLLER ENCLOSURE AND LISTING

- A. Controllers shall be placed within enclosures that conform to NEMA-1 construction and shall further meet UL 94-5VA flammability ratings for plenum application use.
- B. Each controller shall be UL-916 listed and meet FCC Part 15 Class A.

2.10 GUI DISPLAY FRAMES

- A. System Access – The system must be set up to have at least 3 access levels: guest, user and administrator. Guest privileges shall be limited to view only. Users shall be able to make setpoint and schedule changes. Administrators shall have all privileges as users in addition to being able to assign passwords.
- B. Each Air Handling Unit heating water system and cooling system shall have a minimum of 5 graphic screens available from the tree view.
 - 1. Diagrammatic – One diagrammatic screen shall display the airflow pattern with all dampers, coils and fans shown in their correct schematic location and dynamic data for all input values shown. This main graphic screen shall show the control devices in mechanical flow diagram format with directional arrows to indicate normal flow

- arrangement. These screens shall be available to anyone with access to the system, and therefore shall be view only.
2. Text Screen – Text screen shall display text information with the following primary categories:
 - a. Occupied status
 - b. Unit status
 - c. Temperatures,
 - d. Heating, cooling mode
 - e. Economizer,
 - f. Static pressure & setpoints
 - g. Supply, return and exhaust fan status including setpoints.
 3. A loop tuning screen shall also be furnished for each control loop, so that people with the appropriate access can change loop tuning parameters from PCs without needing individual programming tools.
 4. Override screens shall be furnished for each controller to permit overriding control points without the need for vendor specific software.
 5. An alarm screen shall also be furnished for each AHU, heating plant or cooling plant. The heating and cooling systems shall have similar screens as the AHUs.
- C. Each VAV air terminal unit shall have a graphics screen and a text screen.
- D. Systems that won't permit creating these customized screens as described herein will not be acceptable. Systems that use controllers that won't permit overrides of inputs and outputs from a browser based graphic screen will not be acceptable.
- E. Animations
1. All shapes shall be 3-D with a common perspective.
 2. All dampers shall have a minimum of 5 animation levels to show partially open, half open, mostly open, fully open, and closed position of dampers.
 3. All analog inputs shall show the actual value and engineering units on the graphic screen.
 4. Binary inputs shall be linked to flashing animated displays.
 5. Safety alarms will flash when in alarm.
 6. Filter status shall be indicated when value indicates that they are dirty.
 7. To prevent clutter on the graphic displays, symbols will only be shown for equipment that is controlled or monitored by the DDC system.
 8. Normal status for safeties will not be indicated, and normal status for safeties will be indicated by an image of a clean filter.
 9. Pumps and fans shall rotate when flow is proven by a monitoring device. Coils shall change color when valves are open to permit water flow through the coils.
- F. Color Schema – Graphics shall use common color schemes to make the overall system easy to understand. All overall backgrounds shall be white or other neutral color. All text shall be black. Any value that is in alarm shall be red or have a red background. Any value that is overridden shall have a blue background. All like sensors shall be the same color. For example, all temperature devices shall be yellow, all pressure devices shall be purple, all humidity devices shall be teal, all fire alarm devices shall be red, and all CO2 devices shall be green.
- G. Current setpoints and occupancy status shall be shown at the bottom of each graphic screen.
- H. Floor Plans – Overall floor plan drawings shall be provided, and permit access to each zone's individual floor plan sections.

1. On the individual floor plan sections, room numbers and room temperature and setpoint shall be displayed. Values that are out of the acceptable range shall appear in a different background color and/or flash.
 2. Each VAV air terminal unit shall have its own graphic screen that contains the points from within its controller including the box flow setpoint, room temperature setpoint, maximum cooling flow setpoint, minimum cooling flow setpoint, and minimum heating flow setpoint, plus the discharge air temperature from the AHU supplying the unit. The VAV text screen shall have the same information as the graphic screen plus high and low flow calibration values, damper rotation adjustment (CW or CCW), and air balance set-up features.
 3. GUI shall permit operator the ability to enable, set or disable high and low occupied and unoccupied limits for each room temperature reading.
- I. Text Screens shall be available for all levels of access. Setpoint and output values are changeable from the text screen for users with appropriate access privileges and administrators, but not guests. When a value can be overridden or edited, a red box shall appear around it when the cursor is position on it. A single click of the mouse shall bring up pop up menu that provide options to make a permanent override, change setpoint, or release a previous override of an output point. Analog inputs shall have pop up menus that allow setting high and low alarm limits and the ability to enable and disable alarm limits as appropriate for the sensing device. Pop up menus must be customized to include a description of the point that is being modified. Generic override menus are not permitted because they would not describe to an operator what is about to be modified. The Control Contractor shall set up all initial alarms as indicated in the point matrix.
- J. Text screens shall include schedule information including current state and date and time of next scheduled event. Positioning the mouse over the current state shall permit single click access to the schedule. The schedule screen shall allow the operator to edit a yearly, weekly, daily, holiday or special event schedule for the system being viewed. Temperature values and setpoints shall be displayed below the schedule information, and shall have a minimum of 1 decimal place. Heating, cooling and damper outputs shall be displayed next. The OA temperature for economizer switchover shall be displayed and adjustable from the text screen. Air flow readings shall be shown with setpoint and actual readings. Fan information shall be shown next, followed by static pressure readings and setpoints, which shall have a minimum of 2 decimal places. Miscellaneous setpoints including night setback cooling and heating, average zone temperature, return air warm-up and cool-down, dehumidification, and unoccupied mixed air temperature setpoints shall all be shown and adjustable. All safeties shall be shown, followed by coil pump control information.
- K. Each system shall have its own specific alarm screen available to all operators but only editable by operators with user and administration access privileges. From the alarm screen, users and administrators shall be able to enable and disable alarms. Points that are in alarm shall have an alarm symbol highlighted in red. Points that are not in alarm shall be shown in gray. Alarms that are disabled shall have a way to indicate this on the alarm screen graphic.
- L. Loop tuning screens shall be available through the web browser interface to save the owner the cost and time associated with using vendor specific software for tuning loops. Access to these screens shall not be provided to guests. Air handling units shall have dedicated screens for discharge air temperature, static pressure, and outside air control loops. Loop tuning screen for discharge air temperature shall include the discharge air temperature, discharge air temperature setpoint, cooling loop throttling range, I-gain and ramp time, heating loop throttling range, I-

gain and ramp time, economizer loop throttling range, I-gain and ramp time, unoccupied heating loop throttling range, I-gain and ramp time, cooling valve output, heating valve output, and damper control output. Screens shall also have graphs that show 5 minutes of live data for the discharge air temperature, setpoint, cooling valve, heating valve and mixed air dampers. Each loop tuning screen shall include the appropriate throttling range, I-gain and ramp time.

- M. Each non-unitary controller shall have an override screen. These screens shall be available on-site for use during point-to-point check-out and commissioning. The override screen shall show the inputs and outputs for each controller with the points in their wired location. Unused points shall be shown as spares. Points that are in alarm shall have a red background, and points that are overridden shall have a blue background just as on other screens. These screens shall show the actual values that come back from the controller, not the values that may have been typed in for override at the GUI if the controller software is not accepting the override value. The override screen shall also permit timed overrides.
- N. Each air handling unit shall also have an overview screen listing every VAV terminals data in a text format that includes occupancy mode, room temperature, room setpoint, box flow, flow setpoint, temperature leaving VAV terminal, % cooling and % heating. Also, each VAV AHU shall have an air balance screen that will permit balancing the system through a computer connected to the Ethernet or directly to the appropriate BC without vendor specific software. The air balancing screens shall permit at least 8 manual override commands: normal, position (%), flow value, flow percent, open, close, min flow, and max flow.
- O. Heating systems and cooling systems with multiple pieces of equipment such as pumps with lead-lag control shall display which device is lead and when the other device will become lead on the text screen.
- P. Although only one outside air temperature sensor is needed per building, the GUI shall use independent outside air temperature points, so that during check-out and commissioning, the outside air temperature for a system can be changed without changing the outside air temperature for the whole building. The GUI shall also have a global outside air temperature point that can be overridden from the screen for the controller where the point is physically connected. Overriding this outside air temperature value will change it for all systems, except when outside air temperature has been overridden for an individual system.
- Q. The system shall allow for the easy development and editing of dynamic graphics. Wizards shall be utilized to assist the operator with their manipulation of the graphic system. The operator shall be able to, through a single mouse function, select between the dynamic display mode and the graphic edit mode for the currently viewed graphic frame, assuming appropriate access level is provided to the operator. Systems requiring multiple mouse or operator keyboard commands to enter the graphic edit mode are not desirable and require thorough definition of steps involved to accomplish function.
- R. Animation of system data shall be provided via graphic elements on the display frames. Standard graphic element library shall be provided to assist the operator with their implementation. The ability to define and add new animated graphic elements shall be provided. As a minimum, the ability to move, size, draw, arrange, align, layer, space, rotate, invert, duplicate, cut, copy, paste, erase any animated element shall be provided. System parameters and setpoints shall be assignable and modifiable by the animated graphic elements, relieving the need for keyboard commands for system manipulation.

- S. The ability to simultaneously display a dynamic X/Y chart of selected points, shall be provided. The chart shall be an element of the graphic display and shall automatically update with the display data. The chart shall allow for dynamic manipulation to modify the range, rate, and timeframe of view, in both a real-time as well as historical configuration. A minimum of 4 values shall be included on any chart display element. There shall not be a limit to the quantity of chart elements displayed on a graphic frame. Trace colors and X values shall be User configurable. Systems not providing this capability are required to provide an equivalent charting package with the GUI offering.
 - T. The ability to provide graphically displayed global scheduling and editing functions shall be provided. The ability to link these functions to the associated equipment or zone frames shall be a standard feature. A calendar shall be provided for display and modification of the SDC time clock functions. The User shall be able to view a daily, weekly, monthly, annual, special or holiday schedule from a defined display frame. A list of served areas shall be displayed on the same screen, this list shall be displayed at all times, pull down menus or other means of accessing these areas shall not be acceptable. The system shall have a master override screen that will allow an operator to change the schedule for every piece of equipment in every building by changing the master schedule.
- 2.11 All analog values shall be trended every 15 minutes. The trend samples shall be saved in the BC for at least 36 hours. Access to trended data shall be available by the single click of a mouse on the analog value. Systems that open other windows and require a selection of the desired data are not acceptable.
- 2.12 GUI ALARMING
- A. The GUI shall provide, as standard, alarm annunciation of system data. On every display frame, the ability to view, acknowledge, delete and manipulate real-time and historical alarms shall be provided. The ability to provide a unique and custom alarm display for every display frame shall be provided. The ability to continuously or upon request, view the alarm display, shall be provided.
 - B. Alarm conditions shall be capable of invoking, as a minimum; a display frame, an email message, and a text message sent to a pager or cellular phone.
 - C. Alarm logging shall be provided in a user definable configuration. All alarms shall be displayed and/or routed as follows, as a minimum; GUI display frame, local printer, server printer, client printer, logged to file, and archived in standard format for information management. Alarm groupings shall be hierarchical in nature allowing up to 8 alarm groups and 16 sub-groups. The GUI shall not possess any limits on the quantity of alarms that can be logged, including historical data archiving. Systems possessing limits must define the restrictions and may not be acceptable.
 - D. Provide up to 999 alarm priorities with up to 5 alarm color changes, per priority, according to alarm status.

2.13 GUI TRENDING

- A. The GUI shall automatically perform time based, user defined, periodic collection of real time point data. The data shall be presented as an X/Y chart in the display frame. The data shall be stored and archived in a file format that allows for the manipulation and utilization of the data by third party applications.
- B. A dynamic trend shall be defined as a group of at least 4 data points, with a circular buffer of 2000 data points. A historical trend shall be defined as a group of at least 8 data points, with the sampled points limited only by archival disk space. Sampling rates shall be user selectable from instantaneous (one per second) to once a week. Collection of data shall be user selectable to start and stop on a specific time and date. There shall be no limit to the number of X/Y charts within a display frame.
- C. X/Y charting and column and row reporting shall be an integral part of the system. All points shall be chartable or reportable. Analytical data shall be displayed for any of the selected points in a clearly displayed X/Y chart. This analytical data shall consist of at least the following: Average Mean, Standard Deviation, Simple Average, Current Value, Cycle Length, Cycle High and Cycle Low.
- D. X/Y charting shall provide for the following chart manipulation: display, zoom, scroll, centering, pen legend and export to Excel, Text via Dynamic Data Exchange.

PART 3 - EXECUTION

- 3.1 Furnish a complete set of shop drawings showing the kind of control equipment for each of the various systems and their functions, along with indication on the drawing of all original setpoints and calibration values and set up parameters, and sequence of operation and also that of the automation system. These drawings shall be submitted for approval to the Engineer, together with a complete brochure describing the equipment and their function and operation.
- 3.2 The control equipment supplier shall submit a detailed outline of the owner training material for review and comment by the Engineer during the shop drawing phase. The control system training program shall be customized to reflect the systems installed under this contract and shall cover, as a minimum: software navigation (via custom graphics and Windows based icons), system architecture, pass wording and system security features, input/output control functions, alarm functions/acknowledgement, trending/long term reporting, and control component operation.
- 3.3 Upon completion of the project, furnish and turn over to the Owner and Architect (3) complete sets of brochures describing the various items of equipment, their functions and directions for operation and maintenance.
- 3.4 Upon completion of the control system, the Control Contractor shall adjust all components of the system. The Controls Contractor shall make all adjustments in the control system required

and as directed by the air balance contractor to achieve the desired air balance quantities. All instruments shall be carefully calibrated and each control function shall be demonstrated to function properly, to the satisfaction of the Engineer and the Owner. Provide a complete instruction manual covering the function and operation of all components. At the time of demonstration, each function shall be simulated to insure that controls respond properly to all signals, and the Owner shall be instructed in the proper operation of the system.

- 3.5 In addition to the adjustments and fine tuning, the Contractor shall include as a part of this contract an additional 40 hours of service technician time for work as directed or authorized by the Engineer to make software changes or field adjustments to hardware.
- 3.6 During the first year of operation, after acceptance by the Owner, the Control Contractor shall provide complete service to adjust or assist the Owner in adjusting the equipment to obtain optimum performance from the control equipment and from the heating and air conditioning systems in general. This shall be done without additional expense to the Owner. This work shall include revisions to DDC software programs and controller programs, and all PC front end software upgrades. A backup of final field programs shall be created and stored in a safe location, as coordinated with the owner.
- 3.7 The control equipment manufacturer shall provide instruction and training of the Owner's personnel regarding the hardware and software of the system. Software training shall include programs, methods of programming, control loops, scheduling and reports. Training covering hardware shall include operation information, functional use, wiring diagrams and schematic diagrams necessary to troubleshoot the operating system. Training shall include "hands on" instructions to completely familiarize Owner's personnel with the equipment and system. Training of Owner's personnel shall be equal in scope and detail to that provided by the manufacturer to its service technicians.
- 3.8 Coordinate with Owner's IT Department for instruction on connection to the LAN.
- 3.9 Integrate the new DDC control system into the owners new Niagara Supervisor.
- 3.10 TRAINING
 - A. The control equipment supplier shall provide 40 hours of instruction at the job site to familiarize the Owner's personnel in the application and details of the installed system. Site training classes shall not be scheduled for longer than 4 hours duration except at the discretion of the Owner.
- 3.11 FIELD QUALITY CONTROL
 - A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
 - B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.
8. Check dampers. Verify that proper blade alignment, either parallel or opposed, has been provided.
9. Check DDC system as follows:
 - a. Verify that DDC controller power supply is from emergency power supply, if applicable.
 - b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
 - c. Verify that spare I/O capacity has been provided.
 - d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

END OF SECTION 23 0923

SECTION 23 3113 - DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct materials.
2. Duct liner.
3. Rectangular ductwork.
4. Round ductwork.
5. Flat Oval ductwork.
6. Duct connectors.
7. Sealants and gaskets.
8. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
1. Fabrication, assembly, and installation techniques.
 2. Factory- and shop-fabricated ducts and fittings.
 3. Reinforcement and spacing.

4. Seam and joint construction.
 5. Duct Connectors
 6. Duct Liner
 7. Duct Sealants and Gaskets
 8. Penetrations through fire-rated and other partitions.
 9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 10. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Coordination Drawings: Plans, drawn to scale (1/4" = 1'-0"), on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- D. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- A. Refer to 'Ductwork Systems Schedule' on drawings.

2.2 RECTANGULAR DUCTWORK

- A. Construction
1. Single wall factory- or shop-formed continuous helical (spiral) lock seam.
- B. Fittings/Transitions – Shall conform to SMACNA Figure 2-7.
1. Transition angles shall be limited to 30 degrees on converging transitions and 20 degrees on diverging transitions.
 2. Elbows shall have an inside radius equal to the duct width. 90 degree elbows shall be square with double wall turning vanes. Elbows less than 90 degrees shall be radiused. Non-radiused elbows less than 90 degrees, with or without turning vanes are not permitted.
 3. Branch take-offs, where not detailed otherwise, shall be with a static boot (45 degree clinch collar) per SMACNA Figure 2-6 or conical spin-in fitting. Straight tap take-offs are not permitted.
 4. Square throat, radius heel 90-degree elbows are not permitted.
 5. Radiused, Angled (15° Max.), or Mitered (15° Max.) offsets.
 6. Concentric Transitions, $\theta = 45^\circ$ Max.
 7. Eccentric Transitions, $\theta = 30^\circ$ Max.

2.3 SINGLE WALL ROUND AND FLAT OVAL DUCTWORK

- A. Medium pressure applications (2" S.P. and higher).
1. Construction
 - a. Single wall factory- or shop-formed continuous helical (spiral) lockseam.
 2. Joints/Seams
 - a. Slip connections or gasketed flanges.
 3. Fittings/Transitions – Shall be compatible with duct system.
 - a. 90-Degree Branch tees shall be streamlined, spin-in conical type with Y branches.
 - b. 45-Degree lateral tee wherever possible.
 - c. Die-stamped elbows, $r/D = 1.5$ (minimum).
 - d. Radiused, angled (15° max.) or mitered (15° max.) offsets.
 - e. Concentric transitions, $\theta = 45^\circ$ max.
 - f. Eccentric transitions, $\theta = 30^\circ$ max.
- B. Low pressure applications (1" S.P. or less).
1. Construction
 - a. Single wall factory- or shop-formed continuous helical (spiral) lockseam.

2. Joints/Seams
 - a. Slip connections or gasketed flanges.
 - b. Round Ductwork: Longitudinal seams may be utilized for 1" and less (positive and negative) static pressure construction class at final air devices.
3. Fittings/Transitions – Shall be compatible with duct system.
 - a. Factory- or shop-formed and welded.
 - b. Elbows shall be long radius type.
 - c. Elbows for longitudinal seam round ductwork shall be factory- or shop-formed segmented standing seam or pleated. Other fittings shall be comparable to the elbows.
 - d. Round Ductwork Additional Provisions:
 - 1) Standard tees allowed.
 - 2) Segmented elbows allowed.

2.4 DOUBLE WALL ROUND AND FLAT OVAL DUCTWORK

- A. Construction:
 1. Shall be acoustically lined double wall spiral lock seam with perforated liner and insulation thickness per 'Ductwork Insulation Schedule'.
- B. Fittings:
 1. Double wall to single wall transitions shall be provided where flat oval and single wall round ducts connect.
 2. Fittings shall utilize a solid inner liner.
 3. 90-Degree branch tees shall be streamlined, spin-in conical type with Y-branches.
 - a. Branch fittings from oval main duct shall be lateral round taps located on the minor axis and shall be at no less than a 45° angle.
 4. 45-Degree lateral tee whenever possible.
 5. Die-Stamped elbows, R/D = 1.5 (Min.).
 6. Radiused, Angled (15° Max.), or Mitered (15° Max.) offsets.
 7. Concentric Transitions, $\theta = 45^\circ$ Max.
 8. Eccentric Transitions, $\theta = 30^\circ$ Max.
- C. Connections shall be flanged, gasketed and "slip & drive" style connection utilizing a 1/4" thick neoprene gasket between the two flanges.

2.5 DUCT CONNECTORS

- A. Rectangular Duct Connectors
 1. Shall be equal to Ductmate Industries "25 and "35" may be used on rectangular ductwork except where welding or brazing is specifically required. Adhere strictly to manufacturers instructions.
- B. Round duct branch connection to rectangular sheet metal duct
 1. Shall be equal to Flexmaster Series FL, straight side with or without manual damper, as described on the drawings. Connectors installed on interior lined rectangular duct shall have an integral insulation guard sleeve.

C. Rectangular tap-to-round branch connection with static boot configuration

1. Shall be equal to Flexmaster USA Type STO. Buckley "Air-Tite" Bellmouth BM and BM-D fittings with neoprene gasket and adhesive facing may be used for duct taps to rectangular sheet metal duct which is not internally lined.

2.6 SEALANT AND GASKETS

A. Duct sealant materials shall be:

1. Water based synthetic latex emulsion duct sealant equal to Ducmate PROSeal.
 - a. No V.O.C.'s
 - b. UL 181B-M Listed, UL 723 classified
 - c. For applications up to 15" w.g.
 - d. Gray Color

B. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

B. Hanger Rods

1. Noncorrosive Environments: Cadmium-plated steel rods and nuts.
2. Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables

1. Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
2. Stainless-Steel Ducts: Stainless steel complying with ASTM A492.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
2. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

B. Ductwork Coordination

1. General Coordination – Coordinate duct layout carefully with other trades to avoid conflict with structural elements, lighting and plumbing- heating piping. Flattening of ductwork and offsets to fit ductwork in available space is generally shown. In the absence of such, the Contractor shall arrange the ductwork to maintain concealment and allow ceilings and lights to be installed as intended. Do not hang ductwork until possible interferences with electrical and mechanical trades have been resolved. Having ductwork fabricated and delivered in advance shall not be justification for interference with other trades.
2. Coordination Drawings – The HVAC Contractor shall provide a complete set of ¼" = 1'-0" sheet metal fabrication drawings. The drawings shall be noted with duct size and installation elevations from the finished floor. The drawings shall be used for overall coordination with the other trades. Meet with the other trades prior to developing and finalizing these drawings.

C. Joints & Seals

1. Transverse joints and longitudinal seams shall be assembled with sealant to conform to SMACNA Class B seal. Selection of sealant materials shall be compatible with the application. Sealants shall be applied in accordance with the manufacturer's recommendations.
2. Exterior ductwork shall be sealed with mineral impregnated fiber tape. Ductwork shall be supported as noted or detailed on the drawings.
3. System Pressure Testing – Ductwork systems operating at 3" S.P. or greater (positive or negative) and all exterior ductwork shall require duct pressure testing.

D. Hangers, Straps & Supports – Attachment of hangers, straps, and supports to the structure shall be as follows:

1. Concrete Construction
 - a. Pre-set concrete inserts – In concrete construction of 4" minimum depth.
 - b. After-set concrete inserts – In 4" minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.

2. Steel Construction – Utilize beam clamps in steel beam construction. For steel joists, provide clamps or threaded rod, nuts and washers through the bottom chord. Provide anchoring where clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.
3. Wood Construction – Side beam bracket in wood construction, secured to the wood joist with lag screws set in drilled pilot holes.
4. Unistrut Channel – Unistrut type channel support systems may be utilized. Channels should be attached to the structure with inserts or clamps. Utilize threaded rod and appropriate attachments with channels as required.
5. Deck Mounting – *Attachment to steel deck is prohibited.* Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical. This does not apply to steel decks with concrete slab poured on the deck. Refer to Parts A. and B. above.
6. Supplemental Steel - Supplemental steel shapes intended for ductwork support are to be provided by the H.C.
7. Refer to Drawings for additional notes on supports and hangers.

E. Duct Routing and Penetrations

1. General Coordination – Coordinate openings required for the passage of ductwork through walls, partitions, floors and roofs with the General Contractor.
2. Electrical Coordination – Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures. Ductwork shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment in accordance with NEC.
3. Cutting – Cutting of the existing structure i.e. roof, walls, floors, etc. shall be by the HVAC Contractor.
4. Wall Penetrations
 - a. Non-Fire-Rated Penetrations – Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
 - b. Fire-Rated Penetrations – Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers where required or fire seal perimeter of duct when no damper is required. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
5. Structural Support for Penetrations –Supplemental steel structural members required to support penetration openings in the structure for ductwork shall be provided by:
 - a. The General Contractor.

Refer to drawings for locations and additional details, but are to include wall, floor, and roof penetrations.

6. Sleeves & Concrete Curbs

- a. Sleeves – Sheet metal sleeves in conjunction with fire dampers shall be placed in walls and floors to pass ductwork. Floor sleeves shall project 4” above the finished floor in equipment rooms and areas of similar usage, and shall form a waterproof seal.
- b. Concrete Curbs – Exceptions to sleeves shall be at locations where the opening is protected from drainage falling thru by means of concrete curbs or shaft walls. This Contractor shall be responsible for providing 4” high x 4” wide concrete curbs with beveled edges to protect floor openings related to his work in equipment rooms or providing an equal effective waterproofing metal curb, if not specifically included in the General Contract.

F. Duct Protection & Cleaning

1. Protect duct interiors from moisture, construction debris and dust, and other foreign materials by covering each open end of the duct with visqueen secured with duct tape before the end of each day’s work. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines.”- Duct Cleanliness Level – Advanced.
2. Due to the high level of cleanliness required, the Contractor shall take extreme care in erecting and maintaining a clean duct system. Each duct section shall be wiped out with a wet cloth and dried with a clean, dry cloth immediately before installation. Before the end of each day’s work, all open ductwork, fittings and air devices shall be sealed with heavy visqueen plastic and completely taped around all edges. Just prior to starting the air system, the visqueen barriers shall be removed and a temporary filter shall be placed over all return air openings or registers. Secure the filters firmly in place. If deficiencies in storing practices are found by the Engineer, the Contractor will be required to thoroughly clean all interior surfaces with alcohol prior to installation.

G. Interior insulating duct liner shall be installed in strict accordance with manufacturer’s printed instructions and SMACNA standards. Liner in rectangular duct shall be shop applied with adhesive over 90% of the surfaces and with weld pins. Liner in round duct shall be installed per manufacturer’s instructions. Edges not factory sealed, cut edges and all joints shall be coated and closed with an adhesive-sealant, both in shop fabrication and field assembly. Leading edges shall be protected with metal “Z” or channel nosing where air velocity exceeds 3,000 fpm. Duct liner shall be protected from getting wet or dirty while being transported to the building site, stored on site and after installation.

H. Painting

1. Where interior duct surfaces are visible through grilles, registers, diffusers and louvers, the inside of the duct shall be coated with flat black paint before the device is installed, to eliminate obtrusive appearances.
2. All exposed ductwork not installed with insulation in finished spaces to be painted shall be prepared for painting by the General Contractor to match Architect’s base material colors.

END OF SECTION 23 3113

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Air Control Dampers & Accessories
 - a. Manual balancing dampers.
 - b. Backdraft dampers.
2. Life Safety Dampers & Accessories
 - a. Fire dampers.
 - b. Smoke dampers.
 - c. Combination fire-smoke dampers.
3. Pressure Differential gauges.
4. Turning vanes.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Air blenders.
9. Sound attenuators:
 - a. Duct Silencer
 - b. Return Air Canopy

B. Related Sections:

1. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.
2. Division 23 Section "Ductwork" for ductwork materials, requirements, and schedules.
3. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.

- d. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 AIR CONTROL DAMPERS & ACCESSORIES

A. MANUAL BALANCING DAMPERS & ACCESSORIES

1. Steel Rectangular Dampers

- a. Construction
 - 1) General – Single cross-blade up to 12 blade widths and in larger sizes, multiple blade type 6" maximum width with opposed blade arrangement.
 - 2) Frame – 16 ga., galvanized steel hat channel with reinforced corners
 - 3) Blades – 14 ga., galvanized steel, one piece airfoil shape, parallel blade. Synthetic blade edge seals.
 - 4) Jamb Seals – 300 Series stainless steel cambered compression type.
 - 5) Linkage – Out of airstream steel assembly
 - 6) Leakage Class – Class 1A
- b. Manufacturers
 - 1) Ruskin CD60 or approved equal by
 - 2) Greenheck
 - 3) Nailor
 - 4) Pottorff

2. Aluminum Rectangular Dampers

- a. Construction
 - 1) General – Single cross-blade up to 12 blade widths and in larger sizes, multiple blade type 6" maximum width with opposed blade arrangement.
 - 2) Frame – 16 ga., extruded aluminum hat channel with reinforced corners
 - 3) Blades – heavy gage extruded aluminum, one piece airfoil shape, parallel blade. Synthetic blade edge seals.
 - 4) Jamb Seals – Flexible metal compressible type.
 - 5) Linkage – Out of airstream steel assembly.
 - 6) Leakage Class – Class 1A.
- b. Manufacturers
 - 1) Ruskin CD50 or approved equal by

- 2) Greenheck
- 3) Nailor
- 4) Pottorff

3. Steel Round Dampers

- a. Construction
 - 1) General – Single blade design.
 - 2) Frame – 20-ga. galvanized steel.
 - 3) Blades – 20-ga. galvanized steel.
 - 4) Control Shaft – Square axle shaft.
 - 5) Max Velocity – 1500 fpm.
- b. Manufacturers
 - 1) Ruskin #MDRS25 or approved equal by
 - 2) Greenheck
 - 3) Nailor
 - 4) Pottorff

4. Damper Adjustment Handle

- a. Construction
 - 1) General – Locking quadrant positioner with handle
 - 2) Handle – Heavy gage steel handle to accept square rod.
- b. Schedule
 - 1) Uninsulated ductwork – Ventfabrics "Ventlock" #641
 - 2) Externally insulated ductwork – Ventfabrics #644
- c. Manufacturers
 - a) Ventfabrics
 - b) Duro Dyne
 - c) DynAir

B. BACKDRAFT DAMPERS

- 1. Construction
 - a. General – Adjustable, counterbalanced type.
 - b. Frame – Extruded aluminum, 12-ga., galvanized steel brace at corners.
 - c. Blades – Extruded aluminum with extruded vinyl blade edge seals mechanically locked into blade edge.
 - d. Bearings – Corrosion resistant, synthetic type.
 - e. Counterbalance – Zinc plated bar on blades.
- 2. Manufacturers
 - a. Ruskin #CBD6 or approved equal by:
 - b. Greenheck
 - c. Nailor
 - d. Pottorff

2.2 LIFE SAFETY DAMPERS & ACCESSORIES

A. FIRE DAMPERS

1. Compliance – Dampers shall be constructed and tested to conform with UL 555 and shall be UL listed. AMCA Leakage Classes.
2. Construction
 - a. General – Dynamic rated, folded blade curtain type with blades folded in the head of the damper housing. Equipped with a 165°F fusible link (unless otherwise noted).
 - b. Horizontal Air Streams – Gravity-drop type.
 - c. Vertical Air Streams – Spring-loaded type.
3. Damper Schedule – The following is a description of the fire damper types as indicated on the plans:
 - a. TYPE “B”
 - 1) Low velocity with blades stored out of the air stream.
 - b. TYPE “C”
 - 1) High velocity with blades stored out of the air stream and rectangular, round, or oval duct collar each side.
 - c. TYPE “D”
 - 1) Horizontal ceiling radiation classified damper, folded type equal to Ruskin CFD and CFDR, with coated fire-retardant fabric over blades, and spring-closing mechanism. Dampers are to be mounted in conjunction with diffusers, grilles, and registers in fire rated ceiling assemblies to maintain fire integrity of the UL listing of the floor-ceiling or roof-ceiling assembly. Installation shall conform to manufacturer’s instructions for mounting, connection and support or dampers and insulating board protection over diffusers and duct above.
 - d. TYPES “BB” and “CC” – (3-hour)
 - 1) Duct fire doors similar to Ruskin IBD 23, identical in configuration to Types “B” and “C” fire dampers respectively. Fire doors shall be designed specifically for application in ducts or in fire wall openings, shall bear a UL fire door label for a 3-hour rating (Class A opening) and conform to NFPA 90A, Paragraph 3-3.1.
4. Controls – Fire dampers located at double wall locations shall be provided with a closed position proving micro-switch. Switch shall change state if the fusible link releases and closes the fire damper. The switch shall be equal to Honeywell BX-2RW863-A2.
5. Manufacturers
 - a. Ruskin
 - b. Greenheck
 - c. Pottorff
 - d. Nailor
 - e. Duro Dyne

2.3 PRESSURE DIFFERENTIAL GAUGES

- A. Pressure differential gauges for air filter application shall be dial type gauges. Range shall be appropriate for the application. Gradations shall read in inches w.c.
- B. Each gauge shall be furnished with vent valves, aluminum or plastic tubing, static pressure tips and mounting bracket or flange.
- C. Manufacturer
 - 1. Dwyer "Magnehelic" Series 2000 or approved equal.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for 36" wide and larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

- A. Duct Access Doors – Doors shall be factory fabricated with following characteristics:
 - 1. Construction Material – Constructed of the same material as the ductwork system served (except galvanized sheet metal for fiberglass duct).
 - 2. Door Thickness – Doors located in:
 - a. Insulated ductwork (internal and/or external) shall have double-wall insulated doors, thickness as required per the insulation schedule.
 - b. Uninsulated ductwork shall have single-wall construction.
 - 3. Hinge – Continuous Piano Hinge. 1.5" wide steel construction, zinc plate.
 - a. Ventfabrics #Ventlok 157 or equal.

4. Latches – Provide the following type of latch for each application:
 - a. Low pressure ductwork (1” w.c. or less) – Cam lock type latches.
 - b. High Pressure ductwork (greater than 1” w.c.) – Heavy duty handle type latches.
 5. Frame & Seal – Frame and neoprene gasket between door and frame.
 6. Size – Access doors shall be 18” x 16” minimum except smaller where duct size will not permit such size.
 7. Pressure Application – Access doors and panels shall be designed to provide tight seal commensurate with the duct system operating pressure. Apply duct sealer or rubber gasket between frame and duct and on ducts of 3” S.P. and higher construction class, mechanical fastening of the frame and rubber gasket shall be provided.
 8. Removable Sash Access Door – Where sufficient clearance is not available to allow the door to swing open 90 degrees or for round ductwork, a removable access panel with neoprene gasket, frame and cam lock latches on all four sides shall be provided in lieu of the hinged door.
- B. Large Plenum Access Doors – doors shall be factory fabricated and as described for duct access doors except that doors shall be 18” x 48” (unless otherwise noted) with overlapping frame,
1. Construction Material – Constructed of the same material as the ductwork system served (except galvanized sheet metal for fiberglass duct).
 2. Door Thickness – Doors located in:
 - a. Insulated ductwork (internal and/or external) shall have double-wall insulated doors, thickness as required per the insulation schedule.
 - b. Uninsulated ductwork shall have single-wall construction.
 3. Hinge – Continuous piano hinge. 2” wide steel construction, zinc plated. Ventfabrics #Ventlok 167 or equal.
 4. Latches – Heavy duty type. Lever both outside and inside. Ventfabrics #Ventlok No. 310 or equal.
 5. Latch Quantity – Two latches shall be provided, except on doors 50” and higher three shall be provided.
 6. Frame & Seal - Shall be mechanically fastened to the plenum wall.
 7. Pressure Application – Access doors and panels shall be designed to provide tight seal commensurate with the duct system operating pressure. Apply duct sealer or rubber gasket between frame and duct and on ducts of 3” S.P. and higher construction class, mechanical fastening of the frame and rubber gasket shall be provided.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 30 oz./sq. yd.
 2. Net Fabric Width: 4" wide.
 3. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 4. Service Temperature: Minus 40 to plus 200°F.
- E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd.
 2. Net Fabric Width: 4" wide.
 3. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 4. Service Temperature: Minus 50 to plus 250°F.

2.7 FLEXIBLE DUCTS

- A. Flexible insulated duct shall be constructed of galvanized steel spiral wire mechanically locked to an airtight aluminum or polyester inner core, 1" thick 3/4 lb. density fibrous glass insulation and a polyethylene or reinforced metalized vapor barrier outer jacket equal to Flexmaster Type 5 or 5M. Duct shall be rated at a minimum of 6" positive and 4" negative static pressure and shall be listed as Class 1 Air Duct or Air Duct Connector with 25-50 flame-smoke ratings per UL 181 and comply with NFPA 90A.
- B. Non-insulated flexible duct equal to Flexmaster NI-85 may be used on duct systems not specified to be insulated, with similar restriction stated above.
- C. Flexible duct shall be used at final connections to air control terminal units and ceiling air diffusers except as limited in Part 3.

2.8 SOUND ATTENUATORS

- A. Duct Mounted Silencer
1. Sound attenuators shall be constructed of sheet metal with inner perforated metal lining and baffles backed with sound absorbing fiberglass, designed for maximum attenuation with minimum air resistance.
 2. Dynamic insertion loss in Decibels for a 5 ft. rectangular unit shall be:

<u>Octave Band</u>	<u>dB</u>
1	6
2	10
3	18
4	30
5	42
6	33
7	22
8	11

3. Units shall be:
 - a. Industrial Acoustics "Quiet Duct" Type MS or equal by
 - b. Semco

c. Vibro-Coustics.

B. Return Air Canopy

1. Performance – ASHRAE, SMACNA pressure and velocity classifications and ASTM E477, ASTM E84 25/50 Flame/Smoke Spread
2. Construction – 20-gauge solid steel casing, absorptive acoustic fiberglass acoustic media. Fiberglass to be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin.
3. Manufacturer:
 - a. Price Industries
 - b. Titus
 - c. Tuttle & Bailey

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

1. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
2. Materials – Install duct accessories of materials suited to duct materials use:
 - a. Galvanized-steel accessories in galvanized-steel and fibrous-glass ducts,
 - b. Stainless-steel accessories in stainless-steel ducts,
 - c. Aluminum accessories in aluminum ducts,
 - d. Or as noted above.

B. BACKDRAFT DAMPERS

1. Install at discharge of exhaust fans at least one half the fan diameter away from fan.

C. FIRE DAMPERS

1. Fire dampers shall be installed in conformance with the manufacturer's instructions and SMACNA recommendations.
2. Dampers shall be installed in sheet metal wall or floor sleeves along with retaining angles and duct access doors or panels. Sleeve and duct connections shall be breakaway type or rigid type with corresponding gauge requirements in accordance with SMACNA recommendations.

D. VOLUME DAMPERS

1. Locations:
 - a. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.

- b. Install volume damper upstream/downstream of each supply, return or exhaust air device, register or grille.
 - c. Volume dampers shall be in accessible locations for testing, balancing, and adjusting purposes. Coordinate with reflected ceiling plans.
2. Lined Ductwork – Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
3. Install steel volume dampers in steel ducts.
4. Install aluminum volume dampers in aluminum ducts.
5. Set dampers to fully open position before testing, adjusting, and balancing.

E. PRESSURE DIFFERENTIAL GAUGES

1. Install air filter pressure differential gauges in a readable location on or near the air handling unit, filter housing or as otherwise indicated on the drawings.

F. ACCESS DOORS

1. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - a. On both sides of duct coils.
 - b. Upstream / and downstream from duct filters.
 - c. At outdoor-air intakes and mixed-air plenums.
 - d. At drain pans and seals.
 - e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - f. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - g. For control devices requiring inspection.
 - h. Elsewhere as indicated.
2. Install access doors with swing against duct static pressure to ensure closure.
3. Label access doors according to Division 23 Section "Identification for HVAC System" to indicate the purpose of access door.

G. FLEXIBLE CONNECTORS

1. Location: Install flexible connectors to connect ducts to equipment.
2. For fans developing static pressures of 5-inch w.g. and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

H. FLEXIBLE DUCTS

1. Connect flexible ducts to metal ducts with Panduit straps or stainless-steel clamps. End of the insulation and jacket shall be sealed to the metal duct with double wrapped duct tape. Maximum length of flexible duct shall be:
 - a. Terminal units to supply ducts – 3 ft.
 - b. Air devices to ducts – 7 ft.
2. Flexible duct installation locations:
 - a. Shall be installed:
 - 1) At final air devices above accessible ceilings.
 - b. Shall *not* be installed:
 - 1) Where ductwork is exposed.
 - 2) Above inaccessible ceilings – coordinate with reflected ceiling plan.
 - 3) Through any wall, ceiling, floor, or fire rated assembly.
 - 4) In the immediate vicinity of, and connecting to, air devices in fire rated ceilings where the assembly details require steel ductwork.

I. SOUND ATTENUATORS

1. Return Air Canopy – Install above return air device per manufacturer's recommendations in lieu of shop-fabricated plenum per detail.

END OF SECTION 23 3300

SECTION 23 3400 - FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Downblast Power Roof Ventilator.
 - 2. Upblast Power Roof Ventilator.
 - 3. Ceiling Mounted Centrifugal Fan.
 - 4. Ceiling Circulation Fan
- B. Related Sections
 - 1. 23 0513 Electrical Requirements for HVAC Equipment
 - 2. 23 0531 Equipment Drives
 - 3. 23 0548 Vibration Control

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Fans shall be constructed, rated and labeled in accordance with AMCA Standard 210-67. Fans shall be statically and dynamically balanced throughout the operating range.
- B. Where the Class (I, II, III, etc.) of fan is stated, the class shall be adequate for the duty specified plus a 25 percent increase in static pressure. No infringement will be allowed on this requirement.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- E. UL Standard: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fans shall be provided as specified below and shown on the drawings, complete with motors, drives and associated devices.
- B. All fans of any one listed type shall be of the same manufacturer.
- C. Fan motors shall be direct drive, ECM type. Refer to Section 23 0513 Electrical Requirements for HVAC Equipment.
- D. Motorized backdraft dampers, where specified, shall be furnished with a 120V actuator. Refer to HOA controller details on HVAC drawings for additional information.
- E. All fans shall be provided with a Hand/Off/Auto controller from the unit manufacturer.

2.2 MOTORS

- A. Refer to Section 23 0513 - Electrical Requirements for HVAC Equipment

2.3 DOWNBLAST POWER ROOF VENTILATOR

- A. Construction – Power roof ventilator shall consist of a spun aluminum weather hood, counterflashing base, vertical shaft open centrifugal wheel, direct drive ECM, motor disconnecting means in the motor compartment, motorized backdraft damper and bird screen.
- B. Mounting – A 24” high insulated metal roof curb with straight edges and wood nailer on top shall be provided with each fan. Provide wood cant strips around the curb only if recommended for the roofing system.
- C. Accessories – A motorized backdraft damper and bird screen shall be provided with each fan except that for kitchen range hood.
- D. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:
 - 1. Greenheck
 - 2. Cook
 - 3. Twin City Fan

2.4 UPBLAST POWER ROOF VENTILATOR

- A. Construction – Upblast power roof ventilator shall consist of a spun aluminum weather hood with arrangement for upward discharge, counterflashing base, vertical shaft open centrifugal wheel, direct drive ECM, motor disconnecting means in the motor compartment

- B. Accessories – A motorized backdraft damper and bird screen shall be provided with each fan except that for kitchen range hood.
- C. Mounting – A 24” high insulated metal roof curb with straight edges and wood nailer on top shall be provided with each fan. Provide wood cant strips around the curb only if recommended for the roofing system.
- D. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:
 - 1. Greenheck
 - 2. Cook
 - 3. Twin City Fan

2.5 CEILING MOUNTED CENTRIFUGAL FAN

- A. Ceiling fan shall consist of a centrifugal fan or fans with forwardly curved blades, direct connected motor with internal overload protection, motor disconnecting plug, sheet metal housing with ½” acoustical liner, discharge duct collar with gravity damper and finished metal or plastic ceiling grille.
- B. Fan shall be furnished with a solid state speed controller with off-position and cover plate. The speed controller shall be turned over to the Electrical Contractor for installation.
- C. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:
 - 1. Greenheck
 - 2. Cook
 - 3. Twin City Fans

2.6 CEILING CIRCULATION FAN

- A. Fan shall be ETL certified and built pursuant to construction guidelines set forth by UL standard 507 and CSA standard 22.2. The fan components shall be designed specifically for high volume, low speed fans to ensure lower noise operation. Sound levels from the fan operating at maximum speed shall not exceed 55 dBA, as measured on the floor below the fan and 20 feet horizontally from the center of the fan.
- B. Airfoils:
 - 1. Fan shall be equipped with ten (10) high volume, low speed airfoils, fabricated of extruded aluminum alloy. Airfoils shall be connected by means of two (2) locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
- C. Winglets:

1. Each airfoil shall be equipped with winglets designed to redirect outward airflow into downward airflow. The winglets shall be molded of high density polypropylene. Winglets shall be attached to the tip of each airfoil by means of a barrel screw.
- D. Motor:
1. The fan motor shall be an AC induction type inverter rated at 1725 RPM. Motor shall be totally enclosed, fan cooled (TEFC) with an IP55 NEMA classification. Motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in -30 deg F. to 122 deg. F ambient conditions.
- E. Gearbox:
1. The gear box shall include a high efficiency, hermetically sealed, nitrogen filled, offset helical gear reducer with two stage gearing, hollow output shaft, cast iron housing, double lip seals, high quality bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit.
 2. Gearbox shall be equipped with a passageway in which wiring, piping, etc can be routed below the fan. A non-rotating, standard junction box with aluminum cover shall be provided at the base of the fan for installing future optional features.
- F. Mounting Post:
1. Fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and upper mounting system. Mounting post shall be a minimum 3"x3" square tubing and powder coated for corrosion resistance.
- G. Hub:
1. The fan hub shall be precision cast aluminum alloy for high strength and light weight. The hub shall be secured to the output shaft of the gearbox by means of a steel flange interface. Both hub and flange shall be machined to achieve a well balanced and solid rotating assembly. The hub shall incorporate a minimum of five (5) safety retaining clips made of 1/4" thick steel that shall restrain the hub/airfoil assembly in case of gearbox output shaft failure.
- H. Mounting System:
1. The fan mounting system shall be designed for secure installation from a structural support beam(s). All components in the mounting system shall be of welded construction using low carbon steel no less than 3/16" thick and be powder coated for appearance and resistance to corrosion. All mounting bolts shall be SAE Grade 8 or equivalent.
- I. Safety Cable:
1. The fan shall be equipped with a safety cable that provides and additional means of securing the fan assembly to the building structure. The safety cable shall be 3/8" diameter and fabricated of 7 x 19 stranded galvanized steel. The loops shall be secured with swaged fittings, pre-loaded and tested to 3,000 lb-f.
 2. Field construction of safety cables is not permitted.
- J. Controller:
1. The fan controller shall be constructed using a Variable Speed Drive that is pre-wired to the motor and factory programmed to minimize the starting and braking torques, for smooth and efficient operation. The controller shall be pre-wired to the motor using a short run of flexible conduit THHM with a dedicated ground conductor to minimize

- electromagnetic interference and radio frequency interference. An incoming power cord shall also be pre-wired to the controller for ease of installation.
2. The controller shall be contained within a completely sealed aluminum enclosure with an IP45 NEMA classification. The controller shall be secured to the mounting post 'onboard' the fan assembly.
- K. Wall Control:
1. The fan shall be equipped with a remote wall control. The wall control shall be a digital keypad device mounted inside an aluminum bezel. The bezel shall be capable of mounting to a standard wall box. The wall control shall be equipped with a touchpad control and an LED display for controlling the fan's direction, operation, and speed.
 2. Communication with the fan drive controller shall be by a standard CAT-6 Ethernet cable that is field provided by the E.C.
 3. Wall control shall be equipped with a simple diagnostic program to identify faults in the system. Wall remote device shall be capable of retrieving fan operation and diagnostic data (fault messages).
- L. Special Equipment Warranty:
1. In addition to the 1 year parts and labor warranty described in the front end construction documents, the following special warranties shall be provided by the manufacturer.
 - a. Airfoils – Lifetime Parts warranty
 - b. Hub – Lifetime Parts warranty
 - c. Motor – 10 year Parts warranty
 - d. Gearbox – 10 year Parts warranty
 - e. Controller – 10 year Parts warranty
- M. Fans shall be manufactured by:
1. Big-Ass Fans
 2. Greenheck
 3. Cook

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fans and roof curbs level and plumb, in accordance with manufacturer's written instructions.
- B. Support units as described below using the vibration control devices specified in Section 23 0548 Vibration Control.
1. Base mounted unit: Set unit on equipment base using vibration isolators as specified. Secure unit to equipment base.
 2. Roof curb mounted units: Set unit on the curb and fasten the fan base to the curb.
 3. Suspended unit: Suspend unit from structural steel support frame using threaded steel rods and vibration isolation springs.

4. Wall mounted units: Mount unit from wall angle with housing or collar. For masonry applications, mount directly to wall.
- C. Arrange installation of fans to provide access space around fans for service and maintenance.
- D. Adjust damper linkages for proper damper operation. Motorized backdraft dampers are to be wired by the Electrical Contractor to open when the fan operates.
- E. Perform the following operations and checks before start-up.
1. Remove shipping blocking and bracing.
 2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork and electrical are complete. Verify proper thermal overload protection is installed in motors starters and disconnects.
 3. Verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Align belts and reinstall belt guards.
 4. Lubricate bearings, pulleys, belts and other moving parts with factory-recommended lubricants.
 5. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full open position.
- F. Mechanical equipment and supports that are exposed to wind shall be designed and installed to resist the wind pressure determined in accordance with the building codes. Refer to specification 23 0530 for additional requirements.

END OF SECTION 23 3400

SECTION 23 3600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single-duct air terminal units

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- D. Terminal units shall be certified to comply with ARI Standard 880.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unit sizes (inlet duct dimension) shall conform to those listed on the drawings except where larger size is required (or smaller size is acceptable) to meet noise or operational requirements. Resultant noise level from the control unit, ductwork and diffusers, as a system, shall not exceed a room NC level of 25 from both airborne and radiated noise, based on a 10 db room absorption coefficient, with 1.5" s.p. differential across the unit at maximum cfm setting. Sound performance shall be ARI certified.
- B. Pressure drop thru the terminal unit and hot water coil shall not exceed the maximum drop listed on the drawings. The coil face area shall be upsized if necessary to meet this requirement. The terminal unit casing shall be correspondingly upsized or the larger coil furnished separately.

For a separately furnished coil and intervening duct transition, with internal insulation same as that in the terminal unit casing, shall be provided.

2.2 COMPONENTS AND ACCESSORIES

- A. Casing Construction – Unit casing shall be 22-gauge minimum thickness, galvanized or galvanized sheet metal with beaded round inlet duct connection. Provide galvanized construction for use in exposed locations for field application of paint.
- B. Casing Liner – Casing shall be lined internally with:
 - 1. Material – Unit casing liner shall be of the following construction:
 - a. Standard Construction – 1” thick, 4 p.c.f. dual density aluminum foil faced rigid fiberglass board.
 - b. Mylar, Tedlar or similar facing materials are not acceptable.
 - 2. In lieu of foil facing, sheet metal liner may be provided.
 - 3. Acoustical considerations must be fully addressed.
 - 4. Performance – Minimum R-Value = 4.0.
 - 5. Sealing & Enclosure – Edges, joints and other exposures shall be additionally coated with approved sealants and/or protected with metal edging.
 - 6. Compliance – Insulation and facing lining shall meet:
 - a. UL 181 air erosion/ mold growth & humidity standards.
 - b. UL 723/NFPA 90A for 25/50 fire and smoke requirements.
 - c. ASTM C665 biological and fungi standards.
- C. Fan Blower (Fan Powered Units Only) – Blowers shall be constructed of steel with forward curved blades, dynamically balanced wheels and direct drive motor. Unit shall include a backdraft damper at the fan section outlet to prevent cold primary air from flowing back through the fan into the ceiling plenum. Motor shall be an ECM DC brushless motor complete with and operated by a single-phase integrated controller/inverter that operates the wound stator and sensor motor position to electronically commutate the stator. All motors shall be designed for synchronous rotation. Motor shall maintain a minimum of 70% efficiency over its entire operating range. Motor shall be direct coupled to the blower. Provide isolation between the motor and the blower assembly. Unit shall include a manual fan speed control for field adjustment of fan air flow set point.
- D. Hot Water Reheat Coil
 - 1. Certifications – Coil shall have ARI certified ratings and shall be hydrostatically tested at 200 psi.
 - 2. Coil Construction – Coil shall consist of copper tubes, aluminum fins and galvanized steel casing. Coils shall be provided with appropriate fins per inch to satisfy the required scheduled capacity per the contract drawings.
 - 3. Air Vent – Provide a manual air vent on the coil.
 - 4. Hot water control valve shall be furnished by the Temperature Controls Contractor.
- E. Electrical Reheat Coils
 - 1. Certifications – Coil shall be ETL listed to UL 1995 approved and provided by the terminal unit manufacturer.
 - 2. Coil Construction – Open coil heater elements of high grade 80/20 resistance wire, 45 watts per square inch maximum density.

3. Control Panel Enclosure - Safety and control devices shall be mounted in a NEMA 250 Type 1 control panel attached to the coil. Devices shall include:
 - a. Power disconnect switch with “dead front” feature associated with the hinged cabinet door,
 - b. Magnetic contactor(s),
 - c. Primary automatic reset high temperature limit switch,
 - d. Secondary manual reset high temperature limit cutout,
 - e. Minimum differential pressure air flow switch,
 - f. Fused control transformer,
 - g. Terminal strips for power and control wiring.
 - h. Silicon-controlled-rectifier (SCR) controller.
 4. Wiring – The coil and devices shall be factory wired. Control wiring shall be arranged to ensure that the damper actuator and contactor(s) are properly sequenced for control.
 5. Insulation – Coil to be provided with fiberglass insulation from factory.
 6. Electrical Connection – Units with Fan motors and electric reheat coils shall be provided with a single point power connection.
- F. Air Flow Control Damper or Valve – Damper or valve shall have linear control characteristics and shall be 16-gauge galvanized steel or extruded aluminum with gasketing and self-lubricating bearings.
- G. Velocity Sensor – Multi-point averaging type. The velocity sensor shall be mounted in the inlet air stream and shall amplify the air flow signal to provide accurate control at low, as well as high, inlet static pressure conditions. The required minimum static pressure of the volume regulator shall not exceed 0.25 in. w.g. for proper operation.
- H. Air Flow Taps – Taps and differential pressure airflow device shall be provided to enable direct reading of total and static pressures. A conversion chart shall be attached to each unit to convert pressure readings to air flow quantities.
- I. Bottom Access Doors – Units with a heating coil section shall be provided with an access door on the upstream side of the coil. Access doors shall be insulated type with edge seals and either snap or quarter-turn sash latches, screws will not be acceptable. Access doors shall be provided at the bottom of the unit unless otherwise noted.
- J. Air Leakage – Casing leakage and damper leakage shall each not exceed 2% of maximum air flow cfm at 3.0” s.p. differential across the unit.
- K. Controls Enclosure – Units installed in a return air plenum shall have a sheet metal housing to enclose non-plenum-rated control devices and wiring which are mounted on the exterior of the casing.

2.3 MANUFACTURERS

- A. Units shall be manufactured by:
1. Price
 2. Titus
 3. Trane
 4. Tuttle & Bailey

5. Enviro Tech
6. Krueger

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unit Supports – Support the units from the building structure with steel shapes, solid steel hanger rods or sheet metal strap hangers. Units shall not be supported by the ceiling suspension system.
- B. Unit Access Coordination
 1. Coordinate unit locations with ceiling components, light fixtures, and other equipment, services, elements or obstructions to ensure adequate clearance for access and servicing.
 2. Provide ceiling access panels where the ceiling system does not afford ready access.
 3. Coordinate right/left hand connections prior to placing order. Units ordered with coil connections and/or control enclosure boxes on inaccessible sides shall be re-ordered, the mounting of units “up-side-down” is not acceptable.
- C. Hot Water Connections – Connect supply and return piping to each hot water coil with shut-off valves, balancing valves, and unions. Provide a manual air vent at the coil. Automatic control valves shall be furnished by the Temperature Control Contractor and installed by the HVAC Contractor.
- D. Electrical Connections – Coordinate power connections with the E.C. where required.
- E. Temperature Controls Devices
 1. The Temperature Controls Contractor shall furnish the following:
 - a. The digital controller
 - b. Damper operator and linkage
 - c. Hot water control valve.
 - d. Space temperature sensor
 - e. Duct mounted discharge air temperature sensor.
 2. The digital controller, damper operator and linkage, furnished by the Temperature Controls Contractor, are to be sent to the terminal unit manufacturer for factory mounting. Coordinate accordingly.
 3. Refer to the Temperature Control specification sections and Drawings for additional control devices and points and coordinate to provide a complete and operational system.

END OF SECTION 23 3600

SECTION 23 3713 - DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grilles
2. Registers
3. Diffusers
4. Louvers
5. Special Air Diffusion Devices

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, grilles, and return air canopies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

- A. Air outlet and inlet devices shall be equal to those specified by catalog number and description in the schedule on the drawings. Damper operators shall be concealed screw type. An auxiliary mounting frame shall be furnished with each grille and register except those mounted on exposed ducts or in lay-in application.
- B. Linear "T" bar air supply diffusers shall be slotted diffusers with fixed air pattern control complete with a galvanized sheet metal supply plenum having a round or oval duct connection and 1/2" neoprene coated fiberglass insulation on the interior. The unit shall be designed to mount on or alongside the ceiling "T" bar and shall include flanges on both sides of the diffuser to support the ceiling tiles. Additional "T" bars matching those of the ceiling system shall be provided by the HVAC Contractor if the diffuser does not have these flanges. Units shall have a center notch where required to accommodate intervening "T" bars.

C. Manufacturers:

1. Price
2. Titus
3. Tuttle & Bailey
4. Krueger

2.2 LOUVERS

- A. Louvers shall be exterior weatherproof-type equal to those scheduled and shown on the drawings. Louvers shall be assembled entirely by welding. Louvers shall withstand uniform wind loading pressure of 20 psf. Performance data indicating pressure loss and water penetration, derived from AMCA 500 testing, shall be included with submittals.

1. Aluminum Louvers
 - a. Construction – Extruded 12 ga. aluminum frame and drainable, stationary blades.
 - b. Finish – R1 caustic etch and finished with Kynar 500 (or equivalent) fluoropolymer finish. Color is to be selected by the Architect from the manufacturer's standard colors.
2. Accessories – Bird screen shall be ½" square mesh aluminum wire on the interior face of the louver attached at 12" centers on the perimeter.

B. Manufacturers:

1. Airolite
2. Greenheck
3. Pottorff
4. Ruskin

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Ceiling System Verification – The Contractor shall be responsible for comparability of ceiling mounted devices with the ceilings and suspension systems (lay-in, concealed spline, plaster, drywall, etc.). Verify with architectural drawings.
- B. Alignment and Supports – Carefully align square and rectangular devices with the vertical and horizontal building lines. Diffusers shall be attached rigidly to the ductwork. Where connected by flexible ducts, special flexible duct supports shall be provided, either from the ceiling suspension system or by independent suspension wires or rods from the building structure.
- C. Painting – Paint interior visible surface of ductwork behind grilles, registers, diffusers and louvers flat black, as needed, to eliminate the sight of shiny surfaces.
- D. Air Balancing – Each ducted air device shall be provided with a balancing damper, located either at the run-out duct to the final air device for accessible locations or an integral damper at the air device for inaccessible locations. Transfer air devices are not required to have balance

dampers, unless noted. Duct mounted air devices shall be provided with standoff frame and integral balance damper or scoop style damper, as noted. Refer to drawings for other specific instances.

E. Louvers

1. Exterior louvers shall be provided and installed by the HVAC Contractor in cooperation with the General Contractor.
2. Install louver assemblies in strict accordance with manufacturer's recommendations. Louvers to be installed plumb, square, level and true.
3. Blank off all unused portions of the louver with 14 ga. Aluminum and insulate blank off with 1" rigid foil faced insulation. Seal blank off areas airtight.
4. Seal perimeter of louver with exterior grade caulk to match louver color.
5. Paint visible ductwork behind louvers black with exterior grade primer and paint.

END OF SECTION 23 3713

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SECTION 23 5100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Listed double-wall vents and chimneys.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Building-heating-appliance chimneys.
- B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Selkirk Model PS
 - 2. Heat-Fab, Inc.
 - 3. Metal-Fab, Inc.
 - 4. Metalbestos.
 - 5. Van-Packer Model CS Type BH
- B. Description: Double-wall metal vents tested according to UL 1738 (condensing) and rated for 1000 deg. F. continuously, or 1700 deg. F. for 10 minutes; with positive, neutral, or negative flue pressure complying with NFPA 211.
- C. Construction: Inner shell and outer jacket separated by:
 - 1. At least a 1-inch air space.
 - 2. Utilize Overlapping Vee Band on inner ½" rolled flanges, and Channel Band for the outer jacket.
- D. Inner Shell: AL 29-4C Stainless steel, 304 Stainless or 316 Stainless Steel. Minimum 20 gauge
- E. Outer Jacket: 304 Stainless steel, or Aluminized Steel. Minimum 24 gauge

- F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
 - 1. Termination: Stack cap designed to exclude minimum 90 percent of rainfall.

PART 3 - EXECUTION

3.1 INSTALLATION OF LISTED VENTS AND CHIMNEYS

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- C. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
- D. Lap joints in direction of flow.
- E. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- F. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.
- G. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 23 5100

SECTION 23 5533 - FUEL-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes gas-fired unit heaters.

1.2 SUBMITTALS

- A. Product Data: For each type of fuel-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2013, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace heat exchanger of fuel-fired unit heater that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.5 PRODUCTS

1.6 GAS-FIRED UNIT HEATERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Lennox Industries, Inc.
 - 2. Modine Manufacturing Company.
 - 3. Reznor/Thomas & Betts Corporation.
 - 4. Sterling HVAC Products; Div. of Mestek Technology Inc.
 - 5. Trane.
- D. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
- E. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.
- F. Type of Venting: Indoor, separated combustion, power vented.
- G. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.
- H. Heat Exchanger: Stainless steel.
- I. Burner Material: Aluminized steel with stainless-steel inserts or Stainless steel.
- J. Unit Fan: Propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.
- K. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
 - 1. Gas Control Valve: Single stage.
 - 2. Ignition: Electronically controlled electric spark with flame sensor.
 - 3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
 - 4. Vent Flow Verification: Differential pressure switch to verify open vent.
 - 5. Control transformer.
 - 6. High Limit: Thermal switch or fuse to stop burner.
 - 7. Thermostats: Devices and wiring are specified in Division 23 Section "Instrumentation and Control for HVAC."
 - 8. Thermostat: Single-stage, wall-mounting type with 50 to 90°F operating range and fan on switch.
- L. Discharge Louvers: Independently adjustable horizontal blades.

M. Accessories:

1. Vertical discharge louvers.
2. Four-point suspension kit.
3. Summer fan switch.
4. Unit-mounted thermostat bracket.
5. Power Venter: Centrifugal aluminized-steel fan, with stainless-steel shaft; 120-V ac motor.
6. Concentric, Terminal Vent Assembly: Combined combustion-air inlet and power-vent outlet with wall or roof caps. Include adapter assembly for connection to inlet and outlet pipes, and flashing for wall or roof penetration.

N. Capacities and Characteristics: Refer to Schedule on Drawings.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54 applicable local codes and regulations, and manufacturer's written installation instructions.
- B. Install and connect oil-fired unit heaters and associated fuel and vent piping according to NFPA 31 applicable local codes and regulations, and manufacturer's written installation instructions.
- C. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- D. Install piping adjacent to fuel-fired unit heater to allow service and maintenance.
- E. Gas Piping: Comply with Division 22 Section 1613 "Natural-Gas House Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
- F. Vent Connections: Comply with Division 23 Section "Breechings, Chimneys, and Stacks."
- G. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
 1. Install electrical devices furnished with heaters but not specified to be factory mounted.
- H. Adjust initial temperature set points.
- I. Adjust burner and other unit components for optimum heating performance and efficiency.

2.2 FIELD QUALITY CONTROL

- A. Tests and Inspections: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 23 5533

SECTION 23 7413 – PACKAGED, OUTDOOR, AIR HANDLING UNIT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Direct-expansion cooling.
 - 2. Electric-heating coils.
 - 3. Hot Gas Reheat Coil
 - 4. Gas furnace.
 - 5. Roof curbs.

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 QUALITY ASSURANCE

- A. ARI Compliance:
 - 1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies.
 - 2. Comply with ARI 270 for testing and rating sound performance.
 - 3. Comply with ARI 1060 for testing and rating of energy recovery module.
- B. ASHRAE Compliance:
 - 1. Comply with ASHRAE 15 for refrigerant system safety.
 - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- G. Motors 1 HP and larger shall be “premium efficiency” series motor.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.
 - 2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than ten (10) years from date of Substantial Completion.
 - 3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Trane Inc. - IntelliPak
 - 2. York – Sun Premier
 - 3. Daikin - Rebel

2.2 CASING

- A. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs. Panels shall be easily removable for servicing all components.
- A. Unit casing construction shall be double wall, 2” thick with minimum R-13 foam insulation.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

- A. Air circulating fans shall be either ECM or direct drive plenum type with backwards curved fan blades. Direct drive plenum fans shall be provided with a VFD capable of full fan modulation.
- B. Condenser fans shall be either ECM or direct driven propeller type with wire guards.
- C. Units shall be furnished with exhaust fan and damper for powered venting, controlled in conjunction with the economizer.

2.4 COILS

- A. Supply-Air Refrigerant Coil:
 - 1. Aluminum plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Coil Split: Interlaced.
 - 4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.
- B. Supply -Air Hot Gas Refrigerant Reheat Coil
 - 1. The unit shall be provided with a hot gas reheat coil.
- C. Outdoor-Air Refrigerant Coil:
 - 1. Aluminum -plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

- A. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.
 - 1. The lead compressor shall be variable speed.
- B. Refrigeration Specialties:
 - 1. Refrigerant: R-32 / R-454b.
 - 2. Expansion valve with replaceable thermostatic element.
 - 3. Refrigerant filter/dryer.
 - 4. Manual-reset high-pressure safety switch.
 - 5. Automatic-reset low-pressure safety switch.
 - 6. Minimum off-time relay.
 - 7. Automatic-reset compressor motor thermal overload.
 - 8. Brass service valves installed in compressor suction and liquid lines.

C. Refrigerant Detection & Mitigation Control

1. Refrigerant systems with an A2L or higher flammability classification, as defined in ASHRAE Standard 15 and 34, shall be equipped with a refrigerant leak detection system. The leak detection system shall provide the following mitigation controls to ensure there is never a build up of refrigerant greater than the lower flammability of the respective refrigerant. The following shall occur
 - a. Activate refrigerant system safety shut-off valves to reduce releasable refrigerant charge.
 - b. Energize the air circulation fan(s).
 - c. De-energize potential ignition sources, including open flames (direct and indirect gas furnaces) and unclassified electrical sources of ignition with apparent power rating greater than 1kVa, where the apparent power is the product of the circuit voltage and current rating.

2.6 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 1. 2" MERV 8 Pre Filter
 2. 4" Merv 14 Final Filter

2.7 GAS FURNACE

- A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.
 1. CSA Approval: Designed and certified by and bearing label of CSA.
- B. Burners: Stainless steel
 1. Fuel: Natural gas.
 2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
- C. Heat-Exchanger and Drain Pan: Stainless steel.
- D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.
- E. Safety Controls:
 1. Gas Control Valve: Modulating.
 2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 ELECTRICAL POWER CONNECTION

- A. Provide two power connections to the unit, each with an electrical disconnect switch.

1. Circuit #1 – Compressors and Condensers
2. Circuit #2 – Fans, Controls, Gas Heat

2.9 CONTROLS

- A. Unit shall be provided with Refrigeration Circuit Only Controls. Other unit components shall be internally wired to a control board with I/O which may be extended to the building DDC system.
 1. Refer to HVAC Control diagrams for additional information.

2.10 ACCESSORIES

- A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- C. Coil guards of painted, galvanized-steel wire.

2.11 ROOF CURBS

- A. A 40" high roof curb with a side discharge shall be provided with the unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The roof curb shall be set in place, shimmed level and secured. Once the curb is anchored in place, the unit shall be set in place and the installation completed.
- B. Mechanical equipment and supports that are exposed to wind shall be designed and installed to resist the wind pressure determined in accordance with the building codes. Refer to specification 23 0530 for additional requirements.
- C. Provide condensate drainage piping from the drain pan with a 4" deep trap and cleanout.
- D. Power and control wiring shall be routed to the unit through the roof curb. Carefully coordinate wire pathways with the roof curb and concrete pad installation. Excavate and repair existing pavement to conceal pathways.
- E. The Electrical Contractor will provide power wiring through a fused disconnect switch to each set of power terminals in the unit. All other power and control wiring required for the completion of the systems shall be furnished and installed by the HVAC Contractor. All wiring shall be furnished and installed by the HVAC Contractor. All wiring shall be run in ½" and larger conduit in accordance with applicable provisions of the Electrical Specifications.

END OF SECTION 23 7415

SECTION 23 8239 - UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cabinet unit heaters with centrifugal fans and electric-resistance heating coils.
2. Propeller unit heaters with electric-resistance heating.
3. Wall & ceiling mounted unit heaters with propeller fans and electric-resistance heating coils.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 1. Equipment schedules include rated capacities, furnished specialties, and accessories.
 2. Plans, elevations, sections, physical dimensions, weight, and details.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 PROPELLER UNIT HEATERS

- A. Fan: Direct driven propeller type fan with aluminum wheel and single speed permanent split capacitor motor with internal overload protection. Units shall have a wire fan guard.
- B. Electrical Disconnect:

1. Toggle disconnect switch furnished and mounted on cabinet.
- C. Heating Coil:
1. Electric Resistance – Copper clad steel sheath element with continuously brazed steel fins formed to allow side draw through air flow. Overcurrent protection and limits controls for high-temperature protection.
- D. Cabinet: Galvanized steel, 18 gauge, with baked enamel finish. Horizontal units shall be equipped with adjustable discharge louvers.
- E. Controls: Low voltage transformer, on-off switch, 24v 2-way 2 position ball valve and wall mounted thermostat.
- F. Manufacturers:
1. Electric Resistance
 - a. Berko
 - b. Chromalox, Inc.
 - c. Indeeco
 - d. Markel Products
 - e. QMark Electric Heating
 - f. Raywall

2.2 WALL & CEILING MOUNTED ELECTRIC RESISTANCE UNIT HEATERS

- A. Fan: Direct driven propeller fan and single speed permanent split capacitor motor with internal overload protection. Units shall have a wire fan guard.
- B. Electrical Disconnect:
1. Toggle disconnect switch furnished and mounted on cabinet.
- C. Heating Element: Steel sheathed block with fin element. Overcurrent protection and high temperature protection.
- D. Cabinet: Galvanized steel, 18 gauge, with extruded aluminum frame. Unit is recessed in wall.
- E. Safety: Automatic thermal overload cut-off to deenergize the unit if an over-temperature situation occurs.
- F. Controls: Integral temperature control thermostat.
- G. Manufacturers:
1. Berko
 2. Chromalox, Inc.
 3. Indeeco
 4. Markel Products
 5. Marley Engineered Products
 6. QMark Electric Heating
 7. Raywall

8. TPI Corporation
9. Trane.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to drawings for arrangement, type, capacity, motor characteristics and other requirements.
- B. Mounting
 1. Install unit heaters to comply with NFPA 90A and manufacturer's recommendations.
 2. Horizontal, vertical and concealed suspended unit heaters shall be suspended from all four corners, from building structure with steel hanger rods and auxiliary angles and fastening devices.
 3. Propeller unit heaters shall be suspended from all four corners, from building structure with steel hanger rods and auxiliary angles and fastening devices or provide ceiling or wall mounted bracket as required.
 4. Wall mounted heaters that are recessed into the wall shall be provided with lintels as required by the Structural Engineer. Coordinate wall type, location and size as required.
 5. Wall mounted heaters shall be provided with rough-in box and secured as required.
 6. Ceiling mounted heaters shall be provided with rough-in boxes and secure as required.
 7. Ceiling mounted heaters shall be suspended as required from the structure above ceiling. Coordinate with ceiling type.
- C. Access
 1. Cabinet unit heaters shall be provided with lockable access covers as required for disconnecting means and service.
 2. Concealed unit heaters mounted above inaccessible ceiling shall be provided with an appropriate ceiling access panel.
- D. Temperature Controls
 1. Wiring between the unit and wall mounted thermostats shall be run in conduit, furnished and installed by the HVAC contractor. See Section 23 0914 "Control Wiring".
 2. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

END OF SECTION 23 8239

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DIVISION 26 ELECTRICAL

26 0000 General Requirements for Electrical Systems

- 26 0001 Basic Electrical Requirements
- 26 0004 Firestopping for Electrical Systems
- 26 0005 Excavation, Backfill and Surface Restoration

26 0500 Common Work Results for Electrical

- 26 0519 Low-Voltage Electrical Power Conductors and Cables
- 26 0526 Grounding and Bonding for Electrical Systems
- 26 0529 Hangers and Supports for Electrical Systems
- 26 0533 Raceway and Boxes for Electrical Systems
- 26 0537 J-Hook Pathways for Electrical Systems
- 26 0543 Underground Ducts and Raceways for Electrical Systems
- 26 0553 Identification for Electrical Systems
- 26 0563 Specific Wiring Applications

26 0900 Instrumentation and Control for Electrical

- 26 0923 Lighting Control Devices

26 2000 Low-Voltage Electrical Distribution

- 26 2416 Panelboards
- 26 2726 Wiring Devices
- 26 2813 Fuses
- 26 2816 Enclosed Switches and Circuit Breakers
- 26 2913 Enclosed Motor Controllers

26 3000 Facility Electrical Power Generating and Storing Equipment

- 26 3213 Engine Generators
- 26 3623 Automatic Transfer Switches

26 4000 Electrical Cathodic Protection

- 26 4313 Surge Protective Devices (SPD) for Low-Voltage Electrical Power Circuits

26 5000 Lighting

- 26 5113 Interior Lighting Fixtures
- 26 5600 Exterior Area Lighting

26 6000 Electronic Safety and Security

- 26 6101 Fire Detection and Alarm System

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SECTION 26 0001 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Electric Services
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Equipment Selection
16. Shop Drawings
17. Testing
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Operation and Adjustment of Equipment
23. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

- A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.
- B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Electrical work.
- C. A complete and functional Electrical system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

- D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

- A. The scope of the electrical work includes furnishing, installing, testing and warranty of all electrical work and complete electrical systems shown on the electrical drawings and specified herein, including Division 00, Division 01, Division 26 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word "provide", as used shall mean "furnish and install". If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.
- B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.
- C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having equipment, wireways and fittings

fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets and minor changes as may be necessary to install wireways, fittings and equipment.

- D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.
- E. Equipment, ductwork and piping shall not be installed in the dedicated electrical space above or in the working space required around electrical switchgear, motor control centers or panelboards as identified by NEC 110.26 Spaces About Electrical Equipment – 600 Volts Nominal or Less. For Equipment rated over 600 volts nominal – 110.32 Work Space About Equipment – 110.33 Entrance and Access to Work Space – 110.34 Work Space and Grounding. The Electrical Contractor shall caution other trades to comply with this stipulation.
- F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the Contractor causing such conflict. The Architect's decision shall be final in regard to arrangement of equipment, conduit(s), devices, wireways etc., where conflict arises.
- G. Provide offsets in system runs, additional fittings, necessary conduit, pull boxes, conductors, switches and devices required to complete the installation, or for the proper operation of the system. Each contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.
- H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved from the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

- A. Where standards (NFPA, NEC, ASTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

- A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.
- B. Under Alternate E1, Provide Standby Power System, Automatic Transfer Switch, associated power, control and annunciation wiring and installation for a complete and operational standby system.

1.8 SITE VISIT

- A. Refer to Section 017300 Execution.
- B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

- A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.
- B. Except where the permit application is made by the Architect or the Engineer, the Electrical contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the Electrical work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities except fire alarm permit documents shall be prepared and submitted by an approved, licensed fire alarm subcontractor.
- C. Include payment of all permit and inspection fees applicable to the work in this Division.
- D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.
- E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

- A. Refer to Section 013100 Project Management and Coordination.
- B. The HVAC Contractor shall initially prepare and be responsible for ¼" scale coordination drawings. These drawings shall be reproduced and distributed to the Plumbing, Fire Suppression and Electrical Contractors for their input and revisions. Assure that all contractors work together to obtain finish coordinated drawings and no work being installed until all contractors have approved and signed-off with their approval and drawings have been submitted and reviewed by the Engineer.

1.11 TEMPORARY ELECTRIC SERVICES

- A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.
- B. The temporary service and temporary lighting for construction is provided by the Electrical Contractor.

- C. The Electrical Contractor is cautioned to carefully consider the possible sources of temporary electric service and the probable location of the General Contractor's office.
- D. The General Contractor will make application to the local utility company for the temporary electric service and will pay for all electric power used during construction, including electric heating.
- E. The Electric Contractor shall furnish, install and pay for all necessary conduit, wire, metering, poles, switches, receptacles, lights and accessories to provide a 400 amp, 120/230 volt, 3 phase, 4 wire temporary electric service with the main disconnect switch, meter, and a 42 circuit load center at a location specified by the General Contractor.
- F. Consult the utility company for fees required and include same in Electrical Contract.
- G. Labor, receptacles, boxes, fixtures, wire, etc. required by the various Contractors inside their offices shall be paid for by the respective Contractors.
- H. Lighting fixtures shall be placed every 40 ft. along each corridor or where corridors do not occur, along the long axis of all rooms. Provide a minimum 800 lumen lamp in a commercial grade molded plastic socket and lattice wire guard temporary lighting assembly with extra heavy duty "ST" 3-wire cord. Lamps shall be spaced a minimum of 10 ft. apart. For large open areas or during the early stages of construction, 250 watt metal halide fixtures (or LED equivalent) with wire guards may be utilized. Receptacle circuits shall consist of 1-gang cast "FS" type box with grounded duplex receptacles a maximum of 50 ft. on center with a maximum of 4 per circuit. All receptacle circuits shall be protected by its own overcurrent device in a panel board. Install wiring and equipment above 6'-6" and below the finished ceiling. Extend circuits as required. Provide GFCI protected receptacles and circuits as required by NEC and OSHA.
- I. Contractors requiring extension cords shall provide their own cords and plugs up to capacity of 20 amperes. For services to larger items of equipment and welders, this Contractor shall extend proper feeders as requested at the expense of the Contractors requiring the service.
- J. The Electrical Contractor shall maintain the temporary light and power system for the duration of the work and shall remove it from the site when directed. Temporary wiring and equipment shall remain the property of the Electrical Contractor.
- K. The use of the permanent electrical system for temporary services during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period.
- L. Warranty periods on equipment, materials and systems shall commence upon Owner acceptance of the building or systems. Temporary use shall not jeopardize or alter warranty requirements.
- M. The complete temporary service shall comply with Power Company, OSHA, and all Code requirements.

1.12 WORKMANSHIP

- A. Refer to Section 01400 Quality Requirements.

- B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.
- C. Electrical work shall be performed by a licensed Electrical Contractor in accordance with requirements of the jurisdiction.

1.13 PROTECTION

- A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.
- B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.
- C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.
- D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

- A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in the Electrical Contract:
 - 1. All metal which is not factory or shop painted and which remains exposed to view in the building including finished areas, mechanical rooms, storage rooms and other unfinished areas shall be given a prime coat of paint.
 - 2. All metal installed outside the building which is not factory or shop painted shall be given a prime coat of paint.
 - 3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

4. Apply Z.R.C. Cold Galvanizing Compound, or approved equal, for touch-up of previously galvanized surfaces.
 5. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.
- B. Finish painting is included in the General Contract. Refer to the Cutting and Patching paragraph in this Section for finishing requirements.

1.15 CLEANING

- A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.
- B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.
- C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.
- D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.
- E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 EQUIPMENT SELECTION

- A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.
- B. All electrical equipment and wiring shall bear the Underwriters Laboratories, Inc. label where UL label items are available, and shall comply with NEC (NFPA-70) and NFPA requirements.
- C. The selection of materials and equipment to be furnished under this contract shall be governed by the following:
 1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specification, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.
 2. Where the words "or approved equal" appear after a manufacturer's name, specific written approval must be obtained from the Engineer during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval during shop drawing submittal.
- D. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.
- E. Before bidding equipment, and again in the preparation of shop drawings, the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated accessories. Also verify that adequate space is available for servicing of the equipment and that required NEC (and other applicable Code's) clearances are met. The Contractor and his supplier shall also verify compatibility of equipment specified with available system/service voltages, etc.
- F. If extensive changes in conduit, equipment layout or electrical wiring and equipment are brought about by the use of equipment or existing site conditions which are not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.17 SHOP DRAWINGS

- A. Refer to Section 016000 Product Requirements.
- B. One set of shop drawings, in electronic format (pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.
- C. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.
- D. The review of shop drawings by the Architect or Engineer shall not relieve the Electrical Contractor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.
- E. Shop drawings of the following electrical equipment and materials shall be submitted:
 1. Firestopping.
 2. Wireway.
 3. Miscellaneous cabinets.
 4. Plenum cable.
 5. Wiring devices and coverplates.
 6. Service/Distribution panelboard.
 7. Panelboards and associated distribution equipment.
 8. Fuses.

9. Motor controllers (VFD's) and disconnects.
10. Lighting Controls including layout plans of Occupancy Sensors.
11. Low voltage switching/lighting control system
12. Lighting fixtures.
13. Fire alarm system with schematic and point to point wiring diagrams.

1.18 TESTING

- A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.
- B. As each electrically operated system is energized, it shall be tested for function.
- C. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Architect or Engineer.
- D. All signaling and communications systems shall be inspected and tested by a qualified representative of the manufacturer or equipment vendor. Submit four (4) copies of reports indicating results.
- E. Tests shall be witnessed by field representatives of the Architect or Engineer or shall be monitored by a recorder when appropriate. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests.
- F. Instruments required for tests shall be furnished by the Contractor.

1.19 FINAL INSPECTION AND PUNCH LIST

- A. Refer to Section 017700 Closeout Procedures.
- B. As the time of work completion approached, the Contractor shall survey and inspect his work and develop his own punch list to confirm it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.
- C. Requests to the Architect, Engineer or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these; this is in the interest of expediting acceptance for beneficial occupancy.
- D. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completion or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.20 OPERATING AND MAINTENANCE MANUALS

- A. Refer to Section 017823 Operation and Maintenance Data.

- B. Two copies each of operating and maintenance manuals shall be assembled for the Electrical work by the Contractor.
- C. All shop drawings and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of replacement material required. Major items of equipment shall consist of not less than the following:
 - 1. Distribution switchgear.
 - 2. Fire Alarm System.
 - 3. Specialty equipment.
- D. Standard NEMA publications on the operation and care of equipment may be furnished in lieu of manufacturer's data where the manufacturer's instruction is not available.
- E. These shall be assembled into three-ring loose leaf binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 RECORD DRAWINGS

- A. Refer to Section 017839 Project Record Drawings.
- B. The Electrical Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect. This shall apply particularly to underground and concealed work, and to other systems where the installation varies to a degree which would justify recording the change.

1.22 WARRANTIES

- A. Refer to Section 017700 Closeout Procedures.
- B. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of one (1) year minimum from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.
- C. This provision is intended specifically to cover deficiencies in contract completion or performance which are not immediately discovered after systems and placed in operation. These items include, but are not limited to, motor controller malfunction, heater element changes required for motor controller, fuse replacement where fuses blow due to abnormal shorts,

adjustments and/or replacement of malfunctioning equipment and adjusting special equipment and communication systems to obtain optimum performance.

- D. This provision shall not be construed to include maintenance items such as making normally anticipated adjustments or correcting adjustment errors on the part of the Owner's personnel.
- E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.
- F. Extended warranties shall be provided where indicated in the equipment specification Sections.

1.23 OPERATION AND ADJUSTMENT OF EQUIPMENT

- A. As each system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing and adjusting voltages and currents and adjusting all operating equipment.
- B. Caution: Verify that all bearings of equipment furnished are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the other trades judgment in these matters. Follow specific instructions in regard to lubrication of equipment furnished under this Contract.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

- A. Refer to Section 017900 Demonstration and Training as well as individual Division 26 Sections for requirements.
- B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.
- C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.
- D. A minimum of 8 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:
 - 1. Show locations of items of equipment and their purpose.
 - 2. Review binder containing instructions and equipment and systems data.
 - 3. Coordinate written and verbal instructions so that personnel understand each.
 - 4. Separate instructions shall be given by manufacturer's representatives for the various special and communications systems.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 26 0001

SECTION 26 0004 – FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Johns Manville.
3. Nelson Firestop Products.
4. Specified Technologies Inc.
5. 3M; Fire Protection Products Division.
6. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer's instructions.
- B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.
- C. Provide firestop system for every conduit or opening at penetration of all fire resistance rated walls and horizontal assemblies.
- D. Provide rigid supports for conduit on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.
- E. Coordinate opening size and additional framing requirement with the General Contractor for each opening to meet the firestop installation requirements.
- F. Refer to 26 0533 Raceway and Boxes for Electrical Systems for sleeve requirements and treatment of penetrations not requiring firestopping.
- G. Annular space of penetrations of nonfire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a nonfire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.
- H. Smoke Barriers:
1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

- I. Smoke Partitions:
 - 1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke.
Non-rated smoke partitions do not require a fire stopping system.

END OF SECTION 26 0004

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SECTION 26 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for all in-grade underfloor conduit, exterior ducts, conductors, conduit, lighting standard bases, manholes, handholes, pullboxes, utility trenches and any incidental work included in the Electrical Contract.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over conduit or duct in a trench, including haunches to support sides of conduit.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated sub-grade in a trench before laying manhole, pullbox or conduit.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

- A. Excavate for all in-grade underfloor conduit, exterior ducts, conductors, conduit, lighting standard bases, manholes, handholes, pullboxes, utility trenches and any incidental work included in the Electrical Contract.. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 26 002 Basic Electrical Materials and Methods. All work shall comply with requirements set forth in Division 2.
- B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.
- C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.
- D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.
- E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

- 2.1 Refer to Division 31 Earthwork for bedding and backfill materials

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

- A. Interior and exterior trenches shall be over-excavated and the conduits, ducts or conductors shall be laid on 6" minimum depth sand bed.
- B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or crushed limestone,

3/4" maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18" above the top of the conduit or conductor. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

- C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.
- D. Backfill shall be mechanically compacted in layers not over 6" deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.
- E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. Refer to Division 32 for Surface Restoration requirements. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.
- F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.
- G. All exterior underground direct buried conductor, conduit and concrete encased ducts shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6" wide with black letters identifying the type of service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18' above and on the centerline of the conductor, conduit or duct.
- H. In addition to a warning tape, concrete encased ducts shall have a concentrated red dye poured on top of the concrete before fully cured.

END OF SECTION 26 0005

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SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 VAC and less.
 - 2. Connectors, splices, and terminations rated 600 VAC and less.
 - 3. Photovoltaic wires and cables rated for 1500 VDC or less.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.
- C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC and metal-clad cable, Type MC with ground wire.
- D. Photovoltaic Wiring: Comply with NEMA WC 70 for PV Wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR SIZE

- A. Refer to schedule on drawings.

3.2 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Stranded for No. 8 AWG and larger.
- B. PV Strings: Copper. Stranded for No. 12 AWG and larger.

3.3 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. PV Strings: Type PV Wire with MC4 connectors.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- E. Class 2 Control Circuits: Power-limited cable, in raceway.
- F. Use conductors such as type FEP with high temperature insulation as identified in the NEC for connections to resistance heating elements or in other areas subject to temperature exceeding the rating of THWN, XHHW or THHN.
- G. In addition to the conduit system, a separate grounding conductor shall be installed with all feeders and branch circuitry.
- H. Equipment grounding conductors shall be green, or completely taped green, at all accessible points.

- I. Wire size ampacity shall equal or exceed its overload protective device. Where sizes shown on the drawings are greater than the apparent ampacity requirements, the size shown shall prevail to compensate for voltage drop. In no instance shall conductors be installed that are less than required by the N.E.C. Minimum conductor size shall be No. 12 AWG except No. 14 AWG may be used for control wiring or where otherwise specifically indicated.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Conduit systems shall be clean and clear before pulling wires. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Pulling of branch circuit conductors shall be performed by manual means without the use of levers or heavy pulling devices that may compromise the conductor's or insulation integrity.
- D. A maximum of 8 conductors shall be installed in a branch circuit conduit unless specifically noted otherwise on the drawings. Equipment ground conductors are not counted when determining maximum fill.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Wiring in vertical raceways shall be supported with strain relief devices; Kellems grips or approved equal.
- G. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- H. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- J. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- K. Underground splices (including splices in exterior pullboxes and manholes) shall be made using sealing kits or wire nuts U.L. listed and approved for the application.
- L. Where fireproofing of cables is noted on the drawings or required by Code, each cable shall be arc and fireproofed with on (1) half-lapped layer of Scotch Brand 77 Electric Arc and Fireproofing Tape. Tape shall be secured with a 2-layer band of Scotch Brand 69 Glass Electrical Tape over the last wrap. Installation shall comply with manufacturer's recommendation.

- M. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack. Refer to additional notes on plans for branch circuitry installation requirements.

3.5 TESTING

- A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.
- B. As each electrically operated system is energized, it shall be tested for function.
- C. On all electric services including change-outs, backfeeds, etc. the Contractor shall verify phase rotation and voltage readings to assure the final installation is proper. Submit to the Engineer in writing a record of voltage readings and current readings taken at no-load and fully loaded conditions.
- D. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Engineer.
- E. Tests shall be witnessed by field representatives of the Engineer or shall be monitored by a recorder. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests. Copies of all test reports shall be included in the O&M manuals.
- F. Instruments required for tests shall be furnished by the Contractor.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 GROUNDING RODS

- A. Grounding Rods shall be copper clad, molten welded copper to steel; unless otherwise designated, 3/4" diameter X 10 ft. long.

2.3 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Clamps and continuity devices shall be non-ferrous material, UL approved. Connections to ground rods and all underground connections shall be made with welded connections (“Thermoweld” or “Cadweld”).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.

8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Wiring devices shall be connected with grounding jumper from ground pole on device to grounding screw (or grounding pigtail) in the outlet box.
- D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
- C. Main service neutral shall be grounded to the street side of the building water service. A bonding jumper shall be installed around the water meter. In addition to using the water service as a grounding electrode, effectively grounded building steel, driven ground rods outside or buried electrode shall be provided and connected. Bond to interior metallic water, gas and all other metallic lines.
- D. The complete metal conduit system shall be used for the equipment grounding system. Conduit systems and associated fittings and terminations shall be made mechanically tight to provide a continuous electrical path to ground and shall be safely grounded at all equipment by bonding all metallic conduit to the equipment enclosures with locknuts cutting thru paint of enclosures. Bond all conduits entering service entrance switchboard with a ground wire connecting the grounding bushings to the equipment ground bar. Conductors shall be sized per NEC Tables 250-66 and 250-122. Bond all communications conduit systems to ground.
- E. In addition to using the conduit system for grounding, a complete auxiliary green wire equipment grounding system shall be installed, continuous from main ground, thru distribution

and branch circuit panelboards and paralleling all feeders and branch circuit wiring. Grounding conductor sizes shall comply with NEC Table 250-122, minimum size shall be #12 copper except #14 on control circuits. This shall apply to all circuits rated 100 volts or more above ground potential.

- F. Ground neutral of all transformers for separately derived systems.
- G. Motor frames shall be bonded to the equipment grounding system by an independent green wire, sized as shown.
- H. Cord connected appliance frames shall be grounded to the equipment grounding system thru a green wire in the cord.
- I. A green grounding conductor shall be installed in each non-metallic conduit and all flexible conduits, including exterior underground conduits.
- J. System neutral connections shall be insulated from metal enclosures except at the neutral of the service entrance equipment and on the neutral of a separately derived system. Connections to the main service enclosure shall be by means of bonding jumpers.
- K. The building neutral shall be identified throughout with white conductors for 280/120 volt systems and grey conductors for 480/277 volt systems. Where there are neutral conductors from a separately derived system (such as 120/208 volt, 3 phase, 4 wire where the main building service is 277/480 volt, 3 phase, 4 wire) the neutrals of the two systems shall be separately identifiable per NEC Article 200.
- L. A minimum #6 ground wire shall be run from each telephone backboard/data rack back to the main building ground. Or where indicated on the drawings or in the specifications, a separate communications grounding system shall be provided and bonded to the electrical grounding system at the main ground bar.
- M. Bond the generator neutral to the generator equipment grounding conductor. Bond the generator frame to the equipment grounding conductor. Provide signs at the grounding locations per NEC Article 701.
- N. Where metal covers on pull boxes and junction boxes are used, they shall comply with the grounding and bonding requirements of NEC Article 250.
- O. Connections to driven ground rods or other such electrodes shall be a minimum of 3 feet from the building foundation wall or beyond the roof drip line, whichever is greater.
- P. The ground rods of the electrical grounding system shall not be used as the electrodes (ground rods) of the lightning protection system (where specified) and vice versa. However, the lightning protection system (where specified) shall be bonded to the electrical grounding system at one point per NEC.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. Thomas & Betts Corporation.
 - e. Unistrut; Tyco International, Ltd.
 - f. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Utilize supports with swivel type attachments to maintain true vertical support from sloped structure or inclined structural elements (such as beam clamp with swivel option).

- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on blocking attached to substrate by means that meet anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 CONCRETE BASES

- A. Provide dowel rods to connect concrete bases to concrete floors/slabs/substrates. Unless otherwise indicated, install dowel rods on maximum 18-inch centers around the full perimeter of concrete base.
- B. Provide epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor/slab/substrate, unless concrete bases are installed directly on grade. Place and secure anchorage devices. Using setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast galvanized or stainless-steel anchor-bolt inserts into bases.
- D. Indoor bases shall be at least 4" thick and shall have straight and finished sides and a 1"-45 degree chamfer at the top perimeter. Reinforcing steel bars shall be placed in both directions of the bases. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is floor mounted or wall mounted within 4" of the floor.
- E. Outdoor bases shall be at least 6" thick and shall have straight and finished sides and a 1"-45 degree chamfer at the top perimeter. Perimeter of pads shall extend down below the frostline. Reinforcing steel bars shall be placed in both directions of the bases and a mesh overlay shall be provided. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is slab or grade mounted or mounted within 6" of slab or grade.
- F. Unless indicated otherwise in specifications or on drawings, use minimum 3000-psi, 28-day compressive-strength concrete. Size and provide concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.
- G. Forms: As required for equipment pads or other special applications in field, provide forms made of steel, wood, or other suitable material of size and strength to resist movement during concrete placement, and to retain horizontal and vertical alignment until removal. Use straight forms, free distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends. Do not remove forms for 24 hours after concrete has been placed. Set forms to required grades and lines, rigidly braced and secured. Provide sufficient quantity of forms to allow continuous progress of work, and so that forms can remain in place at least 24 hours after concrete placement. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Form areas that involve termination of spare conduits below grade, or that involve continuation of conduits by others, accordingly to accommodate easy future access to the ends of conduits for future extensions.
- H. Reinforcement: Cut bars true to length with ends square and free of burrs. Provide metal expansion caps for one end of each dowel bar in expansion joints. Design caps with one end closed and minimum length of 3" to allow bars movement of not less than 1", unless otherwise indicated. Provide these for joining applications where continuous pouring cannot be accomplished.

- I. Concrete Placement: Remove loose material from subbase surface immediately before placing concrete. Check subbase and forms for line and grade before placing concrete. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Place concrete using methods that prevent segregation of mix. Use splash boards to divert the flow of concrete away from the trench sides, and to avoid dislodging soil and stones. Coordinate with Owner's Representative at least 72 hours prior to placing concrete. Line up concrete trucks as required to achieve one continuous pour where applicable. Do not backfill until a minimum of 48 hours have passed.
- J. Concrete Finishing: Smooth surface by screeding after striking-off and consolidating concrete. Provide Class A finishing. Broom finish concrete pads, and aprons around pullboxes and structures. Protect concrete from damage until acceptance of work. Exclude traffic over affected areas for at least 14 days after placement.

3.5 PLYWOOD EQUIPMENT BOARDS

- A. Plywood Equipment Boards: Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent. Provide plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than $\frac{3}{4}$ inches deep. Provide marine grade plywood where subject to moisture conditions. Provide Simpson Strong Tie (or equal) expansion screw anchors.
- B. Unless otherwise noted, boards shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal $\frac{1}{2}$ " rustproof spacers between back of plywood and wall. Cut, fit, and place plywood equipment boards accurately in location, alignment, and elevations to support and anchor electrical materials and equipment. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads. Maintain at least 4 inches from bottom of plywood equipment boards and the finished floor surface.
- C. Unless directed otherwise in field, plywood equipment boards shall be 8 feet high by $\frac{3}{4}$ inches deep by length shown on drawings (as dimensioned or as scaled) or length as required to accommodate equipment if not indicated on drawings. Unless directed otherwise in field, provide plywood equipment boards for all indoor surface mounted panelboards and systems "head-end" equipment for all applications where located in mechanical or electrical rooms/areas and only where specifically shown on drawings for all other applications.

END OF SECTION 26 0529

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SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel only; set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 CABLE TRAY (Wire Basket Type)

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Mono Systems.
 - 3. MP Husky.
 - 4. Thomas & Betts.
 - 5. Cablofil.
 - 6. Cope.
 - 7. Wiremaid.
- B. Description: Basket tray shall be steel wire structure, welded at all wire intersections and zinc plated after construction. 12" wide with 4" load depth (unless size is indicated otherwise on the plans), supported at 12 ft. intervals at a minimum or as required by manufacturer to meet load rating and as field conditions and structure dictate.
- C. General: Except as otherwise indicated, provide metal basket trays, of types, classes and sizes indicated, with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
- D. All field formed bends or transitions shall be either a UL listed and approved assembly or where the tray is modified in the field, shall be Field Evaluated and approved by UL.
- E. Splice connectors shall be the bolted type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed .00033 ohms. Splice connector construction shall be such that a splice may be loaded anywhere within the support span without diminishing rated load capacity (and grounding capacity) of the basket tray. Splice plates shall be furnished with straight sections and fittings or with clamp fittings to enable field cut and formed bends as recommended by the manufacturer.
- F. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum span as recommended by the manufacturer. Supports shall be constructed from 12-gauge steel formed shape channel members with necessary hardware such as trapeze support kits. Basket trays installed adjacent to walls shall be supported on wall mounted brackets.

- G. Trapeze hangers shall be supported by 3/8" (minimum) diameter rods or cable suspension system listed and approved for use by the tray manufacturer. Provide PVC sheath on threaded rod section passing thru basket when center-hung type supports are utilized to protect cabling.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Brushed Aluminum with snap-on covers.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mono Systems.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Hubbell Wiring Systems.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- F. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT except FMC may be utilized in existing walls.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. EMT: Use all steel, compression type or all steel setscrew type, concrete tight.
3. Flexible conduit: Use malleable iron, "squeeze" type, non-insulated. (For lighting fixture whips only: Use all steel or die-cast screw-in connector).
4. Liquid-tight conduit: steel or malleable iron.

3.2 CABLE OR BASKET TRAY APPLICATION

- A. Locate tray such that a minimum 12" clearance is maintained above and to one side of tray to accommodate installation of cabling. Carefully coordinate installation with other trades to maintain this clearance.
- B. For wire basket type tray, follow the manufacturer's installation details for cutting methods and locations for field formed connections, bends and offsets.

3.3 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter. Generally run conduit and conductors as high as practicable against underside of floor slab in concrete construction or immediately below the **top chord** of bar joist construction unless otherwise shown or noted. This high level zone shall be used for running electrical raceways and shall be grouped or

racked together wherever feasible. Runs at bottom chord level or ceiling grid level are not acceptable.

- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation. Plan raceway routing to minimize the number of offsets and junction boxes.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated. All conduit shall parallel building lines.
- G. Conduit shall be run overhead and shall not be run below concrete slabs unless specifically indicated on the drawings and in the legend on the drawings.
- H. Conduit crossing building expansion joints shall have expansion provisions with grounding continuity, use special expansion fittings listed for the application. Refer to the Architectural and Structural floor plans and details for locations of expansion joints.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Raceways for Data, Audio Visual and Communications Cable: Install as follows:
 - 1. 1-Inch Trade Size and Smaller: Install raceways in maximum lengths of 75 feet.
 - 2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
 - 3. Raceway shall be installed continuously from outlet box to above edge of nearest cable tray above accessible ceiling.
 - 4. Bond raceway to cable tray with approved grounding bushing, bonding jumper and necessary fittings.
- L. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in all locations except MC may be used for lighting fixture whips.
- M. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

- N. Do not install wall-mounted boxes back-to-back in opposite sides of wall; in stud walls, boxes shall be on opposite side of studs.
- O. Provide access to all junction and pull boxes.
- P. Set metal floor boxes level and flush with finished floor surface. Provide trim ring compatible with finish floor system.
- Q. Pull mandrel or large swab thru conduit to assure freedom from debris before pulling wires. Use listed pulling lubricants where necessary.
- R. Provide four (4) 1 inch diameter spare conduits for each flush mounted branch circuit panelboard; extend from top of panelboard to above an accessible ceiling for future use.
- S. Contractor shall record carefully on a set of "as-built" prints, the exact location of all feeder conduits (100 amps and larger).
- T. Unless noted otherwise on the drawings, a maximum of 8 conductors shall be installed in a branch circuit conduit. This maximum is a count of all phase and neutral conductors only.

3.4 INSTALLATION OF EXPOSED CONDUIT OUTDOORS

- A. Only install conduit exposed outdoors when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

3.5 INSTALLATION OF EXPOSED CONDUIT ON ROOFS

- 1. Only install conduit exposed on rooftops when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed on rooftops, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide white paint of flat rooftops that have finishes white in color, and for otherwise-colored roof finishes that are not visible from the building interior or from the ground outdoors. Elsewhere select colors to match surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

END OF SECTION 26 0533

SECTION 26 0537 – J-HOOK PATHWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

- A. Conduit/Raceway/Pathway: “Conduit”, “raceway”, “pathway” and similar terms shall be taken to mean “conduit” unless specifically indicated otherwise in project manual documents, or unless specifically directed otherwise in field by Owner or Design Professionals. All such terms shall be considered synonymous for the general purposes of installation means and methods.
- B. Provide J-Hook pathway systems only for the following limited applications: Class 2 (“low voltage”) control wiring above accessible finished-ceiling systems.
- C. Coordination Drawing Submittals: Prior to commencing with any related work, submit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Routing.
 - 2. Scaled layout and relationships between components and adjacent structural, electrical, and mechanical elements.
 - 3. Vertical and horizontal offsets and transitions.
 - 4. Clearances for access above and to side of pathways.
 - 5. Vertical elevation of pathways above the floor or below bottom of ceiling structure.
 - 6. Structural members in paths of conduit groups with common supports.
 - 7. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 J-HOOK PATHWAYS

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below, or equivalent NRTL listed and labeled equivalent.
 - 1. Cooper B-Line (basis of design, model numbers as specified further below).
 - 2. Mono-Systems, Inc.
- B. Materials Description:
 - 1. Provide J-Hook system components that are plenum-rated (regardless of whether air plenum ceilings exist on the project). Provide J-Hooks, not Cable Fasteners, and not Bridle Rings. Provide open-top hooks, so cables can be laid into J-Hooks rather than threaded through. Provide tool-less cable retainer clips (do not use cable ties). Provide hooks sized for maximum 40% fill (in cross section) based on outside diameter of cables. Accordingly, provide multiple sets of J-Hooks along any given pathway as applicable.
 - 2. Provide necessary factory hooks, cable retainers, fasteners, attachment kits, etc. as required for complete installations.

2.2 MATERIALS AND FINISHES

- A. Provide steel units with rolled hook edges to prevent damage to cable jackets and insulation.
- B. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
- C. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide J-Hook support along “free-air” cable pathway routes. Provide J-Hooks at four-foot intervals and at offsets. Route J-Hooks above ceilings through corridors and similar open areas wherever possible to minimize above-ceiling wall penetrations.
- B. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70. Locations and routing that may be shown on plans are schematic and diagrammatic in nature. Layout all proposed pathway routing, elevations, installation methods, etc. on coordination drawings and coordinate all proposed routing with all affected trades prior to commencing with work. In addition, review the information with Owner and Design Professionals for all areas where pathways will be visible after completion of construction, to ensure a neatly organized installation occurs. Where exposed in finished areas, install in a manner that minimizes detrimental effects on room aesthetics. Install as out of site as reasonably possible.
- C. Keep pathways at least 24 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal runs above liquid and steam piping. Level and square runs, and install at proper elevations and heights. Do not begin installation of cables until J-Hook pathway installations are complete and until installations locations (end to end) are in a weatherproof environment. Install pathways so that they are accessible for cable installation after construction is complete. Install pathways with enough workspace to permit access for installing cables. Strictly adhere to factory load capacities and fill capacity. Provide factory cable retainers, fasteners, attachment kits, and other accessories as required for a complete installation.
- D. Securely anchor (mechanical, not adhesive) J-Hooks directly to structural components of the building. Do not anchor J-Hooks to ductwork, conduit, piping, fixtures, equipment, ceiling supports (rods, wires, T-bars), etc. Comply with requirements in Section 260529 and related sections for hangers and supports. Support using factory-approved methods. Fasten cables on horizontal runs with factory cable clamps, retainers, fasteners, attachment kits or flexible Velcro-secured wraps compliant with NEMA VE 2. Tighten clamps/wraps only enough to secure the cable, without indenting the cable jacket. Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices equipment or other electrical work. Do not use perforated strap.

- E. Coordinate work prior to rough-in with respective equipment and cable installers, and with Owner's Representative. Carefully coordinate proposed routing, including elevations, with affected installers and entities prior to rough-in. Neatly route paths parallel and perpendicular to building architectural lines, plumb on walls, and at a consistent elevation wherever possible. Install paths in a uniform plane/elevation wherever possible. Keep horizontal and vertical offsets to an absolute minimum. Route paths so that a minimum of 24 inches exists between cables and potential EMI sources such as lighting ballasts, motors, power wiring, dimmer circuits, etc.
- F. Provide a minimum of two (2) 4-inch bushed conduit sleeves where pathway is routed above inaccessible ceilings, and at penetrations of floors, masonry walls, fire rated walls, smoke-tight partitions, smoke-related partitions, and similar elements. Provide smoke and fire stopping at such penetrations as applicable in (see Section 260502). Provide EMT conduit for "drops" from paths to outlets and equipment, with sweep bends, insulated throat fittings and 200-pound pull string.

END OF SECTION 26 0537

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SECTION 26 0543 –UNDERGROUND DUCTS AND RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.
3. Manholes.

1.2 SUBMITTALS

A. Product Data: For accessories for manholes, handholes, and boxes.

B. Shop Drawings for Factory-Fabricated Handholes and Boxes: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: Type EPC-40-PVC **Type EPC-80-PVC**, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Utilize galvanized rigid steel for 90 degree bends (long sweep type) with proper adapters between PVC duct and galvanized steel.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cantex, Inc.
 2. CertainTeed Corp.; Pipe & Plastics Group.
 3. Heritage Plastics.
 4. Carlon Electrical Products.
 5. Manhattan/CDT; a division of Cable Design Technologies.
 6. Spiraduct/AFC Cable Systems, Inc.
- B. Duct Accessories:
1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, to provide minimum duct spacings while supporting ducts during concreting or backfilling.

2.3 HANDHOLES AND BOXES

- A. Description: Comply with SCTE 77.
1. Color: Gray /Green.
 2. Configuration: Units shall be designed for flush burial and have open /closed bottom, unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, As indicated for each service.
 6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer Handholes and Boxes: Molded of fiberglass-reinforced polymer concrete, with matching covers.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carson Industries LLC.
 - b. Quazite (Hubbell).
 - c. Highline Products, Inc.

PART 3 - EXECUTION

3.1 EARTHWORK AND RESTORATION

- A. Refer to Division 26 Section “Excavation, Backfill and Surface Restoration”.

3.2 DUCT INSTALLATION

- A. Slope: Pitch ducts toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends at other locations, unless otherwise indicated.
- C. Joints: Stagger couplings so those of adjacent ducts do not lie in same plane.
- D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.
- E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- F. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.
- G. Concrete-Encased Ducts: Support ducts on duct separators.
 - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
 - 3. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 - 4. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
 - 5. Identify Ductbank with one of the following methods:

- a. Mark the top of all underground duct runs with concentrated red dye or powder on top.
- b. Provide 6" wide yellow plastic tape, with black letters indicating "Electric"; place approximately 18" above and continuously along the centerline of duct bank.

3.3 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: Set covers of handholes 1 inch above finished grade and boxes with bottom below the frost line.
- D. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.4 GROUNDING

- A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5 CLEANING

- A. Pull mandrel through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 26 0543

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Wiring device circuit identification.
 - 3. Warning labels and signs.
 - 4. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WIRING DEVICE CIRCUIT IDENTIFICATION

- A. Marker Tape: Self-laminating, clear polyester, 3/8" high tape with black lettering.
- B. Provide label on every wiring device cover plate, indicating panel and circuit breaker fed from. Utilize 12 pt. font. Mount label on face of device cover plate, centered near the top .

2.3 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.

2.5 PHOTOVOLTAIC WARNING LABELS

- A. Refer to 'PV' series drawings for project required labels and quantity.
- B. Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, shall follow labels indicated on drawings.
- C. Minimum letter height shall be 3/8".
- D. Labels shall conform with NFPA 70 chapters 690 and 705.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Electrical and Auxiliary Systems Box, Conductor and Cable Identification: Use marker tape to identify field-installed branch circuit, alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Identify panel and branch circuit number(s) on all junction box covers permanently clearly printed with bold black indelible marker.

3. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Conduit and junction boxes:

1. Color code or label all junction boxes and exposed conduit at 20 ft. intervals. Coding shall be painted or labels of the pre-manufactured type permanently mounted with metal or plastic band.
2. Label panelboard and branch circuit number(s) on outside of junction box cover at all junction boxes containing branch circuit wiring. Labelling shall be neatly done utilizing black indelible ink markers.
3. Paint all junction boxes and covers for fire alarm wiring red.
4. Provide a color identification scheme under heavy plastic cover hanging in the electrical rooms; identification shall be:

PRODUCT DATA SHEET 1 - b) Normal - Black

A. Branch circuit panelboards:

1. Identify panel designation on directory card within the panel.
2. Fill out branch circuit directory indicating circuit number and area served, rooms, group of rooms, lighting, convenience outlets, motors, etc. Card index shall be neatly typed.
3. Replace branch circuit directory in existing panelboards in areas of alteration.
4. Branch circuit phase conductor color format shall be permanently identified inside each panelboard.

B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: Self-adhesive, engraved, laminated phenolic label. Unless otherwise indicated, provide a single line of text with 1/4-inch- high letters on 5/8-inch- high label; where 2 lines of text are required, use labels 1 inch high.

2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Electrical switchgear and switchboards.
 - c. Transformers.
 - d. Motor-control centers.
 - e. Disconnect switches.
 - f. Enclosed circuit breakers.
 - g. Motor starters.
 - h. Lighting Relay Panel(s).
3. Label shall include equipment name, voltage and where fed from. Where equipment is located in finished spaces, accessible to the public, in addition to adhesive, secure labels with screws, one on each end.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded feeder, and branch-circuit conductors.
 1. Color shall be factory applied.
 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White
 3. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow
 - d. Neutral: Grey.

END OF SECTION 26 0553

SECTION 26 0563 – SPECIFIC WIRING APPLICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Various items of equipment require additional electrical connections, wiring and/or interlocks that are not specifically identified on the drawings or in the specifications. Included, but not limited to, are the following items:
 - 1. Mechanical/HVAC Equipment and motors.
 - 2. Exterior Lighting Control Equipment.
 - 3. Motorized Doors.
 - 4. Security/Access Control Equipment.
 - 5. Fire Protection/Suppression Equipment.

1.2 COORDINATION

- A. Coordinate wiring requirements and interlocks for equipment provided by other Contractors. Obtain copies of approved Shop Drawings and/or manufacturer's wiring diagrams to determine exact wiring requirements.
- B. This Contractor shall inquire of the Engineer during bidding, or at the earliest practical date, any questions which may arise regarding the intention and scope of this work.

PART 2 - PRODUCTS

- 2.1 Materials and equipment shall be as indicated on the drawings and in the specifications.

PART 3 - EXECUTION

- 3.1 Final connections to fixture pigtails shall be made with approved pressure connectors such as IDEAL “Twister” or T&B “Freespring Winged”.

3.2 Miscellaneous Equipment Connections

- A. Various items of equipment such as kitchen, laboratory, laundry, HVAC, Plumbing, etc. will be furnished and set in place by other trades. This equipment, unless otherwise shown on the drawings, will be furnished with necessary electrical outlets, operating and control switches, terminating in an electrical outlet box, or equivalent electrical connector located on the equipment. This contractor shall furnish power wiring to these various items of equipment and connect them up complete for full operation.

- B. Where disconnect switches are indicated or where otherwise required, they shall be mounted in an accessible location. In the case of labs, kitchens, laundries and finished areas, provide NEMA 4X Stainless Steel enclosure and locate in as inconspicuous a place as possible. Locate disconnect switches under counters where feasible and accessible in lieu of above counter, however, this contractor shall ensure that the installation of equipment does not interfere with access and operation of such switches.
- C. Where necessary to expose conduit in finished spaces, rigid aluminum conduit and conduit body ("LB") fittings shall be utilized.
- D. Coordinate and provide any additional 120 volt power connections required for special low voltage systems devices or equipment panels such as Security System/Door Access System control panels, door strikes, surveillance cameras, security/fire shutters or doors, temperature control system panels/transformers, etc.
- E. Roughing-in drawings for equipment shall be obtained from the Architect or Contractor providing the equipment with substantial time prior to the installation of such equipment to enable proper electrical rough-in equipment.

3.3 Miscellaneous Wiring Interlocks

- A. Various items of work are required in connection with interlocking motor and starter/VFD operations and providing wiring to serve equipment which is furnished by other trades.
- B. Interlocks between motor controllers for purposes of accomplishing sequence control or simultaneous operation of motors are all to be included in the Electrical Contract. Requirements for a simple simultaneous motor operation interlock are indicated by a schedule on the drawings or by specific notes. These interlocks consist of auxiliary contacts on the starter/VFD of the lead motor wired in, according to standard diagrams of the motor starter/VFD manufacturer to energize the holding coil of the starter or VFD control input for the motor. These interlocks shall be thru the "automatic" position only of the starter/VFD where HOA switches are supplied. Furnish extra contacts on external relays as required for interlocks. Where interlocks, other than the simple sequence above, are required, they shall be as described as follows in this section.
- C. Air handling unit motors shall lead and exhaust fans and moving media air filters (if applicable) follow. Chiller pumps shall lead, followed by chiller, condenser pump and cooling tower, in that order. Condenser pumps shall lead and chemical feeder shall follow. Hot water pumps shall lead and boilers follow.
- D. All safeties, such as freezestats and firestats for air handling systems or high temperature/pressure switches for pumping systems, where required to be wired by the Electrical Contractor, shall be wired thru both the "Hand" and "Automatic" positions.
- E. The following is a list of equipment and systems requiring wiring. Note that these are in addition to standard interlocks scheduled on the drawings.
 - 1. Exterior lighting shall be controlled via a lighting control relay system as scheduled on the drawings. Refer to specification section 26 0943 for system requirements.

2. Motorized backdraft dampers on exhaust fans and power roof ventilators shall be connected to their respective associated motor leads to energize the backdraft damper motor and open the damper when the fan operates. Dampers, operator and transformer, if required, will be furnished by the fan supplier, install transformer and wire to damper.
3. Motorized Doors: Door controls, including door switches (pressplates, prox sensors, etc.), limit switches, relays, etc. will be furnished by the door equipment supplier. This equipment shall be turned over to the Electrical Contractor and installed for a complete and operational motorized door operator system per the equipment supplier wiring diagrams. Provide additional boxes, conduit and wiring as required per the supplier's diagrams and to meet field conditions. Where motorized door operators are located in fire walls and/or smoke partitions, provide a signal from the fire alarm system to disable the door controls to allow it to be manually operable while maintaining it's latching feature. Where motorized door operators are located on exterior doors and are required to open doors for smoke evacuation, provide a signal from the fire alarm system to open and hold doors during the course of smoke evacuation sequence.
4. Independently mounted controllers furnished by others: Where starters/VFD's are furnished by other trades, and are required to be mounted remote from the motor, the Electrical Contractor shall accept and mount them and perform all power and control wiring between the controls and motors indicated. Motor controllers equipped with automatic alternators shall have two independent circuits and control sources to preclude loss of operation when one circuit fails.

END OF SECTION 26 0563

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SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1: GENERAL

- 1.0 Section Includes
 - A. Lighting Control Components and Systems:
 - 1. Line Voltage Wall Switches Low Voltage Wall Switches and Sensors
 - 2. Occupancy / Vacancy Sensors Detection
 - 3. Power Interfaces
 - 4. Line Voltage Wall Switches and Sensors
 - 5. Wireless Devices and Systems
- 1.1 Related Requirements
 - A. Section 262726 Wiring Devices
 - B. Section 265113 Interior Lighting
- 1.2 References
 - A. Underwriters Laboratories (UL):
 - 1. UL 916- Energy Management Equipment
 - 2. UL 924 - Emergency Lighting and Power Equipment
 - 3. UL 1472 – Standard for Safety Solid-State Dimming Controls
 - B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electric Code
 - C. IEC 61000-4-2 Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques-Electrostatic Discharge Immunity Test; 2008
 - D. NEMA WD 7-2011: Occupancy Motion Sensors
 - E. NEMA SSL 7A: Phase Cut Dimming
 - F. FCC Part 15 and equivalent ISED / NOM
- 1.3 Administrative Requirements
 - A. Coordination
 - 1. Coordinate placement of daylight and occupancy sensors to achieve optimum performance. Proper sensor placement should be coordinated with others to avoid obstructions that would interfere with maintaining prescribed light levels
 - 2. Coordinate the work to provide luminaires and lamps that are compatible with the lighting controls to be installed
 - 3. Notify architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work
- 1.4 Submittals
 - A. Submit under provisions of Section 26 0001
 - B. Shop Drawings include
 - 1. Floor Plan(s) showing device and accessories layout
 - 2. System schematic/typical riser diagrams
 - C. Product Data Sheets
- 1.5 Project Closeout Documentation

- A. Provide a factory published manual
 - 1. Warranty
 - 2. Technical support contact
 - 3. Electronic manual on manufacturer's website for free download
- 1.6 Quality Assurance
 - A. Manufacturer Qualifications:
 - 1. Remote Support: Manufacturer capable of providing remote support and ability to virtually connect with customers to address issues.
 - 2. On-Site Support: Manufacturer capable of providing on-site response time within the continental United States
 - 3. Service Contracts: Manufacturer capable of providing service contracts for continued on-site and remote support of the lighting control system post-installation for terms up to 10 years from substantial completion.
 - B. All devices are 100% factory function tested prior to delivery
 - C. Compliant with the requirements of NFPA 70
 - D. All power components UL listed for required loads
- 1.7 Project Conditions
 - A. Only install equipment after the following site conditions are maintained:
 - 1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C); unless specified extended temperature operation within the product specification sheet.
 - 2. Relative Humidity less than 90% non-condensing
 - B. Standard electrical enclosures are permanently installed
 - C. Equipment is protected from dust, debris and moisture
- 1.8 Warranty
 - A. Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace (same device or equivalent), materials, and devices that fail to perform as specified within extended warranty period.
 - B. Five (5) years from the date of shipment

PART 2: PRODUCT INFORMATION

- 2.1 Manufacturers:
 - A. Low Voltage
 - 1. SensorSwitch
 - 4. Current
 - 5. Leviton
 - 6. Wattstopper
 - 7. Sensorworx
 - 8. Acuity-NLight
 - 9. Crestron
 - B. Line Voltage
 - 1. Refer to "26 2726 Wiring Devices" section for acceptable Manufacturers
- 2.2 General:

- A. Provide system hardware that is designed, tested, manufactured, warranted by a single manufacturer
- B. Operational Life: At least 10 years expected life while operating within the specified ambient temperature and humidity range
- C. Power Failure Memory: automatically store system settings and recover from a power failure without requiring user input.

Occupancy Detection Technology Requirements:

- D. The occupancy sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
- E. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or based sensing technologies shall not be accepted.
- F. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
- G. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 10 minutes.
- H. Allow adjustments to the occupancy time delay based on owner preference, fixture life extension or increase energy savings. Should be done in consultation with the building owner and specifying engineer.
- I. Installer, in accordance with manufacturer’s recommendation, shall determine final sensor location. All sensors shall be factory calibrated for optimum performance for its installed PIR lens, and shall not require initial or subsequent field adjustment of detection sensitivity.
- J. All sensor setting adjustments shall be digital; comprising of a one or more user interfaces: Push-button, Visual Light Infrared, RFID or Bluetooth Programming methods
- K. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

2.3 Low Voltage Wall Switches

- A. Shall be capable of the following:
 - 1. Accept 12-24VAC/VDC
 - 2. Suitable for installation in a single-gang switch box
 - 3. Support On / Off / Dimming and 3-way Connection
 - 4. Single and dual pole options
 - 5. Programmable via push button programming with visual LED visual feedback

2.4 Line Voltage Wall Switches

- A. Shall be capable of the following:
 - 1. Shall accept Class 1 wiring directly.
 - 2. Devices will operate as On / Off and Dimming (pending model variant)
 - 3. Dimming devices shall be 0-10V sink devices
 - 4. Multi-way switches allow for 3-way, 4-way and up to 9 connections.
 - 5. All Multi-Way devices On / Off loads will operate and respond in unison.

6. Multi-way devices with dimming loads will operate in unison when initiated by a dimming device
7. Multi-way device is a class 1 low voltage data bus and must not be used with a standard toggle switch.
8. Count down timer capabilities
9. Single and dual pole options

B. Phase Dimming Wall Switches;

Shall be capable of the following:

1. Shall accept Class 1 wiring directly.
2. Devices will operate on / off and dimming LED load types
3. Compatible with NEMA SSL 7A

C. Line Voltage Wall Switch with Occupancy Sensor

- A. Sensor shall provide wall-to-wall PIR occupant movement supporting small (hand motions) and large (walking motion) detection .
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC (models allowing 120-277 VAC input) and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
- E. Light Commercial devices will be designated as 120 VAC and lower load rating compared to commercial based products.
- F. Sensor shall recess into single gang switch box and fit a standard GFI opening.
- G. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection internally and intrinsically through its mounting strap.
- H. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- I. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology (only exception is versions with lighted push-buttons).
- J. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (off) condition. Sensor shall not require a minimum load to be connected to function.
- K. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, low temperature/high humidity operation.
- L. All sensor settings, including time delay and photocell settings shall be digital and accessible for adjustment via one or more user interfaces.
- M. Wall Switch sensors shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point as applicable.
- N. All models shall be capable of both Auto-On, Manual On, and Partial-On operation.

- O. All models shall be capable of a “Reduced Turn On” operation where the initial PIR turn on level is higher in order to eliminate PIR from reflective surfaces from being detected. PIR shall be returned to normal levels upon initial PIR detection.
- P. All models shall have a “Predictive Off” mode where user can manually turn the lights off when leaving the room and still have them come on automatically when they return to space.
- Q. All models shall be capable of disabling override switch.
- R. Multiple switches controlling the same load (3-way or 4-way applications) shall use multi-way based devices.

2.5 Wall Switch Occupancy Sensors – Large Areas

- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 40 ft (12.19 m).
- B. In areas with periodic or permanent obstruction to a sensor’s field of view, sensors that utilize dual technology detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz Load ratings shall be 13A each pole, ¼ HP motor load.
- E. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- F. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- G. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
- H. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (Off) condition. Sensor shall not require a minimum load to be connected in order to function.

2.6. Low Voltage Occupancy Sensors

- A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer’s best practice recommendations.
- B. In areas with periodic or permanent obstruction to a sensor’s field of view, sensors that utilize dual technology detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
- C. Sensors shall interconnect with other sensors and power/relay packs with class 2, three-conductor wire.
- D. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.
- E. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.
- F. Each designated zone shall contain one sensor with a SPDT class 2 auxiliary relay, providing an input to building automation system (BAS). All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that power pack must be installed on the Line side of the local toggle switch for auxiliary relay to work properly.

- G. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- H. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- I. Sensors with a recessed profile are acceptable substitutes for above ceiling mount sensors

2.7 Power Packs

- A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.
- B. Power pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
- C. When required by local code, power pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
- D. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for a minimum of 300,000 cycles.
- E. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.
- F. A dry contact relay to connect BMS, HVAC, Fan, etc., shall be provided.

2.8 Line Voltage Occupancy Sensors

- A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.
- B. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- C. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
- D. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- E. Multiple sensors controlling the same load shall be wired in parallel.
- F. For applications requiring independent control of two loads, a sensor with two dual relays shall be required. Each relay shall have independent programmable occupancy time delays.
- G. Dual relay sensors shall have an optional operational mode called "Alternating On" where when during unoccupied periods, one relay is always left closed (thus one load is always on). The

- particular relay that is left closed alternates each cycle so that the aging of the connected lamps is even.
- H. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
 - I. Specific sensors capable of switching 5 Amps of two-phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
 - J. Wall mounted sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.
 - K. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
 - L. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
 - M. Sensor settings may be programmed via pushbutton or via mobile application.
 - N. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors.

2.9 Indoor Photocells and Daylight Harvesting Controls

- A. Low voltage photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.
- B. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
- C. Photocell set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Further adjustment may be made manually if needed.
- D. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
- E. Low voltage dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable drivers.
- F. Low voltage dimming sensor's set point shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
- G. Combination photocell/dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the on/off function as well as the dimming function of 0 to 10 VDC dimmable drivers.
- H. Combination photocell/dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set point may be manually entered.
- I. Dual zone option shall be available for photocell, dimming, or combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.

- J. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
- K. Line voltage versions of the above described dimming sensors shall be capable of powering off 120/277 VAC.
- L. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
- M. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors

2.10 Wireless Devices and Systems

- A. Automatically sync for system operation
 - 1. Shall conform to SOC2 criteria
 - 2. Must not use a predefine PIN.
- B. Send and receive messages for real-time operation and feedback
- C. Use industry standard RF protocols (list is subject to change)
 - 1. Bluetooth Devices must be listed with the Bluetooth SIG organization
- D. All devices are FCC / Industry Canada compliant.
- E. Settings shall be programmable via push-button or mobile device application (Apple iOS and Android Operating Systems).

PART 3: EXECUTION

3.1 Installation

- A. Follow manufacturer's instructions for all installation steps
- B. Provide a complete installation per Contract Documents
- C. Where applicable provide FAQs and Quick Start Guides

3.2 Startup and Programming

- A. Provide telephone support via toll free line
- B. Factory trained service available for purchase
- C. Where applicable training video and elearning content

3.5 Maintenance

- A. Factory trained service technicians available within the continental US
- B. Offer integrated help on-screen and via online videos
- C. Factory telephone support via toll free line

END OF SECTION

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- C. Panelboard schedules for installation in panelboards.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and/or surface-mounted cabinets, as indicated on the drawings.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

- b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: Top and/or bottom as Project condition dictates.
- C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.
- H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cutler-Hammer.
 - 2. Siemens.
 - 3. Square D.
 - 4. ABB.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, power and feeder distribution type.
- B. Doors: Secured with vault-type 3 point latch with tumbler lock; keyed alike.
- C. Mains: Lugs only as identified on the drawings.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Mains: Circuit breaker and/or lugs only as identified on the drawings. Sized to have 225 amp bussing unless indicated otherwise on drawings.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. Sized to accommodate 42 poles unless indicated otherwise on drawings. Furnish number of breakers shown.
- D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents listed on the drawings.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 5. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 - 6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles. Where more than one pole is used, they shall employ a common trip.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits. Type HACR for feeding heating, air conditioning and refrigeration equipment.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of lighting and appliance panelboard trim 72 inches above finished floor; distribution panelboard trim 90 inches above finished floor, unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges and ground fault settings as applicable.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from flush mounted panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room, area or equipment designations. Temporary conditions of occupancy shall not be utilized as circuit descriptions. Indicated spare circuits shall be specifically labeled as such. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 2416

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SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-box motion sensors.
 - 3. Snap switches and wall-box dimmers.
 - 4. Solid-state fan speed controls.
 - 5. Wall-switch and interior occupancy sensors.
 - 6. Communications outlets.
- B. See Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Legrand).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

- a. Cooper; 5351 (single), 5352 (duplex).
- b. Hubbell; 5361 (single), 5362 (duplex).
- c. Leviton; 5351 (single), 5352 (duplex).
- d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. All receptacles installed outdoors shall be weather resistant type.
- C. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper.
 - b. Pass & Seymour/Legrand.
 - c. Leviton.
 - d. Hubbell.

2.4 TAMPER RESISTANT STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, NEC 406.12 & 517.18(C) and UL 498.
- B. Where indicated on plans to provide Tamper Resistant type receptacle, device shall have non-conductive dual mechanical shutter mechanisms on 120V connection ports, compliant with NEC requirements. This is in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, etc.).

2.5 USB CHARGING TYPE RECEPTACLES

- A. Convenience Receptacles, 125V, 20A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498.
- B. Where indicated on plans to include USB Type Charging ports, device shall include Dual-Port USB Type A-C charging ports with minimum 5 Amps combined charging power (minimum 25 watts), in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, Tamper-resistant, etc.).

2.6 NIGHT LIGHT ACCESSORY

- A. Where indicated on plans to include night light accessory (“NL”), device shall have LED night light, integral with the face of device and photo-sensor for control of night light function. This is in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, Tamper-resistant, etc.).

2.7 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, 0-10V, solid-state units with integral, quiet on-off switches. Unit listed and compatible for type of lighting controlled and rated for connected load unless larger rating is indicated for future capacity.
- B. Control: Continuously adjustable slider, with separate on-off switch; single-pole or three-way switching capability. Comply with UL 1472.

2.9 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, manufacturer shall match that submitted for ceiling mounted occupancy sensors.
 - 3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..

2.10 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: **Nylon**.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.
 - 1. Outdoor receptacle covers shall be "In Use" type rated "Extra Duty".

2.11 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Round, die-cast aluminum with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, black finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: As noted on plans or as indicated in applicable specification section.

2.12 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices: White, unless otherwise indicated or required by NFPA 70 or device listing. Switches, receptacles and coverplates for emergency lighting shall match color and type of normal lighting switches.
 - 2. Device plates: Nylon, to match color of wiring devices.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.
5. All 15 or 20 amp-120V wiring devices located within 6 feet from the edge of a sink, located in Kitchens or Bathrooms or serving electric water cooler shall be GFCI protected type device.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
3. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
3. When there is a choice, use side wiring with binding-head screw terminals.
4. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
5. Tighten unused terminal screws on the device.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 "PLUG CONNECT/PLUG TAIL" DEVICES

- A. In lieu of terminal screw connected receptacles and switches as specified above, specialized plug-in type devices may be provided as long as it is offered by the same manufacturer and listed equivalent to the same product line specified. Permanent wiring pigtails shall be of sufficient length to enable replacement of device with standard terminal screw type device as required by Code.
- B. Where plug-in type wiring devices are provided, furnish a minimum of five (5) of each type and color device installed to the Owner as spares. Where more than one hundred (100) of any type is installed, provide a minimum of ten (10) spare devices.

3.3 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 26 2726

SECTION 26 2813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cartridge fuses rated 600-V ac and less for use in, enclosed switches, panelboards, enclosed controllers and motor-control centers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Cooper Bussman, Inc.
 - 2. Mersen.
 - 3. Littelfuse.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

- A. Feeders: Class RK1, time delay.
- B. Motor Branch Circuits: Class RK1, time delay.

- C. Other Branch Circuits: Class RK1, time delay.
- D. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 26 2813

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE/NON-FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cutler-Hammer.
 2. Siemens.
 3. Square D.
 4. ABB.
- B. All starters and disconnect switches shall be of the same manufacturer unless otherwise approved.
- C. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses specified when so indicated on

the drawings, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. ABB.
3. Siemens.
4. Square D.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
5. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at 6'-0" A.F.F. unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Install fuses in fusible devices.
- D. Coordinate location of devices to allow working clearances and to avoid interference with other equipment and trades.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 262816

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SECTION 26 2913 - ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:
 - 1. Across-the-line, manual and magnetic controllers.
 - 2. Multispeed controllers.
- B. Refer to “Disconnect Switches” section for switch requirements.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- B. Comply with NFPA 70.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, minimum clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.
- D. Motor starters and disconnects shall be manufactured and rated in accordance with NEMA, UL and IEEE Standards. IEC rated contactors and overloads are not acceptable.

1.3 COORDINATION

- A. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.
- B. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allen-Bradley Co (Bulletin 509)
 - 2. Cutler-Hammer (Class AN16).

3. Siemens (Class 14).
4. Square D Type S (Class 8536).
5. ABB.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

- A. Manual Controller: NEMA ICS 2, general purpose, Class A, with "quick-make, quick-break" toggle or pushbutton action, and marked to show whether unit is "OFF," "ON," or "TRIPPED." Manual Controllers furnished for fractional horsepower, single phase motors unless otherwise indicated on plans.
 1. Overload Relay: Ambient-compensated type with inverse-time-current characteristics and NEMA ICS 2, Class 10 tripping characteristics. Relays shall have heaters and sensors in each phase, matched to nameplate, full-load current of specific motor to which they connect and shall have appropriate adjustment for duty cycle.
- B. Magnetic Controller: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated. Provide Magnetic Controllers on all motors one horsepower and greater or any 3 phase motor, unless indicated otherwise on plans.
 1. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity. Provide fusing on control transformer primary and secondary, each phase, and grounded on the secondary.
 2. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 20 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.
 3. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 30 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
- C. Combination Magnetic Controller: Factory-assembled combination controller and disconnect switch.
 1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by an NRTL. Provide fusible disconnect only where specifically indicated on the drawings or where required by Code.
 2. Nonfusible Disconnecting Means: NEMA KS 1, heavy-duty, nonfusible switch.
 3. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

2.3 MULTISPEED ENCLOSED CONTROLLERS

- A. Multispeed Enclosed Controller: Match controller to motor type, application, and number of speeds; include the following accessories:

1. Compelling relay to ensure that motor will start only at low speed.
2. Accelerating relay to ensure properly timed acceleration through speeds lower than that selected.
3. Decelerating relay to ensure automatically timed deceleration through each speed.

2.4 ENCLOSURES

- A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated.

1. Outdoor Locations: NEMA 250, Type 3R.

2.5 ACCESSORIES

- A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
- B. Push-Button Stations, LED Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
- C. A Hand-Off-Auto selector switch shall be mounted in the face of each starter enclosure. The selector switch shall be so wired that when it is in the Hand or Auto position, all safety controls are wired in series with the selector switch. All control devices shall be wired in the Auto position only.
- D. Provide a green LED pilot light mounted in the face of enclosure. Wire pilot light so that light will be on when motor is energized.
- E. Provide a red LED pilot light mounted in the face of enclosure. Wire pilot light so that light will be on when starter power supply is energized.
- F. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock control circuit open.
- G. Control Relays: Auxiliary and adjustable time-delay relays. Provide adjustable 0-60 second “on” time delay relay on starters where indicated on drawings and wire into the “Auto” position of the selector switch to delay starting.
- H. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting. Provide on all 3 phase motor starters 5 HP and larger; wire ahead of the H-O-A switch.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, controller, and load; and configuration of pilot device and control circuit affecting controller functions.

3.2 INSTALLATION

- A. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide floor set unistrut frame to mount adjacent to equipment being controlled. Allow proper service clearances to equipment.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.3 IDENTIFICATION

- A. Identify enclosed controller, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Bundle, train, and support wiring in enclosures.
- B. Install all other control and interlock wiring in the field that cannot be factory pre-wired and is indicated on the plans or other specification sections as wired by the Electrical Contractor.
- C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
 - 1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
 - 2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
 - 3. Test electrical phase rotation of 3-phase supply feeders.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Correct malfunctioning units and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 26 2913

SECTION 26 3213 – STANDBY POWER SYSTEM (Diesel Fueled)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a standby power system to supply electrical power in event of failure of normal supply consisting of a liquid cooled engine, an AC alternator with main breaker and system controls, fuel system including fuel tank, exhaust system with muffler and piping and cooling system. Refer to the drawings for capacities and electrical characteristics.
- B. Rating indicated on the drawings is for standby service with 100 hours or less per year operating time.
- C. The electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested as a complete unit, on a representative engineering prototype model of the equipment to be sold.
- D. See Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASME B15.1.
- E. Comply with NFPA 37.
- F. Comply with NFPA 70.
- G. Comply with NFPA 99.
- H. Comply with NFPA 101.
- I. Comply with NFPA 110 requirements for Level 2 emergency power supply system.
- J. Comply with UL 2200, package unit shall be listed and labeled.
- K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

- L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.3 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 2 year(s) from date of Beneficial Use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The generator set shall be of standard design with complete factory assembly by Caterpillar, Cummins-Onan or Kohler (Rehiko).

2.2 ENGINE-GENERATOR SET

- A. The engine set shall be diesel fueled, four cycle for heavy duty industrial application, rated to deliver the specified capacity at an ambient temperature of 104 degrees F (40 degrees C), and an elevation of 1000 ft. above sea level. Engine shall develop approximately 1.5 HP for each KW of generator, after deducting the HP required for the unit mounted fan and pump operation. Maximum speed at rating – 1800 RPM, ratings shall be those in standard published curves and data. Special test ratings for non-standard products will not be acceptable. Engine shall incorporate all standard equipment including:
 - 1. Liquid cooling radiator, engine mounted, with engine driven fan, duct flange and fan guard; engine driven water pump and closed coolant recovery system providing visual diagnostics means to determine if the system is operating with normal coolant level. The radiator shall be designed for operation in 110 degrees F ambient temperature.
 - 2. Engine mounted intake air filter(s) with replaceable element.
 - 3. Full pressure engine lubrication supplied by a positive displacement lube oil pump. Engine shall have a replaceable filter with internal bypass and replaceable elements.
 - 4. Provide engine coolant and oil drain extensions to outside of the mounting base for cleaner and more convenient engine servicing.
 - 5. The engine fuel system shall be designed for operation on No. 2 diesel fuel. A secondary fuel filter, water separator, manual fuel priming pump, fuel shutoff solenoid and all fuel lines must be installed at the point of manufacture.
 - 6. Sensing elements shall be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over speed shutdown and over crank shutdown. These sensors are to be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on

each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.

7. Steel base for engine-generator with adjustable spring type vibration isolators.
8. Electronic governor capable of maintaining alternator frequency within 0.5% from no load to full load alternator output. Steady state regulation is to be 0.25% (Woodward 2301 Electro-Hydraulic governing system or equal by Barber-Coleman.)
9. Electric jacket water (block) heater(s) with 120 or 208 volt power source; each thermostatically controlled and used to aid in quick starting.

2.3 OVERCURRENT PROTECTION, INSTRUMENTATION AND ALARMS

- A. The Main Line Breaker shall be molded case thermal magnetic trip, 100% rated type for load circuit breaking and line protection. Breaker shall be sized for minimum 115 to 125% full capacity of generator output. Generator exciter field circuit breakers are not acceptable substitute.
- B. Control instruments and alarms (NFPA-110) shall be microprocessor based and shall be mounted in an engine mounted control panel (with vibration isolators) and shall include the following:
 1. Oil pressure gauge and alarm light (pressure gauge can mount on engine).
 2. Water temperature gauge with high temperature alarm light (temperature gauge can mount on engine).
 3. Running time meter.
 4. Voltmeter with selector switch, phase to phase, phase to neutral and off.
 5. Ammeter with selector switch, each line and off.
 6. Frequency meter.
 7. Battery charging ammeter.
 8. Over speed shut down alarm light.
 9. Unit auto-run-stop with remote start from automatic transfer switch.
 10. Voltage level adjustment rheostat (can mount on engine).
 11. Safety shut offs for high water temperature, low oil pressure, over speed and engine over crank; fault light and alarm contact for each.
 12. Means for remote shutdown of generator per NEC 445.18(B) (provide maintained contact emergency stop button and means to wire button to unit).
 13. Alarm light for main storage tank low fuel level.
 14. Alarm light for intertank leak detection – for main belly tank.

15. Indication of all alarms required by NFPA 110; include provisions for remote annunciation.
 16. Main line circuit breaker(s) shall have means to lock in the open position per NEC 445.18(A).
 17. Relay with normally closed contact for damper control.
 18. Manual/off/auto switch; four LED's to indicate: not in auto, alarm active, generator running, generator ready.
 19. Provide monitoring of generator start signal control wiring as required by NEC 700.10(D)1, for Emergency Power Systems, to provide audible and visual annunciation, as well as start generator, upon loss of start circuit integrity.
- C. Flush mounted remote annunciator(s) of all alarms required by NFPA 110; locate the annunciator(s) as shown on the floor plans. Include red and green lamps indicating position of each automatic transfer switch.

2.4 GENERATOR FEATURES

- A. Features include the following:
1. The AC generator shall be synchronous, four pole, optimum pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive disc or flexible steel coupling – provide guard.
 2. Consult tank manufacturers about capacities available for size of set in Project.
 3. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 130 degrees Centigrade.
 4. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.
 5. Determine applicable codes and regulations, and coordinate subparagraph below with Drawings.
 6. Design and construction conforming to NEMA, AIEE and ASA standards.
 7. Static excited and static regulated, 12 lead brushless revolving field.
 8. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

9. Voltage regulation plus or minus 1%.
10. Radio interference suppression.
11. Capability to assume rated load in one step with less than 15% transient voltage dip with normal voltage recovery in one second.
12. Power factor 0.8; at 60 Hz.
13. For generator size with output greater than 400 Amps, provide isolated bus bar on each phase and neutral for landing the lugs on the outgoing feeder; oversize termination box on generator to meet NEC wire bending radius and space for bus bars and cable terminations.

2.5 ACCESSORIES AND WEATHERPROOF HOUSING

A. Furnish and connect the following engine accessories:

1. Heavy duty 12 volt or 24 volt lead acid starting batteries and charger. Battery charger shall be heavy duty potted assembly for waterproof and vibration resistance, designed for operation with an engine cranking battery. Universal voltage input with cord and plug connection and multi-stage charging modes of operation. The battery shall not be discharged through the battery charger.
2. Flexible stainless steel exhaust connection for each exhaust outlet.
3. Critical type exhaust silencer, Maxim #M51 or equal by Burgess, EM Products Inc., Universal "ENS", York "Y4" or Cowl. Provide crossover manifold where engine has more than one exhaust outlet. Provide ventilated roof/wall thimble to accommodate exhaust piping; coordinate with General Contractor and HVAC Contractor to comply with specific installation requirements.

B. Sub-base mounted fuel oil tank shall be double wall constructed of steel plate of thickness required by applicable standards and shall be UL listed and constructed per NFPA requirements; manufactured by MO Trailers Corporation, Pryco, Victory Industrial Products or approved equal.

1. Tank shall include necessary vent, fill, fuel level gauge, supply and return openings, piping and accessories. Provide vent line to outside with approved cast iron screened rain shield; must be installed with proper clearance from all building openings.
2. Tank shall meet State of Ohio Fire Marshal requirements for venting, fuel fill spill containment, overfill protection, tank alarm, signage and associated specific requirements.
3. Tank capacity to allow for a minimum 24 hour runtime at full load (less than 500 gallons).
4. Provide an intertank leak detector and alarm contact; connect alarm contact to control panel for local and remote annunciation.

5. Provide fuel level gauge with alarm contacts; connect alarm contacts to control panel for local and remote annunciation.
 6. Base tank shall be fabricated separately from the base; after fabrication, tank shall be bolted to its base to form a complete unit that mates to the generator skid. Base tank shall not interfere with access to engine and generator for maintenance and shall be mounted to allow minimum 2 inches air space between bottom of tank and concrete floor.
 7. Complete assembly shall be prime and finish painted to match color of engine generator set.
 8. Generator sub base mounted fuel tanks shall be provided with vehicular barrier protection on all sides of the tank subject to vehicular damage; located minimum 3 feet from edge of tank and minimum 3 feet tall above grade.
- C. Provide a factory installed weather protective type sound attenuating (75 db at 7 meters) housing around generator for outdoor installation (Skin-Tight Enclosure). Standard features associated with housing shall be as follows:
1. Hinged and removable side and rear panels for easy access to generator set.
 2. Vertical outlet hoods with 90 degree angles and baffles or turning vanes to redirect air and reduce noise; UL 94 HF1 listed acoustic insulation for flame resistant standards.
 3. Louvers on both the generator air intake and radiator air discharge ends for cooling; to prevent rain and snow entry.
 4. Lockable latches on each removable or hinged panel; all parts of latches and hinges and mounting hardware shall be stainless steel.
 5. Rugged galvanized steel or aluminum construction; painted with accepted manufacturer's painting process. Skid mounted. Color selected by Architect/Engineer.
 6. Battery rack.
 7. Insulated critical rated silencer with tail pipe and rain cap; mount silencer inside generator enclosure.
 8. Rodent barriers and insect screens over all openings including louvered openings.

2.6 AUXILLIARY SYSTEMS CONNECTIONS

A. Oil Supply System.

1. All tanks and piping systems and installation shall conform to applicable portions of NFPA 31 and shall meet requirements of the State Fire Marshall.
2. Oil and vent piping shall be schedule 40 threaded coated black steel ASTM A-53 with cast iron screwed standard fittings.

3. Diesel fuel shall be provided by the Electrical Contractor and shall be type and grade as recommended by engine supplier.

2.7 SUBMITTALS

- A. Equipment supplier shall submit for approval with shop drawings, recommended fuel piping diagram, interconnection diagram showing all controls and alarms. Dimensioned drawings of the complete generator assembly including isolators, main breaker location and lug size, exhaust connections, inlet/exhaust shrouds, required clearances, exhaust assembly, batteries and rack, etc. Shop drawings submitted without all required information will be rejected. At the completion of the project, these drawings shall be included as part of the maintenance manuals, these drawings shall be specific to the actual project installation and shall not be standard manufacturer model drawings.
- B. Where engine fuel injectors are required to be cooled by engine fuel, the equipment supplier shall include in his costs all additional necessary equipment and labor to modify the fuel system design including fuel cooler and all other piping and electrical work as needed.
- C. Standard color chips shall be submitted with shop drawings for color selection by the Architect and Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110. Confirm installation will allow full access, without removing connections or accessories, for periodic maintenance.
- B. Secure necessary permits and inspections from the Authority Having Jurisdiction for the installation of Aboveground/Underground Fuel Storage Tank(s) that comply with Ohio Administrative Code 1301, Ohio Fire Code, NFPA 30 & 30A as applicable. Provide a copy of approval documentation of tank(s) installation to the Inspection Agency prior to installation and notify the Fire Marshal when ready for inspection for compliance with Ohio Fire Code when applicable.
- C. Install packaged engine generator on 12" thick steel reinforced concrete base with factory installed isolators between engine and skid. Bolt firmly to foundation.
- D. Make external connections to generator and engine thru flexible connections.
- E. Connect auxiliary systems all in accordance with manufacturer's specific instructions for automatic and manual operation.
- F. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems." Neutral shall not be bonded to generator. Bonding of neutral and ground is accomplished in main switchgear. Provide signs at service entrance location and at grounding location per NEC 700.8.

- G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Furnish and install all control wiring and interlocking between the engine-generator, generator control panel, automatic transfer switch, rupture tank, fuel gauge for belly tank, remote annunciator, remote stop button (located on building adjacent to Generator), damper control, auxiliary systems, etc.
- H. Fill radiator and cooling system with the necessary solution of ethylene glycol, additives and water for freeze and engine component/cooling system protection as recommended by the manufacturer. Provide freeze protection rated to -40 degrees F.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections prior to start-up and to assist in testing.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start unit(s) to confirm proper motor rotation and unit operation.
- D. Coordinate tests with tests for automatic transfer switches and run them concurrently.
- E. Operational/Load Test:
 - 1. Adjust, test and demonstrate proper operation of the system after installation. Test shall demonstrate automatic operation, transfer, quick start and a minimum of 2 hours endurance under not less than 50% load, with not less than 4 hours at full load. Provide a resistance load bank for the test and all necessary temporary cabling, etc. Coordinate location of load bank with Owner and other trades to ensure safe operation of systems and protection of surrounding areas. Engineer/Associate Architect may require extended test time if system is deemed suspect.
 - 2. Engine-generator system shall pick up full load in less than 10 seconds.
- F. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- G. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. The supplier shall furnish a certified full load test certificate verifying that the generator has been tested prior to delivery and found to be in satisfactory working condition under test loads.
- H. All fuel piping and base mounted fuel tanks shall be tested after installation and before filling with fuel. Tests shall comply with Ohio Administrative Code, Chapter 13.

- I. The Electrical Contractor shall provide fuel for testing and top off the tank after completing all tests and demonstrations.
- J. Provide sign at the service entrance indicating type and location of on-site legally required standby power sources per NEC 701.7(A). Coordinate with Authority Having Jurisdiction (AHJ).

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators, allow a minimum of 4 hours for training.

END OF SECTION 26 3213

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SECTION 26 3623 – AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes automatic transfer switches rated 600 V and less.
- B. The Automatic Transfer Switch shall be furnished as a part of the complete package from the Standby Power System and shall be installed/wired by the Electrical Contractor.
- C. The Portable Generator Docking Station may be furnished separately by the Electrical Contractor and shall be installed/wired by the Electrical Contractor.

1.2 GENERAL

- A. Furnish and install electrically operated automatic switch to transfer loads to standby system upon failure of main source of electricity. Unit shall be complete with accessories in NEMA 1 enclosure as shown on the drawings.
- B. Switch shall be electrically operated, mechanically held type with a mechanical interlock to prevent both sides closing simultaneously.
- C. Furnish and install NEMA 3R, manually operated, double-throw switch with camlock power connections for portable generator connection.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 70.
- D. Comply with NFPA 99.
- E. Comply with NFPA 110.
- F. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: ASCO Bulletin 300 Series or equivalent by Russelectric, Cummins, Rehlko, or Caterpillar (GE-Zenith ZTS Series). Voltage and ampere ratings as indicated on the drawings.
- B. Generator Docking Station by Trystar, EST, Berthold Electric, ASCO, Square D or Eaton.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the available fault conditions indicated on the drawings, based on testing according to UL 1008.
- C. Microprocessor Controls: Microprocessor based controller with Control and Display Panel mounted on face of door, panel shall have LED source and switch indication lights and membrane interface panel for test and time delay bypass controls.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
 - 2. Switch Action: Double throw; mechanically held in both directions.
 - 3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
- G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.
- H. Neutral Terminal: Solid and fully rated with lugs, unless otherwise indicated.
- I. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 FEATURES AND ACCESSORIES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Signal-Before-Transfer Contacts: Two sets of normally open/normally closed dry contacts (rated 3 amps at 480 volts AC) operates in advance of retransfer to normal source (and in advance of transfer to emergency source when in test mode). Timer intervals adjustable from 0 to 20 seconds for transfer in either direction and independently adjustable/programmable.
- D. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.
- E. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated.
- F. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer.
- G. Features:
 - 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 - 2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 - 3. Current Sensors for each phase and neutral of Load Source: Sensors shall be wired to LCD display to allow reading of current for each phase as well as RMS summary load.
 - 4. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 - 5. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 15 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 - 6. Test Switch: To simulate normal-source failure.
 - 7. Switch-Position Pilot Lights: Indicate source to which load is connected.
 - 8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate indicating "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate indicating "Emergency Source Available."

9. All pilot/indication lights shall be LED type for long life.
10. Unassigned Auxiliary Contacts: Two normally open/normally closed, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
11. Load Priority/Shed Control and Contacts: For setting (programming) of priority level of transfer switch(es) where more than one transfer switch is connected to emergency/standby power source. Priority 1 Transfer Switch (Life-Safety) shall be first to transfer to emergency source and last to disconnect from emergency source upon return of normal power. Load shed signal(s) shall originate from the generator controller.
12. Terminal provisions for connection of remote test and serial communications port for remote monitoring/annunciation.
13. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
14. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
15. Engine-Generator Exerciser: Microprocessor based, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 14 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

2.5 GENERATOR DOCKING STATION GENERAL REQUIREMENTS

- A. Docking Station Ampacity-Voltage requirements shall be as indicated on the drawings. Provide for Life-Safety System, at a minimum. Provide for other Systems if indicated on drawings.
- B. Enclosure shall be UL 1008 Listed, NEMA 3R rated with multiple single or 3-point latching and locking provisions, Factory applied finish in ANSI #61 Medium Light Grey. UL listed acrylic baked paint finish over a rust-inhibiting, corrosion-resistant primer on treated metal surface.

- C. Station shall have auxiliary contacts for remote monitoring of switch position and contacts for connection of engine start signal wiring (field wired to associated A.T.S. by E.C.).
- D. Station shall have provisions for Camlock cable connections. Spring-loaded or latching hinged flap for cable entry.
- E. Where switch utilizes manual, double-throw action to transfer load, means shall be available to padlock switch in all positions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wall Mounted Switch: Utilize appropriate brackets or inserts.
- B. Floor Mounted Switch: Anchor to concrete base by bolting.
 - 1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."
- C. Identify components according to Division 26 Section "Identification for Electrical Systems."
- D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
 - 1. Connect automatic transfer switch(es) to initiate cranking of the emergency generator and to provide remote indication where specified or indicated on the drawings. Include installation of all wire and conduit associated with each automatic transfer switch.
 - 2. Connect automatic transfer switch to signal elevator (if connected to emergency/standby system).

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Coordinate tests with tests of generator and run them concurrently.

- C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- D. Remove and replace malfunctioning units and retest as specified above.

3.4 WARRANTY

- A. Provide 5-year extended warranty (Parts and Labor). Provide the certificate directly to the Owner accompanied by a letter of transmittal. Provide a copy to the Architect/Engineer with shop drawings.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switch(es) and related standby equipment.

END OF SECTION 263601

SECTION 26 4313 – SURGE PROTECTIVE DEVICES (SPD) FOR LOW-VOLTAGE ELECTRICAL
POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes SPD's for low-voltage power equipment.

1.2 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer. The manufacturer shall have been engaged in the manufacture of SPD products specified and products shall have been in satisfactory service for not less than 5 years.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."
- D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."
- E. Comply with UL 1283 5th Edition, "Electromagnetic Interference Filters," and UL 1449 3rd Edition, "Surge Protective Devices."

1.3 PROJECT CONDITIONS

- A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 - 2. Operating Temperature: 30 to 120 deg F.
 - 3. Humidity: 0 to 85 percent, non-condensing.
 - 4. Altitude: Less than 20,000 feet above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies, Inc. (ASCO)
2. Current Technology, Inc. (ABB)
3. Cutler-Hammer, Inc. (Clipper)
4. Liebert Corporation.
5. Thor Systems, Inc.
6. Siemens Energy & Automation, Inc.
7. Square D.
8. LEA International.

2.2 SERVICE ENTRANCE SUPPRESSORS

- A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:
 1. LED indicator lights for power and protection status.
 2. Audible alarm, with silencing switch, to indicate when protection has failed.
 3. Fuses/circuit breaker, rated at 200-kA interrupting capacity.
 4. Integral disconnect switch or circuit breaker to isolate entire suppressor components for repair/replacement.
 5. Redundant suppression circuits.
 6. Surge-event operations counter.
- B. Peak Single-Impulse Surge Current Rating: 150kA per mode (300 kA per phase).
- C. Connection Means: Permanently wired.
- D. SPD and overcurrent/disconnect device shall have a short circuit current rating greater than that available on the electrical system.
- E. Protection modes and UL 1449 voltage protection rating compatible with system voltage and configuration as indicated on the drawings for complete protection as follows:
 1. Line to Neutral.
 2. Line to Ground.
 3. Neutral to Ground.

2.3 PANELBOARD SUPPRESSORS

- A. Same characteristics and requirements as service entrance suppressors with the following exceptions:
- B. Surge-event operations counter not required.
- C. Peak Single-Impulse Surge Current Rating: 65kA per mode (130 kA per phase).

2.4 ENCLOSURES

- A. NEMA 250 (or better), with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

- A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible (not to exceed 18 inches). Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. Twist input conductors together to reduce system inductance.
 - 1. Provide multipole circuit breaker or fusible disconnect switch as a dedicated disconnect for suppressor, fuse size and type as recommended by SPD manufacturer.

3.2 PLACING SYSTEM INTO SERVICE

- A. Do not energize or connect service equipment to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform the following field tests and inspections and document on test reports:
 - 1. Complete startup checks according to manufacturer's written instructions.

END OF SECTION 26 4313

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SECTION 26 5113 - INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, light engines (LED's) and drivers.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. See Division 26 Section "Wiring Devices" for manual wall-box dimmers for LED fixtures or lamps.
- C. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including occupancy sensors, and multi-pole lighting relays and contactors.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes and photometric data.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. LED Fixtures: Fixtures with LED light source are noted on lighting fixture schedule with advertised lumen output of light source for fixture/manufacturer specified and color temperature. Listed equal manufacturer shall provide fixture with equivalent lumen output as listed product. If insufficient information is provided, the Engineer may require Project Specific, point-by-point photometric calculations of sample areas utilizing the submitted fixture to prove equivalent performance.
- D. Product Certificates: For each type of driver, signed by product manufacturer.
- E. Utility Company Energy Rebate Programs
 - 1. LED lighting fixtures shall be Energy Star or DLC listed to comply with local Utility Company Rebate Programs. Does not apply to track lighting fixtures. Fixture submittals that do not have either of these listings clearly indicated in the product data shall be rejected.
- F. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. All LED fixtures and components shall be tested and comply under the standards of IESNA LM-79-08, LM-80-08, LM-82-12 and TM-21-11 for measurement and publication of projected long term lumen maintenance, color stability, photometric performance and LED source operating lifetime. Fixture submitted shall meet the listed lifetime rating of the fixture specified, as a minimum.

1.4 WARRANTY

- A. Provide a written, five year replacement material warranty for defective or non-starting LED source assemblies. Warranty period shall begin on date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Lighting Fixture Schedule the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified on drawing schedule.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with UL 1598 and NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Polymer Components: Plastic or polymer housing/components of fixture assemblies shall be rated for the temperature (or plenum) environment installed and shall not degrade in structural integrity, shape, color or finish for a minimum of 10 years.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit servicing without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position.
- F. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

- a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
2. Glass: Tempered glass, unless otherwise indicated.
- G. Servicing Access: Fixtures specified for installation in inaccessible (gypsum/drywall) ceilings/walls, etc. shall be fully serviceable/accessible from the fixture aperture.
- H. Disconnecting Means:
 1. Lighting fixtures with luminaires that utilize double-ended lamps and contain driver(s) that can be serviced in place or luminaires that are supplied from multi-wire branch circuits and can be serviced in place shall have a local disconnecting means at/within the fixture complying with NEC Article 410.75.

2.3 DRIVERS

- A. Drivers for LED Light Sources:
 1. Driver shall be separate component from LED light source and shall be replaceable utilizing mounting screws, factory provided clips and electrical connector bodies.
 2. Dimming (When noted or indicated on Fixture Schedule): 100 to 1 percent of rated lumens via separate 0-10V input (Dimmer) control. Line voltage dimming acceptable when noted on plans.
 3. Level Control/Step-Dimming (When noted or indicated on Fixture Schedule): Minimum capability of bi-level control (100%-50%-Off) or 1/3-2/3-Full on, as noted.
 4. Voltage input: 120-277 Volt multi-volt capability.
- B. Internal-Type Emergency Fluorescent Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with driver. Comply with UL 924.
 1. Emergency Connection: Operate light source continuously at a minimum output of 1000 lumens. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture driver.
 2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
 4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 5. Voltage input: 120-277 Volt multi-volt capability.

- C. Where plans call for multi-level switching/lighting, provide appropriate driver in fixture as required to accommodate the switching level arrangement of fixture.

2.4 EXIT SIGNS

- A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
 - 1. Light source for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
 - 2. Voltage input: 120-277 Volt multi-volt capability.

2.5 EMERGENCY LIGHTING UNITS

- A. Description: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns luminaire on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Luminaire automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects luminaire from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Voltage input: 120-277 Volt multi-volt capability.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge.
- C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- D. Recessed fixtures shall be supported at all 4 corners, independent of each other, from structure above with steel #12 single jack chains. Additionally, securely fasten each fixture to the ceiling framing member by mechanical means such as bolts, screws, rivets or approved clips; install a minimum of one on each four sides of fixture.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls.
- INTERIOR LIGHTING FIXTURES

- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 - 1. Single or Continuous Rows: Provide manufacturer required quantity of suspension cables at minimum intervals to support continuous row fixtures. The E.C. shall support suspended fixtures independently from the ceiling system and as specified by the fixture manufacturer.
- D. Surface or Flush Lighting Fixture Support:
 - 1. The E.C. shall coordinate fixture locations with the trade installing the ceiling system to assure support members are oriented and located to accommodate the lighting fixture layout.
 - 2. Surface or flush fixtures in ceilings of the suspended lay-in type shall be installed so that the long dimension of the fixture is supported on the main support members of the ceiling system.
- E. Luminaires installed in exposed or concealed locations under metal corrugated sheet roof decking shall be installed and supported so there is not less than 1-1/2" measured from the lowest surface of the roof decking to the top of the luminaire.
- F. Adjust aimable lighting fixtures to provide required light intensities.
- G. Where fixtures are suspended in Mechanical/Electrical/Storage/Technology or Utility spaces with no suspended ceiling, coordinate mounting heights and locations with exposed ductwork, piping, conduit/data cabling racks, equipment, etc. to provide optimal and even light distribution to service equipment.
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Where applicable, verify transfer from normal power to battery and retransfer to normal.

3.3 SPARE LAMPS/FIXTURES

- A. For LED fixtures with LED source integral to the fixture assembly, provide one spare fixture for each type as noted on lighting fixture schedule.
- B. For fixtures with separate/replaceable LED luminaire (retrofit lamp), provide 5 spare lamps of each type utilized.

PART 4 - END OF SECTION 26 5113

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SECTION 26 5600 – EXTERIOR AREA LIGHTING

PART 1 - GENERAL

- 1.1 Work includes complete new exterior building mounted lighting as well as re-feed of existing pole mounted lighting, as shown on the drawings.

PART 2 - PRODUCTS

- 2.1 Refer to data on the drawings for fixture details.
- 2.3 Exterior building mounted lights utilized for emergency egress shall incorporate multiple drivers/LED sources where a single fixture is utilized at an exterior exit.

PART 3 - EXECUTION

- 3.1 Splicing shall be made with approved and UL Listed, waterproof splicing kits and shall be located in base of poles behind handhole or in splice box if indicated on plans.
- 3.2 Install a green ground wire throughout the underground wiring system and bond to all standards.

END OF SECTION 26 5600

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SECTION 26 6101 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers fire alarm systems, including initiating devices, notification appliances, controls and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - 1. Fire alarm and detection operations.
 - 2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems and other equipment as indicated in the drawings and specifications.

1.2 Acceptable Manufacturer

- A. Manufacturer: The equipment and service described in this specification are those supplied and supported by Notifier whose catalog numbers are used herein for establishing equipment criteria. Other acceptable manufacturers are Honeywell (Silent Knight), Mircom or Simplex Grinnell.
- B. Equipment manufacturer shall have a service organization within 60 miles of the project site and be a U.L. certified company. All equipment and materials necessary for proper operation of the system shall be deemed part of these specifications even if not specifically listed or described in this document.

1.3 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 and 26 Specification Sections, apply to this section.
- B. The work covered in this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 - 1. Division 26: "Common Work Results for Electrical."
 - 2. Division 26: "Control Voltage Electrical Power Cables."
- C. The system and all associated operations shall be in accordance with the following:
 - 1. Guidelines of the following Building Code: BOCA
 - 2. NFPA 72, National Fire Alarm Code
 - 3. NFPA 70, National Electrical Code

4. NFPA 101, Life Safety Code
5. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
6. Other applicable NFPA standards
7. Local Jurisdictional Adopted Codes and Standards
8. ADA Accessibility Guidelines

1.4 System Description

- A. System shall be a microprocessor based, double supervised, closed circuit fire alarm system of modular design utilizing addressable technology for remote devices. Wiring shall be Class "B" for signaling and notification circuits. Smoke detectors shall be analog, addressable units with control panel adjustable sensitivity. All equipment shall be labeled by U.L. for fire alarm signaling use.
- B. Operation of any addressable manual or automatic fire alarm initiating device shall initiate the following:
 1. Sound a Code-3 temporal pattern audible alarm signal (pattern programmable at the main panel) and illuminate fire signal lights (strobes) in a synchronous mode until alarms have been silenced. Alarm may be silenced at the main fire alarm system control panel or at a remote annunciator panel by means of an "alarm silence" switch or if the initiating device returns to normal and a system "reset" switch is manually actuated.
 2. Display the alarm condition on integral LCD display in the main control panel and remote annunciator(s). Display shall indicate the alarming device and its location. All alarm initiating devices shall be individually addressed.
 3. Print the assigned message with time and date at the control panel (or remote printer, if specified). Activate control-by-event functions listed in these specifications.
 4. Initiate a separate trouble and alarm signal for connection to remote monitoring service organization via dedicated telephone line(s) or as directed by Owner.
 5. Release all electromagnetic door holders.
- C. In the event of an operating power failure or an open or a grounded circuit in the system, a trouble signal and a trouble light shall be activated until the problem is corrected and the system is restored to normal. The trouble event shall be recorded in the system history log and printed on the system printer (when applicable). The trouble may be silenced by means of a button on the main control panel. Upon restoration of the system to a normal condition, the trouble light shall extinguish.

1.5 Submittals

- A. General: Submit two (2) sets of the following to the Architect/Engineer for review for conformance with the Bid Documents prior to submission to the AHJ for permit:
 1. Product data sheets for system components highlighted or marked to indicate the specific products, features or functions required to meet this specification. Alternate or as-equal

- products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds or does not comply with this specification.
2. Wiring diagrams from Manufacturer's Vendor.
 3. Shop drawings showing system details including location of FACP, all devices, circuiting and details.
 4. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
 5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, sensor and auxiliary control circuits.
 6. Operating instructions for FACP.
 7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type of product, including all features and operating sequences, both automatic and manual. Provide the names, addresses and telephone numbers of service organizations.
 8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with specified requirements.
- B. Submission to Authority Having Jurisdiction: After Architect/Engineer review of routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make re-submissions if required to make clarifications or revisions to obtain approval.
- 1.6 Quality Assurance
- A. Installer Qualifications: Installer(s) shall meet State of Ohio and local Municipality requirements for certification and as a minimum, have one installer certified as a NICET Level 2. In addition, the fire alarm system supplier shall have on staff, one NICET Level 3 certified individual and be an UL certified company.
- B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by UL Inc. and shall bear the UL label.
- 1.7 Extra Materials
- A. General: Furnish extra materials, packaged with protective covering for storage and identified with labels clearly describing contents as follows:
1. Strobe units: Furnish four (4) units, plus 50 ft. of wire for each device, installed at the Engineer's direction.
 2. Horn/Strobe units: Furnish four (4) units, plus 50 ft. of wire for each device, installed at the Engineer's direction.
 3. Smoke Detectors or Sensors: Furnish two (2) units.
 4. Detector or Sensor Base(s): Furnish two (2) units of each type installed, plus 50 ft. of wire for each, installed at the Engineer's direction.

5. Pull station(s): Furnish two (2) units, plus 50 ft. of wire for each device, installed at the Engineer's direction.
6. Addressable Circuit Interface Modules: Furnish two (2) units, plus 50 ft. of wire for each, installed at the Engineer's direction.

PART 2 - PRODUCTS

2.1 Control Unit

- A. Control unit shall contain all necessary components to provide complete control, testing and indicating facilities for the entire fire alarm system. Relays, where utilized, shall be pluggable type, sealed in dustproof containers to prevent failure from dust, dirt, tampering and accidental contact. Unit shall facilitate silencing of alarm from one addressable device and shall resound on subsequent alarm from another addressable device. Unit shall be double supervised, individually annunciated by addressable point with the following features: test switch, silencing switch(es), reset switch(es), control switch(es), power "on" lamp, minimum of 80 character LCD display, "Alarm" lamp and a means to simultaneously test all indicator lamps (LED's). "Trouble" signal shall be in integrally mounted alert signal with a SPL of 80 db at 4 ft. Trouble alarm silence switch (button) shall have ring back feature.
- B. An alarm shall be displayed on a two line, minimum 80 character LCD display. Display shall indicate alarms, supervisory service conditions and any trouble conditions. The top line of characters shall be the address/point label and the second line shall be the device type identifier. The system ALARM red LED shall flash on the main control panel and remote annunciator panels until the alarm has been acknowledged at any of the panels. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another point, after acknowledged, shall flash the system ALARM red LED on the control panels. The LCD display shall show the new alarm information. A pulsing alarm tone shall occur within the control panel and the remote annunciator panels until the alarm is acknowledged.
- C. The control panel shall be sized to accommodate 250 addressable devices, expandable to 2000 addresses thru the addition of Idnet card(s) within this control panel. Power supplies shall be supplied with 100% capacity including provisions for 20% additional strobe lights and 20% additional audible devices. Provisions for spare capacity shall include additional data loop cards or signaling cards to support the specified capacity. Audible signals shall be master controlled from the fire alarm panel or permit master coded signaling in a Code-3 temporal pattern, panel selectable without making any modifications to remote devices. All visual alarm signals (strobe lights) shall be synchronized at the fire alarm panel. Notifier NFS2-3030 series with all necessary accessories.
- D. Cabinet shall be modular construction, shall be semi-flush mounted and shall accommodate all modules, cards, relays, terminal connections, batteries, etc., necessary for system operation. The outer door and frame assembly shall be equipped with a keyed lock and shall have a transparent door panel to enable viewing all alarm and trouble lights, as well as LCD display, without opening door. Provide manufacturer's standard enamel finish.
- E. The control panel shall communicate individually with addressable initiating and control devices. Each device shall be individually annunciated at control panel.

1. Annunciation shall include the following:
 - a. Alarm
 - b. Trouble
 - c. Open
 - d. Short
 - e. Device missing/failed
2. All addressable devices shall be capable of being disabled or enabled individually.
3. Smoke detectors shall utilize "Alarm Verification" operation.
4. Smoke sensor sensitivity shall be field-adjustable from the control panel for the analog style detectors. Control panel shall have a self-test function such that each sensor is automatically tested once every 24 hours. Sensor shall notify control panel when maintenance is required. System shall automatically compensate for variations in environmental conditions.

F. The control panel shall have a "Walk Test" feature.

G. Operating power shall be supplied from a 120 volt, 60 Hz circuit while the supervisory power shall be supplied from an integral DC power supply. The low voltage DC power shall consist of power limited, filtered and regulated power supplies with maintenance-free, lead-calcium battery back-up with automatic recharger. Indication for normal power supply and power supply trouble shall be provided. Provide remote cabinet for batteries where size dictates need. Batteries shall be sized to maintain system operation, including trouble alarm, for 24 hours with sufficient reserve capacity to power all alarm sounding devices for 5 minutes. Battery capacities shall be sized to include provisions for the spare strobe light and audible devices in Para. 1.7. Door holders are not required to be maintained by the standby batteries. All batteries shall be supervised.

H. Provide surge suppressors ahead of all 120 volt power connections to the fire alarm equipment. Locate suppressors within equipment enclosure or in a junction box directly above/adjacent to the unit. Suppressors shall be Leviton #51020-WM or equal. These suppressors are in addition to internal protection provided with the fire alarm system's internal electronics.

I. Provide surge suppressors on all initiating and notification circuits that enter or leave the building to/from remote locations.

2.2 Remote System Components

A. Miniplex transponders will communicate with the Main Fire Alarm Control Unit to provide for centralized control of alarm and trouble signaling as well as output signaling. The transponder shall be capable of limited stand-alone operation in the event the communication link to the central system is lost. Each transponder shall be furnished with all necessary controls, power supplies and battery back-up.

B. Manual stations shall be addressable communicating devices, shall be non-coded, single action with break rod operation (glass rod not required to reset station), red finish semi-flush mounted with keyed reset switch. Notifier #NBG-12LX.

C. Fire signal lights (strobe lights) for synchronized operation shall provide visual indication of all alarms and shall illuminate in a flashing mode whenever system is in alarm state. Fire signal

lights shall be labeled in accordance with UL 1971 Standards and shall be 15 candela in corridors and 110 candela in all other areas unless specifically designated otherwise. Semi-flush mount signal lights on walls where shown on the drawings. Lens shall be installed in a horizontal alignment on a red back plate labeled "FIRE" and shall produce one flash per second. Strobes shall be System Sensor L Series. Exterior units shall be gasketed and labeled for exterior use, System Sensor SpectrAlert series UL 1638 compliant).

- D. Horns shall be semi-flush mounted, with red grille and field selectable output levels of 85 or 91 dB at 10 ft. (based on UL 464 reverberant test requirements). Horn operating power levels shall be set initially at 85 dB and adjusted upward as required for proper sound coverage during the final check-out. Power calculations shall be made using the current draw for all units operating at 91 dB. Outside assemblies shall be weatherproof. Combination (audible/visible) horn and fire signal lights shall utilize a compact, combination mounting base assembly. Horns shall be labeled "FIRE". System Sensor L Series (utilize the continuous horn signal setting) with mounting accessories. Exterior units shall be gasketed for weatherproof rating. Combination strobe/horn signal units shall be factory assembled, System Sensor L Series.
- E. Combo horns with fire signal lights (strobe lights) for synchronized operation shall provide both audible and visual indication of all alarms and shall illuminate in a flashing mode whenever system is in alarm state. Fire signal lights shall be labeled in accordance with UL 1971 Standards and shall be 15 candela in corridors and 110 candela in all other areas unless specifically designated otherwise. Semi-flush mount horn/signal lights on walls where shown on the drawings. Lens shall be installed in a horizontal alignment on a red back plate labeled "FIRE" and shall produce one flash per second. Horns shall have a red grille with field selectable output levels of 85 or 91 dB at 10 ft. (based on UL 464 reverberant test requirements). Horn operating power levels shall be set initially at 85 dB and adjusted upward as required for proper sound coverage during the final check-out. Power calculations shall be made using the current draw for all units operating at 91 dB. All strobes shall be synchronized throughout the entire building utilizing control circuitry within the main fire alarm panel (and extender panels, if used). Exterior units shall be gasketed and labeled for exterior use, System Sensor L Series.
- F. Surface mounted fire alarm devices mounted on walls-such as manual stations, horns, strobes, etc. shall utilize finished backboxes. These backboxes shall be red metal and shall be field punched for conduit entrance (boxes shall not be stamped KO construction).
- G. Individual addressable monitor module shall be an addressable module used for monitoring N.O. contact devices such as water flow, tamper switches, etc. Notifier #FMM-101.
- H. Programmable relay control module shall be an individual addressable module used for control of auxiliary functions such as elevator control, door release, smoke damper shutdown, air handling unit shutdown, etc. Notifier #FRM-1.
- I. Photo-electric type, addressable, ceiling mounted smoke detectors, shall utilize all solid state components operating on the light scatter principle and shall have adjustable sensitivity set at the transponder to detect smoke at 0.5% to 3.7% light obscuration per foot. The sensors shall communicate actual smoke chamber sensitivity to the system control where it is constantly monitored. Each addressable detector is individual adjustable thru the control panel and environmentally adjusted. The system will indicate when individual sensors need cleaning. Detector head shall have a white finish and contain an integrally mounted LED pilot lamp that indicates detector status. Notifier #FSP-951 with B300 base. Provide remote LED alarm indicators when indicated on plans.

- J. Photo-electric type, addressable, duct mounted smoke detectors, shall utilize all solid state components operating on the light scatter principle and shall have adjustable sensitivity set at the transponder to detect smoke at 0.5% to 3.7% light obscuration per foot. The sensors shall communicate actual smoke chamber sensitivity to the system control where it is constantly monitored. Each addressable detector is individual adjustable thru the control panel and environmentally adjusted. The system will indicate when individual sensors need cleaning. Detector head shall have a white finish and contain an integrally mounted LED pilot lamp that indicates detector status. Notifier #DNR/FSP-951/DST/FRM-1. A remote LED "status" light shall be flush mounted at 54" mounting height in a convenient location within sight of air handling unit, Notifier #RA-400Z.
- K. Waterflow switches shall indicate the continuous flow of water in sprinkler pipes where indicated on drawings. Unit shall be equipped with retard mechanism, adjustable up to two minutes, to minimize false alarms due to pressure changes. Retard mechanism and allowable time delay shall be subject to local AHJ requirements. Unit shall be supplied and installed by the Fire Suppression Contractor and wired to the fire alarm system by the E.C. via a monitor module with a dedicated address.
- L. Gate valve switches (OS&Y) shall monitor the status of sprinkler valves where indicated on drawings and shall signal a trouble alarm when respective valve is closed. Unit shall be supplied and installed by the Fire Suppression Contractor. Each gate valve switch shall be wired to the fire alarm system by the E.C. via a monitor module with a dedicated address.
- M. Magnetic door holders shall be multi-voltage selectable for 24 VDC or 24/120VAC operation. Flush wall mounted, Notifier #FM-998; semi-flush mounted, Notifier #FM-997 for new construction or surface wall mounted, Notifier #FM-996 for remodel applications on existing walls. Floor mount models for single door, Notifier #FM-980 or double door, two Notifier #FM-980, where shown on plans or application requires such use.
- N. Remote Annunciator and Operator Control Panels shall be flush wall mounted where shown on plans. Each shall consist of an 80 character LCD display with control features similar in appearance and orientation as the main fire alarm control panel. Control buttons shall be locked behind a window (keyed the same as the main fire alarm control panel) to prevent unauthorized operation.
- O. Notification appliance power extender control panels shall be provided where shown on the drawings. These panels shall communicate with and be completely supervised from the main fire alarm control panel. They shall be capable of powering additional synchronized visual alarm signals (strobes) and/or audible alarm signal circuits. Each panel shall include supervisory modules, power supplies, batteries and chargers. At the Contractor's option, additional extender panels may be utilized if deemed acceptable by and locations are coordinated with the Architect/Engineer during the bidding phase. Notifier #FCPS-24 Series panel with accessories.
- P. A digital communicator shall be located within the main fire alarm control panel to automatically transmit designated alarms, supervisory and trouble signals to a central station monitoring service via dedicated telephone lines. The digital communicator shall be compatible with the communications protocol of all major Central Station receivers, including: ADCOR, ADEMCO, FBI, Franklin, Osborne Hoffman, Radionics, SESCOA, Silent Knight, Varitech, DCI, Vertex, etc. The main fire alarm panel shall have all provisions for the installation of a digital communicator furnished and installed by the owner contracted Central Monitoring Service. The digital communicator shall be connected to one telephone line and a cellular dialer,

shall supervise both means of communication and shall be capable of sending alarm signals on both means of communications to the Central Monitoring Service. The fire alarm panel shall indicate a trouble alarm on any digital communicator equipment failure (including loss of telephone line connection for longer than 45 seconds). The digital and cellular dialer shall be powered and maintained by the main fire alarm control panel standby battery power supply. Provide surge suppression on the 120 volt power supply and on one telephone lines. Provide both digital and cellular dialers and one year of UL monitoring.

2.3 The digital communicator shall transmit the following event level information:

1. Fire Alarm Condition
2. Supervisory Condition
3. Trouble Condition
4. Daily Test Signal

B. Provide a recessed Knox-Box rapid entry system where indicated on drawings. Extend wiring from the Knox-Box tamper switch to a monitor module to signal a trouble to the building fire alarm system.

PART 3 - EXECUTION

3.1 Installation, General

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

3.2 Equipment Installation

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes and all other necessary material for a complete operating system. Wall mounted devices shall utilize manufacturer recommended rough-in boxes with bushed conduit stubbed above accessible ceiling (as a minimum).

B. If the building has a legally required standby power generator or power system, the E.C. shall provide a 20 Amp-120 Volt emergency circuit from the nearest Life-Safety emergency panel to the main fire alarm panel and any additional Notification Appliance (Power Extender) Panels required by the system.

C. Coordinate door holder equipment connections and installation with door hardware supplier.

D. Locate duct mounted smoke detectors per UL and manufacturer's guidelines for accurate air sampling and to permit easy access for maintenance and testing. Coordinate installation with the H.C. Where required, provide access panels. The E.C. shall ensure accessibility to the entire assembly.

- E. Provide a system smoke detector at the location of each fire alarm control unit (this includes the main panel and extender panels/auxiliary control panels where initiation/notification circuits originate).

3.3 Wiring Installation

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electrical Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuit wiring and a different color code for supervisory circuits. Color code notification appliance circuits differently from alarm initiating circuits. Paint fire alarm system junction boxes, conduit fittings and box covers red.
- D. The following wiring and conduit shall also be included in the fire alarm system work:
 - 1. Empty conduit with pull wire from the digital communicator to the main telephone backboard. Telephone wiring from the telephone backboard to the digital communicator is the Owner's responsibility (or provided under a separate contract). The E.C. shall assist in making the final connections at the digital communicator and verify transmission and receipt by the Central Station prior to final testing.
 - 2. From duct mounted smoke detector, control relay module or fire alarm panel to each air handling unit and exhaust fan for shutdown where required by OBC (606).
 - 3. From electro-mechanical door holders to associated smoke detectors and/or fire alarm panel or control relay.
 - 4. Wiring to supervisory monitor and control points.
- E. **Wire shall be plenum rated, install cabling in a separate J-hook system where accessible. Install conduit in areas that are inaccessible when construction is complete.**

3.4 Field Quality Control

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing and adjustment of the system.
- B. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing. Test the system according to the procedures outlined in NFPA 72.

- C. Report of Tests and Inspections: Provide a written record of inspections, tests and detailed test results in the form of a test log.
- D. Final Test, Certificate of Completion and Certificate of Occupancy:
 - 1. Test the system as required by the Authority Having Jurisdiction (AHJ) in order to obtain a certificate of occupancy.
- E. Revise all wiring diagrams and floor plans to reflect final accepted "As-built" conditions for the project and include in the O&M Manuals for the owner's use. In addition, the supplier shall include an electronic copy of the system's operating program on a CD.

3.5 Cleaning and Adjusting

- A. Cleaning: Remove paint splatters and other spots, dirt and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions, in compliance with NFPA 72. Provide up to three (3) visits to the site for this purpose.

3.6 Training

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's designated personnel for a minimum of 4 hours training on-site.

PART 4 - END OF SECTION 26 6101

SECTION 32 3119
DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Decorative aluminum fences.
2. Swing gates.
3. Horizontal-slide gates.
4. Gate operators, including controls.

B. Related Requirements:

1. Section 03 3000 "Cast-in-Place Concrete" for concrete bases for gate operators, drives, and controls.
2. Division 26 Sections for electrical service and connections for system disconnect switches and powered devices including, but not limited to, motor operators, controls, and limit switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fencing and gates.

1. Include plans, elevations, sections, gate locations, post spacing, and mounting attachment details, and grounding details.
2. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
3. Wiring Diagrams: Include diagrams for power, signal, and control wiring.

C. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches in length for linear materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Product Test Reports: For decorative metallic-coated-steel tubular picket fences, including finish, indicating compliance with referenced standard and other specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For gate operators to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. ASTM B221 – Standard specification for aluminum and aluminum-alloy extruded bars, rods and tubes.

1.7 PRODUCT WARRANTY

- A. All structural fence components shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

PART 2 - PRODUCTS

2.1 DECORATIVE ALUMINUM FENCES

- A. Decorative Aluminum Fences: Fences made from aluminum extrusions.
 - 1. Ameristar Fence Products – Basis of Design.
 - a. Fence System – Echelon Plus/Majestic Type.
 - b. Approved equal.
 - c. Fence Height: 6'-0".
- B. Post Caps: Aluminum castings that cover entire top of posts.
- C. Rails: Extruded-aluminum channels: 3-Rail.
- D. Pickets: Extruded-aluminum tubes: Standard 3/4" square.
- E. Fasteners: Manufacturer's standard concealed fastening system.

- F. Fasteners: Manufacturer's standard corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.
- G. Fabrication: Assemble fences into sections by fastening pickets to rails.
 - 1. Fabricate sections with clips welded to rails for field fastening to posts.
- H. Finish exposed welds to comply with NOMMA Guideline 1.
- I. Finish: Powder coating.

2.2 SWING GATES

- A. Gate Configuration: Double leaf.
- B. Gate Frame Height: 6'-0".
- C. Gate Opening: 12'-0".
 - a. Two (2) gates at 6'-0"/each.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes.
- E. Steel Frames and Bracing: Fabricate members from square steel tubing.
- F. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes.
- G. Frame Corner Construction: Assembled with corner fittings.
- H. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- I. Infill: Comply with requirements for adjacent fence.
- J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
- K. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Provide center gate stops and cane bolts for pairs of gates.
- L. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
 - 1. Function: 39 - Full surface, triple weight, antifriction bearing.
 - 2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.
- M. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.
 - 1. Function: 621 - Latchbolt by key from outside and by turn from inside. Latchbolt is held retracted by device from inside.

- 2. Material: Cast, forged, or extruded brass or bronze.
- 3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick.
- N. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.
- O. Finish exposed welds to comply with NOMMA Guideline 1.
- P. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- Q. Metallic-Coated-Steel Finish: High-performance coating.
- R. Steel Finish: Primed, high-performance coating.
- S. Aluminum Finish: Baked enamel or powder coating.

2.3 HORIZONTAL-SLIDE GATES

- A. Gate Configuration: Single leaf.
 - 1. Type: Cantilever slide, with external roller assemblies.
- B. Gate Frame Height: 6'-0".
- C. Gate Opening Width: 24'-0".
- D. Automated vehicular gates shall comply with ASTM F 2200, Class I.
- E. Galvanized-Steel Frames and Bracing: Fabricate members from square tubing.
- F. Aluminum Frames and Bracing: Fabricate members from square tubing.
 - 1. Frame Members: Extruded-aluminum tubes.
 - 2. Bracing Members: Extruded-aluminum tubes.
- G. Frame Corner Construction:
 - 1. Welded frame.
- H. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- I. Infill: Comply with requirements for adjacent fence.
- J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.

- K. Overhead Track Assembly: Manufacturer's standard track, with overhead framing supports, bracing, and accessories, engineered to support size, weight, width, operation, and design of gate and roller assemblies.
- L. Hardware: Latches permitting operation from both sides of gate.
- M. Finish exposed welds to comply with NOMMA Guideline 1.
- N. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- O. Metallic-Coated-Steel Finish: High-performance coating.
- P. Steel Finish: High-performance coating.
- Q. Aluminum Finish: Baked enamel or powder coating.

2.4 GATE OPERATORS

- A. Gate Operators:
 - 1. Nortek or approved equal.
- B. Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
 - 1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
 - 2. Provide operator with UL approval.
 - 3. Provide electronic components with built-in troubleshooting diagnostic feature.
 - 4. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.
- C. Comply with NFPA 70.
- D. UL Standard: Manufacturer and label gate operators to comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- F. Motor Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1 and the following:

1. Voltage: 208/3Phase.
 2. Horsepower: Not less than $\frac{1}{2}$.
 3. Enclosure: Totally enclosed.
 4. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
 5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
 6. Phase: Polyphase.
- G. Gate Operators: Concrete base mounted and as follows:
1. Hydraulic Slide Gate Operators:
 - a. Duty: Heavy duty, commercial/industrial.
 - b. Gate Speed: Minimum 60 feet (18.2 m) per minute.
 - c. Maximum Gate Weight: 800 lb (363 kg).
 - d. Frequency of Use: Continuous duty.
 - a. Operating Type: Wheel-and-rail drive with manual release.
 - b. Hydraulic Fluid: Of viscosity required for gate operation at ambient temperature range for Project.
 - c. Locking: Hydraulic in both directions.
 - a. Heater: Manufacturer's standard track and roller heater with thermostatic control.
- H. Remote Controls: Electric controls separated from gate and motor and drive mechanism, with NEMA ICS 6, Type 4 enclosure for pedestal mounting, and with space for additional optional equipment. Provide the following remote-control device(s):
1. Digital Keypad Entry Unit: Provided by Owner.
 2. Radio Control: Digital system consisting of code-compatible universal receiver for each gate, located where indicated, with remote antenna with coaxial cable and mounting brackets designed to operate gates. Provide 10 programmable transmitter(s) with multiple-code capability permitting validating or voiding of not less than 1000 codes per channel configured for the following functions:
 - a. Transmitters: Single button operated, with open function.
 - b. Channel Settings: 1 independent channel settings controlling separate receivers for operating more than one gate from each transmitter.
- I. Vehicle Loop Detector: System includes automatic closing timer with adjustable time delay, timer cutoff switch, and loop detector designed to hold gate open until traffic clears. System includes electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. System includes number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement, as recommended in writing by detection system manufacturer for function indicated, at location indicated on Drawings.

- J. Vehicle Presence Detector: System includes automatic closing timer with adjustable time delay, timer cutoff switch, and presence detector designed to hold gate open until traffic clears. System includes emitter/receiver detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of a vehicle in gate pathway when infrared beam in zone pattern is interrupted, and to emit a signal activating the gate operator.
- K. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately function as follows:
 - 1. Action: Stop gate in opening cycle and reverse gate in closing cycle, and hold until clear of obstruction.
 - 2. Internal Sensor: Built-in torque or current monitor senses gate is obstructed.
 - 3. Sensor Edge: Contact-pressure-sensitive safety edge, profile, and sensitivity designed for type of gate and component indicated, in locations as follows. Connect to control circuit using gate edge transmitter and operator receiver system.
 - a. Along entire length of gate posts.
 - 4. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in gate's path when infrared beam in the zone pattern is interrupted.
- L. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop gate at fully retracted and fully extended positions.
- M. Emergency Release Mechanism: Quick-disconnect release of operator drive system of the following type, permitting manual operation if operator fails. Design system so control-circuit power is disconnected during manual operation.
 - 1. Type Mechanical device, key, or crank-activated release.
- N. Operating Features:
 - 1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features with capability for monitoring and auditing gate activity. Provide unit that is isolated from voltage spikes and surges.
 - 2. System Integration: With controlling circuit board capable of accepting any type of input from external devices.
 - 3. Master/Slave Capability: Control stations designed and wired for gate pair operation.
 - 4. Automatic Closing Timer: With adjustable time delay before closing and timer cutoff switch.
 - 5. Open Override Circuit: Designed to override closing commands.
 - 6. Reversal Time Delay: Designed to protect gate system from shock load on reversal in both directions.
 - 7. Maximum Run Timer: Designed to prevent damage to gate system by shutting down system if normal time to open gate is exceeded.
 - 8. Clock Timer: 24-hour programmable for regular events.
- O. Accessories:
 - 1. Warning Module: Audio, Visual, strobe-light alarm sounding three to five seconds in advance of gate operation and continuing until gate stops moving; compliant with the United States Access Board's ADA-ABA Accessibility Guidelines.

2. External electric-powered magnetic lock with delay timer allowing time for lock to release before gate operates.
3. Fire box.
4. Fire strobe sensor.
5. Instructional, Safety, and Warning Labels and Signs: According to UL 325.
6. Retain "Equipment Bases/Pads" Subparagraph below if gate operator, drives, or controls are mounted on precast equipment bases/pads. Pads should extend 6 to 12 inches (150 to 300 mm) below frost line.
7. Equipment Bases/Pads: Precast concrete, depth not less than 12 inches (305 mm), dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

2.6 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- C. Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
- D. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.7 COATING MATERIALS

- A. Epoxy Primer for Galvanized Steel: Epoxy primer recommended in writing by topcoat manufacturer.
- B. Intermediate Coat for Uncoated Steel: Epoxy intermediate recommended in writing by primer and topcoat manufacturer.
- C. Acrylic Topcoat: Complying with MPI #72 and compatible with undercoat.
- D. Six Stage Pretreatment/Wash followed by an electrostatic spray application of a 'no-mar' polyester coat finish with a minimum thickness of 2-4 mils.

2.8 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 03 3000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi slump, and 1-inch (25-mm) maximum aggregate size.
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

2.9 GROUNDING MATERIALS

- A. Comply with requirements of Section 26 0526 "Grounding and Bonding for Electrical Systems."
- B. Grounding Conductors: Size as indicated on Drawings. Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
 1. Material above Finished Grade: Copper.
 2. Material on or below Finished Grade: Copper.
 3. Bonding Jumpers: Braided copper tape, 1-5/8 inch (41 mm) wide and 1/16 inch (1.6 mm) thick, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- C. Grounding Connectors and Grounding Rods: Comply with UL 467.
 1. Connectors for Below-Grade Use: Exothermic-welded type.
 2. Grounding Rods: Copper-clad steel.
 - a. Size: 5/8 by 96 inches (16 by 2440 mm).

2.10 ALUMINUM FINISHES

- A. Polyester Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.11 STEEL FINISHES

- A. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening rails to posts.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 32 inches.
- D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and sleeves and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches (51 mm) above grade. Finish and slope top surface to drain water away from post.
 - b. Concealed Concrete: Top below grade to allow covering with surface material. Slope top surface of concrete to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches to bottom of concrete.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for Concrete Bases: Hand-excavate holes for bases in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.
- C. Concrete Bases: Cast-in-place or precast concrete, depth not less than 12 inches, dimensioned and reinforced according to gate operator component manufacturer's written instructions.
- D. Vehicle Loop Detector System: Bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.
- E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.6 GROUNDING AND BONDING

- A. Comply with Section 26 0526 "Grounding and Bonding for Electrical Systems."
- B. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:
 - 1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.
 - 1) Bond metal gates to gate posts.
- C. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.
- D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
- E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

- F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- G. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, and limit switches.
- C. Lubricate hardware, gate operators, and other moving parts.

3.8 DEMONSTRATION

- A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 32 3119

Attachment A

LETTER OF ASSENT

[Project Owner/GC/Contractor]

[Address]

Re: [INSERT NAME OF PROJECT]- Project Labor Agreement Letter of Assent

Dear [Project Owner/GC/Contractor]:

This written communication is to confirm that [name of contractor/subcontractor] agrees to be a party and to be bound by the terms of the [insert name of project]- Project Labor Agreement (“Agreement”). The obligation to be a party to, and be bound by, the Agreement shall extend to all work covered by the Agreement and undertaken by [name of contractor/subcontractor] in furtherance of the Project as described in the Agreement and under the terms of the construction contract it has agreed to for its work on the Project. Further, [name of contractor/subcontractor] shall require all of its subcontractors of whatever tier to be similarly bound for all work within the scope of the Agreement by signing an identical Letter of Assent.

Sincerely,

[Name of Contractor]

By: _____

[Name and title of authorized representative]

Date: _____

CC: Dayton Building & Construction Trades Council
City of Dayton

TEMPLATE- SUBJECT TO MODIFICIATION ON PROJECT BY PROJECT BASIS

Project Labor Agreement

Between

City of Dayton

and

**Dayton Building & Construction Trades Council and its
affiliated members**

and

(Construction Manager/General Contractor/Contractors)

Covering

(INSERT PROJECT NAME)

This Project Labor Agreement ("Agreement") is entered into this XX day of _____, 20____ by and between the City of Dayton ("Owner"), and the Dayton Building & Construction Trades Council, AFL-CIO ("DBCTC") acting on its own behalf and on behalf of all affiliates and members ("Unions") whose names are subscribed hereto, and who have, through their duly authorized officers, executed this Agreement with respect to the construction of the INSERT PROJECT DESCRIPTION ("the Project"). The term Contractor shall include all contractors/employers, of whatever tier, engaged in construction work within the scope of this Agreement.

This Agreement shall be incorporated into the bid specifications for the Project. Further, this Agreement shall be in addition, but shall not modify, supplant or replace, any licensing, prequalification, or other construction contracting procurement requirements in place for construction projects owned and bid by the Owner.

ARTICLE I

INTENT AND PURPOSE

- 1.1 The Parties to this Agreement express their mutual and sincere commitment to the families and quality of life within the City of Dayton by (a) helping to ensure that local building tradespersons and their families directly benefit from the construction of the region's public and civic infrastructure; (b) supporting a diverse, inclusive local building trades workforce; and (c) supporting the investment made in training local building tradespersons to ensure the highest quality construction.
- 1.2 The purpose of this Agreement is to establish conditions for the prompt and efficient completion of construction work on the Project and to secure optimum productivity by providing close cooperation among the Contractor(s), Owner, City of Dayton community, and the DBCTC.
- 1.3 An incentive for entering into this project-specific Agreement is elimination of the risk of delays and disruption caused by labor disputes and unrest. This Agreement creates effective and binding methods for the settlement of all disputes or grievances which may arise on the Project.

ARTICLE II

SCOPE OF AGREEMENT

- 2.1 For the purposes of this Agreement, the term "Contractor" includes all construction Contractors and Subcontractors of whatever tier engaged in onsite construction work within

the scope of this Agreement, except for those Contractors and Subcontractors specifically excluded from the Agreement. A contractor may only be excluded from this Agreement by mutual consent of the Owner and the DBCTC. A contractor that refuses to become signatory to this Agreement shall not be the basis for exclusion. The term "Contractor" shall also include a Construction manager and/or as Design Build firm when it self-performs services that fall within the historical definition of construction. The term "Employer" includes any Contractor and Subcontractor signatory to this Agreement who employs individuals covered by this Agreement. The term "Owner" refers to the City of Dayton alone. The term "applicable Local Collective Bargaining Agreement" means the labor agreement of an affiliated local Union to the DBCTC that covers the work being performed on the Project within its work jurisdiction/scope of work, copies of which can be reviewed upon request made to DBCTC.

- 2.2 This Agreement is a stand-alone agreement limited to the original construction of the Project and shall have no force or effect after the completion of the Project.
- 2.3 Except as restricted by applicable laws and regulations, Owner and Construction Manager ("CM") have executed a Construction Manager at Risk Contract dated ##/##/### which provides for the qualification and selection of contractors for this Project. The CM and the Owner mutually agree to amend said Contract to include this PLA. The City of Dayton will exercise this right without regard to whether the successful bidder performs work at other sites on either a union or non-union basis and without regard to whether employees and subcontractors of such bidder are or are not members of any union.
- 2.4 Except to the extent the City has already executed a Contract, the Owner shall require all Contractors, as a condition of being awarded contracts for work covered by this Agreement, to accept, execute and be bound by the terms and conditions of this Agreement prior to commencing work on the Project. Proof of compliance with this Section 2.4 shall be via the Contractor executing a Letter of Assent as prescribed by the Owner (see Attachment A - Letter of Assent). Except as otherwise provided herein, every Contractor, of whatever tier, shall become signatory to this Agreement and abide by its terms. The terms and conditions of the applicable Local Collective Bargaining Agreements of the Unions signatory to this Agreement covering the craftwork being performed shall govern the terms and conditions of employees on the Project, other than as explicitly set forth herein.
- 2.5 This Agreement shall apply to and is limited to all work recognized and accepted within historical definitions of new construction work and/or covered by a collective bargaining agreement of a signatory union under the direction of and performed by the Contractor(s), of any tier level, who have contracts awarded for such work on the Project, except for any work or Contractors specifically excluded from this Agreement.

2.6 This Agreement does not apply to the following:

- A. Work performed by non-manual or professional employees, included, but not limited to, architects, construction managers, maintenance plan advisors, commissioning agents, geotechnical consultants, superintendents, supervisors, engineers, field engineers, surveyors, quality assurance and quality inspectors, technicians, office workers, messengers, persons making deliveries to and from the Project site, warehouse employees, guards (or Security Personnel), medical personnel, emergency vehicle operators and employees similarly classified by the Owner; or any Contractor excluded by the Owner;
- B. All Owner operations and activities that do not fall within the historical definition of construction;
- C. Work designated as being for technically unique services or skills that is sole source or warranty work, whether performed at the discretion of the Contractor, of any tier, or by the Owner's assigns or successors, the (INSERT CM/General Contractor/Design Build) shall notify DBCTC and the Owner at least twenty one (21) days in writing that work on the project will be performed under 2.6 (C) prior to the commencement of the work. The written notification clearly identification the justification that the scope falls within 2.6 (C). If the DBCTC disagrees with the justification it shall file a grievance under this agreement. The work shall not commence until the grievance is fully adjudicated under this Agreement.

2.7 Nothing contained herein shall be construed to prohibit or restrict the Owner or its employees from performing work not covered by this Agreement on the Project site.

ARTICLE III

MANAGEMENT RIGHTS

- 3.1 The Owner, its successor or assigns, and Contractors, of whatever tier, retain all rights and authority not expressly excluded or limited by this Agreement.
- 3.2 The Owner may, in accordance with the CM Agreement or other contractual agreement, terminate, delay, modify, suspend, or issue, or approve or disapprove a change order for, any or all portions of the Project at any time.
- 3.3 Except as expressly limited by a specific provision of this Agreement, Contractors, of any tier, and the Owner, and its successors or assigns, maintain the following management rights including, but not limited to:
 - A. Hire and lay off employees as the Contractor feels appropriate to meet work scope requirements, and to retain necessary skills and trained resources for the workforce on the

Project;

- B. Plan, direct and control the execution and assignment of all work;
- C. Determine the size of crews and the number of foremen and general foremen needed per the applicable Local Collective Bargaining Agreement;
- D. Transfer employees from job to job on or outside of the Project without limitation or restriction and from shift to shift at per the applicable Local Collective Bargaining Agreement and the CM Agreement;
- E. Determine work methods and procedures necessary for the Project per the applicable Local Collective Bargaining Agreement and the CM Agreement; and
- F. Discharge, suspend, or discipline employees per the requirements of this Agreement and the Local Collective Bargaining Agreement and the CM Agreement.

ARTICLE IV

UNION/DBCTC RIGHTS AND RESPONSIBILITIES

- 4.1 The Contractor(s) recognize the signatory Union(s) as the sole and exclusive bargaining representatives of all craft employees within their respective jurisdictions working within the scope of this Agreement on the Project. Such recognition shall be strictly limited to the term of this Project.
- 4.2 Nothing in this Agreement requires employees to join or pay dues or fees to a union as a condition of working on the Project. However, this Agreement is not intended to supersede independent requirements in applicable local union agreements as to contractors that are otherwise signatory to those agreements and as to employees of such employers performing covered work.
- 4.3 Contractor(s) shall provide Unions with access to, and meeting time with, any worker referred or assigned to the Project that is not a member of the appropriate Union prior to the commencement of their employment on the Project or within seven (7) days of such employee's first date of reporting for work at the Project location. The Unions shall be permitted access at the Project location at such times and locations as Contractor identifies to assure Project safety and are permitted to present benefits of union membership including, but not limited to, retirement, healthcare, and training benefits. The Unions may conduct such employee meetings without the presence of any Contractor(s) representative. The Unions shall coordinate such meeting with the Contractor(s) during work hours and ensure minimal disruption to work schedules.

- 4.4 Upon being presented with a signed voluntary written authorization form by an employee covered by this Agreement, the Employer will deduct from the wages of such employee and remit to the applicable Union all dues, fees and assessments in accordance with the signed voluntary written authorization.
- 4.5 The DBCTC and its members, agents, representatives and employees shall not allow, incite, encourage, condone, aid or abet, continue, or participate in any strike, walkout, slowdown, picketing, disruptive activity, sympathy strike or other work stoppage of any nature whatsoever for any cause whatsoever, whether jurisdictional or otherwise, or observe any picket of any nature during the term of this Agreement. Any such action by the DBCTC or its members, agents, representatives and employees shall constitute a material breach of this Agreement. The DBCTC and its members, agents, representatives and employees shall forthwith undertake all reasonable means to prevent or to terminate any of the aforesaid activity.
- 4.6 All employees shall continue to work and to perform all their obligations on the Project despite the expiration of any Local Collective Bargaining Agreement.
- 4.7 Any employee who participates in or encourages activities in violation of this Article shall be subject to disciplinary action, including discharge.
- 4.8 All parties agree that in the event that a Union violates the provisions of this Article, the Owner or Contractor will have the right to seek an immediate injunction from the appropriate court without obligation to post bond or other security.
- 4.9 There shall be no lockout by any Contractor during the term of this Agreement. All parties agree that in the event a Contractor violates the provisions of this Article, the Owner or affected Union will have the right to seek an immediate injunction from the appropriate court. In addition, the Owner may terminate the CM Agreement in accordance with the terms of the CM Agreement.
(This Section shall be modified based on construction procurement method)
- 4.10 The Unions shall have the right to designate one working employee on the Project as a steward. Such designated steward shall be a qualified employee performing the work of that craft and shall not exercise any supervisory functions. There shall be no non-working stewards.
- 4.11 In addition to their work as an employee, the designated steward shall have the right to receive complaints and to discuss and assist in their adjustment with the Contractor's appropriate supervisor per Article VI of this Agreement. The Contractor will not seek to hinder or discriminate

against the steward in the proper performance of their union duties.

4.12 For all employee referral from Union hiring halls, the following shall apply:

- A. The DBCTC shall require its member Unions to make all reasonable efforts to refer suitable persons that reside in the City of Dayton, subject to local Union hiring hall referral policies and bylaws, and the requirements of the National Labor Relations Act, for work on the Project.
- B. Selection of applicants for referral to jobs under the scope of this Agreement shall be on a non-discriminatory basis and shall not be based on, or in any way affected by, union membership, bylaws, rules, regulations, constitutional provisions, or any other aspect or obligation of union membership, policies or requirements. There shall be no discrimination against an employee or applicant for employment based on his or her membership or non-membership in a union, or based upon such employee or applicant's race, sex, sexual orientation, gender identity or expression, color, religion, ancestry, national origin, age, disability, family or military status, or any other status that is protected by federal, state, or local law or ordinance.
- C. For the purposes of this agreement, a suitable person shall mean a person who meets all of the following: is qualified and able to perform the work, meets the safety requirements of the Construction Manager, submits to drug testing prior to employment on the project and is not rejected by the Contractor or Owner for past performance. A suitable person may be subject to background checks instituted by employer and employment of any candidate will be subject to employer's acceptance of the results of any such check. If no suitable person is available, the Union shall immediately notify the Contractor.

(This Section shall be modified based on construction procurement method)

- D. If a suitable person is not referred within a forty-eight (48) hour period after a requisition is made (Saturdays, Sundays, and holidays excluded), the Contractor, of whatever tier, may hire an employee to fill the requisition from any source, provided the Contractor makes a good faith effort to hire person residing within a thirty (30) mile drive of the City of Dayton community or within the City of Dayton.

ARTICLE V

WAGES AND FRINGE BENEFITS; WORK RULES

- 5.1 The Contractor shall pay employees subject to this Agreement the prevailing wage rate as set forth in ORC §4115 for work performed on the Project, including fringe benefit contributions. Cash

payments to employees in lieu of fringe benefit contributions are not permitted under this Agreement.

- 5.2 Upon notice to the Owner that a Contractor is delinquent in its obligation to make fringe benefit contributions, where applicable, the Owner shall provide written notice to the CM and contractor and provide reasonable time and opportunity to remedy in accordance with the CM Agreement. In the event the CM and contractor fail to remedy, the Owner may withhold such sums from the monthly progress payment(s) to the Contractor and shall pay such sums directly to the appropriate fringe benefit fund(s).
- 5.3 The Owner, or any Contractor authorized by the Owner, may establish uniform site work rules/procedures and security, health and safety rules/procedures in compliance with federal, state, and local regulations and as established by the CM (controlling contractor). All Unions, Contractors, Subcontractors, and employees agree to abide by these rules, and violation of job site rules may result in disciplinary action up to and including suspension or discharge as provided in the CM Agreement and per the sole discretion of the CM.

(This Section shall be modified based on construction procurement method.)

ARTICLE VI

SETTLEMENT OF GRIEVANCES AND DISPUTES

- 6.1 This Agreement is intended to provide close cooperation between management and labor. Each of the Unions will assign a representative to this Project for the purpose of completing the construction of the Project economically, efficiently, continuously, safely and in compliance with the terms of this Agreement and the CM Agreement.

(This Section shall be modified based on construction procurement method.)

- 6.2 The Contractors, DBCTC, Unions, and the employees, collectively and individually, realize the importance to all parties to maintain continuous and uninterrupted performance of the work of the Project, and agree to resolve disputes in accordance with the grievance-arbitration provisions set forth in this Article.
- 6.3 Any question or dispute arising out of and during the term of this Agreement, other than the rights

set forth in Article V or VII, or otherwise limited or excluded from this Agreement, shall be considered a grievance and subject to resolution under the following procedures:

A. Step 1.

1. When any employee subject to the provisions of this Agreement feels he or she is aggrieved by a violation of this Agreement, the employee, through their steward or local Union representative, shall, within five (5) working days after the occurrence of the violation, give notice to the Project representative of the involved Contractor stating the provision(s) alleged to have been violated. The parties shall meet and endeavor to resolve the matter within three (3) working days after timely notice has been given. If they fail to resolve the matter, the grieving party may, within forty-eight (48) hours thereafter, reduce the grievance to writing and pursue Step 2 of the Grievance Procedure.
2. Should the Local Unions(s) or the CM or any Contractor have a dispute with the other party and, if after conferring, a settlement is not reached within three (3) working days, the dispute may be reduced to writing and proceed to Step 2 in the same manner as outlined herein for the adjustment of an employee complaint.

B. Step 2.

The Union Representative and the involved Contractor shall meet within seven (7) working days of the referral of a dispute to this second step to arrive at a satisfactory settlement thereof. If the parties fail to reach an agreement, the dispute may be appealed in writing in accordance with the provisions of Step 3 within seven (7) calendar days thereafter.

C. Step 3.

1. If the grievance has been submitted but not resolved under Step 2, either party may request in writing, within seven (7) calendar days thereafter, that the grievance be submitted to an Arbitrator mutually agreed upon by them. The Contractor and the involved Unions shall attempt mutually to select an arbitrator, but if they are unable to do so, they shall request the American Arbitration Association to provide them with a list of arbitrators from which the Arbitrator shall be selected. The rules of the American Arbitration Association shall govern the conduct of the arbitration hearing. The decision of the Arbitrator shall be final and binding on all parties. The fee and expenses of such Arbitration shall be borne equally by the Contractor and the involved Local Unions(s).
2. Failure of the grieving party to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the parties involved at the particular step where the extension is

agreed upon. The Arbitrator shall have the authority to make decisions only on issues presented to him or her, and he or she shall not have authority to change, amend, add to or detract from any of the provisions of this Agreement.

- 6.4 The CM and Owner shall be notified of all actions at Steps 2 and 3 and shall, upon their request, be permitted to participate in all proceedings at these steps.

(This Section shall be modified based on the construction procurement method.)

ARTICLE VII

JURISDICTIONAL DISPUTES

- 7.1 The assignment of work will be the sole responsibility of the Contractor performing the work involved, unless specifically assigned by the Owner prior to award of the contract; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan"), approved by the Building and Construction Trades Department, AFL-CIO, June 1984 As Amended Through May 2011, a copy of which is included in Attachment B, or any successor Plan. In the event a successor plan is not approved, such disputes shall be resolved by the then existing legal procedure.
- 7.2 All jurisdictional disputes on this Project, between or among DBCTC members and Contractors that are parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department, AFL-CIO. In the event such Board ceases to exist or any successor plan is not approved such disputes shall be resolved by the then existing legal procedures. Decisions rendered shall be final, binding and conclusive on the Contractors and Unions which are parties to this Agreement.
- 7.3 All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Contractor's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.
- 7.3 Each Contractor will conduct a pre-job conference with the DBCTC and the appropriate local Union prior to commencing work. The Owner, and, where applicable, the Owner's assigns or successors, will be advised in advance of all such conferences and may participate if they wish.
- 7.4 If a Union is not signatory to this Agreement, it shall not have any jurisdiction claim to a scope of work on the Project.

ARTICLE VIII

SAFETY

- 8.1 The Contractor and their employees shall comply with all applicable federal, state and local laws, ordinances and regulations relating to safety and health and the CM's safety protocols, processes and requirements. All employees shall comply with the safety regulations as established by the Owner and CM.

ARTICLE IX

SITE ACCESS

- 9.1 The designated representative(s) of each local Unions signatory to this Agreement shall be communicated in writing to the designee of the CM or General Contractor. Those representatives shall be permitted to enter and move around on the Project site without an escort, provided that such representative(s) sign in and out for every visit to the site,; that such designated representative(s) will not disrupt the efficient operation of the Project; that such representative(s) give the Project Executive advance notice; and that the privilege to enter will not be abused.
- 9.2 Notwithstanding any other provision to the contrary, visitors, including Union representatives and agents, shall not interfere with the work of the employees and shall fully comply with the visitor safety and security rules established for the Project.

ARTICLE X

SUBCONTRACTING

- 10.1 Except as provided in 2.4 and 2.6, the Project Contractor agrees that neither it nor any of its contractors or subcontractors will subcontract any work to be done on the Project except to a person, firm or corporation who is or agrees to become party to this Agreement. Any contractor or subcontractor working on the Project shall, as a condition of working said Project, become signatory to and perform all work under the terms of this Agreement. The applicable Union shall be informed by any contractor or subcontractor of any tier of any subcontract of covered work prior to the subcontractor commencing work on the Project.

ARTICLE XI

HELMETS TO HARDHATS

- 11.1 The Contractor and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractor and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by parties and to participate in controlling contractor's safety orientation program.
- 11.2 The Unions and Contractor agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on this Project and of apprenticeship and employment opportunities for this Project to the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

ARTICLE XII

LOCAL WORKFORCE GOALS

- 12.1 It is the intent of the parties to establish goals for the employment of the residents of the City of Dayton on the Project and to work in good faith and cooperatively to achieve such goals. The Project has an aspirational goal of (INSERT NUMBER) or more of the total Project work hours to be worked by residents of the City of Dayton. For the purposes of this Article, resident of the City of Dayton shall mean the following: a person permanently residing in the City of Dayton; or a person working from a pool of labor located in or having jurisdiction in such limits. In furtherance of these goals, and consistent with DBCTC and its affiliates' commitment to economic prosperity for all working people and diverse and inclusive trade unions, DBCTC and its affiliates will engage in community outreach directly and in partnership with community organizations, utilize apprenticeship readiness programs and pre-apprenticeship programs.
- 12.2 All Contractors and Subcontractors shall report the total hours worked and wage rates received by its employees subject to this Agreement and residing in the City of Dayton to City of Dayton.

ARTICLE XIII

COMMUNITY APPRENTICESHIP GOALS

- 13.1 The Owner and DBCTC recognize the need for a trained and skilled local construction workforce. It is the desire of the Owner to utilize this Project as a training tool for its residents enrolled in apprenticeship programs certified by the Ohio Apprenticeship Council or the U.S. Department of Labor.
- 13.2 The Parties acknowledge historical underrepresentation of disadvantaged individuals, in construction apprenticeship programs. To remedy historical underrepresentation in construction apprenticeship programs the members of the DBCTC have agreed to host an apprenticeship recruitment event in designated neighborhoods within the City of Dayton during the construction of the Project.

ARTICLE XIV

UNION PER CAPITA REQUIREMENT

- 14.1 All Unions signatory to this Agreement are required to comply with the payment of per capita tax to the DBCTC and the Ohio State Building & Construction Trades Council for hours worked on the Project. Any Union that fails to make timely payments of per capita tax for hours worked on the Project may lose any rights under the terms of the Agreement, including the jurisdictional right to claim portions of the scope of work of the Project.

ARTICLE XV

TERM OF AGREEMENT

- 15.1 This Agreement shall become effective on the XX day of XXXXX, XXXX, and shall remain in full force and effect as to each part or phase of construction work until all parts and phases have been accepted by the Owner. It is understood that the liability of any Employer and the liability of the separate Unions under this Agreement shall be several and not joint. The Unions agree that this Agreement does not have the effect of creating any joint employer status between or among the Owner, Contractor(s), Subcontractor(s) or any Employer. This Agreement shall only be binding on

this project, on the signatory parties hereto and does not apply to their parents, affiliates or subsidiaries.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall be deemed effective as of the date stated in Article XV Where any collective bargaining unit does not execute this agreement the agreement will not be enforced for that collective bargaining unit.

City of Dayton

Signature

Print Name/Title

DAYTON BUILDING AND CONSTRUCTION TRADES COUNCIL AFL-CIO:

Signature

Print Name/Title

CRAFT UNION:

Electrical Workers Local

Signature

Print Name/Title

CRAFT UNION:

United Brotherhood of Carpenters

Local

Signature

Print Name/Title

CRAFT UNION:

Laborers Int'l Union of North America

Local

Signature

Print Name/Title

CRAFT UNION:

United Association-Sprinkler

Fitters Local 669

Signature

Print Name/Title

CRAFT UNION:

United Association

Plumbers & Pipefitters Local

Signature

CRAFT UNION:

Sheet Metal Workers Local 24

Print Name/Title

Signature

Print Name/Title

CRAFT UNION:

Bricklayers and Allied Craftworkers

Local 23

Signature

Print Name/Title

CRAFT UNION:

Painters and Allied Trades - Glaziers

Local

Signature

Print Name/Title

CRAFT UNION:

Operative Plasters'

& Cement Masons' Intl Association Local 132

Signature

Print Name/Title

CRAFT UNION:

Roofers, Waterproofers and Allied Workers

Local

Signature

Print Name/Title

CRAFT UNION:

Painters and Allied Trades Local

Signature

Print Name/Title

CRAFT UNION:

International Union of Operating

Engineers Local 18

Signature

Print Name/Title

CRAFT UNION:

Heat & Frost Insulators and Allied

Workers Local

Signature

Print Name/Title

CRAFT UNION:

International Union of Elevator

Constructors Local

Signature

Print Name/Title

CRAFT UNION:

Bridge, Structural, Ornamental, &

Reinforcing Iron Workers Local

Signature

Print Name/Title

CRAFT UNION:

Boilermakers, Iron Ship

Builders, Blacksmiths, Forgers & Helpers Local

Signature

Print Name/Title

CRAFT UNION:

Int'l Brotherhood of Teamsters Local

Signature

Print Name/Title

CRAFT UNION:

United Brotherhood of Carpenters-Millwrights

Local

Signature

Print Name/Title

DRAFT