

CONTRACT DOCUMENTS

**MIDDLETOWN JUNCTION WELLFIELD
DEVELOPMENT**

WARREN COUNTY WATER & SEWER DEPARTMENT

MAY 2025

WARREN COUNTY BOARD OF COMMISSIONERS
406 JUSTICE DRIVE
LEBANON, OHIO 45036
(513) 695-1250

TABLE OF CONTENTS

BIDDING & CONTRACT REQUIREMENTS – DIVISION 00

00 10 10	INVITATION TO BIDS
00 10 20	BID PROPOSAL
00 10 30	BID FORM
00 10 50	EXCEPTION SHEET
00 20 00	GENERAL INSTRUCTIONS TO BIDDERS
00 30 10	NONCOLLUSION AFFIDAVIT – FORM 1
00 30 20	NONCOLLUSION AFFIDAVIT – FORM 2
00 30 30	AFFIDAVIT OF NON-DELINQUENCY OF REAL AND/OR PERSONAL PROPERTY TAX
00 30 40	FINDINGS FOR RECOVERY AFFIDAVIT
00 30 50	EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS, BID CONDITIONS, NON-DISCRIMINATION, AND EQUAL EMPLOYMENT OPPORTUNITY AFFIDAVIT
00 40 00	BONDING REQUIREMENTS
00 40 10	BID GUARANTY AND CONTRACT BOND
00 40 20	PERFORMANCE BOND
00 50 10	EXPERIENCE STATEMENT
00 60 10	CONTRACT
00 70 10	WAGE RATE DETERMINATION
00 70 20	PERMITS
00 70 30	GENERAL CONDITIONS
00 80 10	SUPPLEMENTARY CONDITIONS

TECHNICAL SPECIFICATIONS – DIVISION 01 THRU DIVISION 16

PROJECT MANUAL – WESSLER ENGINEERING – MAY 2025

CONSTRUCTION DRAWINGS

MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT (40 Sheets) – WESSLER ENGINEERING - MAY 2025

REVIS STATION TO BIKE TRAIL FIBEROPTIC DESIGN (11 Sheets) – YATES ENGINEERING - MAY 2025

SECTION 00 10 10
INVITATION TO BIDDERS

Sealed bids will be received by the Clerk of the County Commissioners, Warren County, Ohio, 406 Justice Drive, Lebanon, Ohio 45036, until 11:00 AM, Thursday June 26, 2025, at the Office of the Warren County Commissioners, and then at said time bids will be opened and read aloud for the Middletown Junction Wellfield Development project.

Bid documents including terms, general conditions, supplemental conditions, and specifications are available online at the Warren County's Website at

<https://commissioners.warrencountyohio.gov/Bids/Projects/Index>. Questions regarding the technical specifications should be directed to Chris Brausch at the Warren County Water and Sewer Department, (513) 695-1193 (cbrausch@warrencountyohio.gov). Contact the Warren County Commissioners Office at (513) 695-1250 should you need assistance in accessing the bidding information on the County website.

The project includes the construction of a 3.0 million gallon per day wellfield that includes the installation of three submersible well pumps, piping, pitless adapters, electrical service & gear, control panels, relocation of an existing diesel powered generator, instrumentation, security improvements, and fiber optic. The estimated contract value is \$3,000,000.

A bid guaranty, as required by Ohio Revised Code, Section 153.54, shall accompany each proposal submitted, as follows:

1. A Certified check, cashier's check, or letter of credit equal to ten (10) percent of the bid. A letter of credit may only be revocable by the Owner. Upon entering into a contract with the Owner, the contractor must file a performance bond for the amount of the contract, and the bid guaranty will then be returned to the successful and unsuccessful bidders upon contract execution.

OR

2. A form of bid guaranty bond (attached) for the full amount of the bid. Such bond is retained for the successful bidder but returned to unsuccessful bidders after the contract is executed.

Warren County reserves the right to reject any or all bids submitted, to waive any irregularities in bids, and enter into a contract with the Bidder who in Warren County's consideration offered the lowest and best bid. By order of the Board of County Commissioner, County of Warren, State of Ohio.

Krystal Powell, Clerk

**SECTION 00 10 20
BID PROPOSAL**

The undersigned declares that the only persons or parties in this Bid are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that all the Contract Documents as prepared have been carefully examined; that the undersigned is fully informed in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this bid. The undersigned do hereby propose to furnish all labor, materials, tools, equipment, etc., necessary to complete the work located in Hamilton Township, Warren County, Ohio and that the bid includes all costs including, permit fees, taxes, insurance, overhead, and profit. All material and equipment must comply with the specifications and contract drawings that comprise the Contract Documents.

The premiums for all Bonds required shall be paid by the Contractor and shall be included in the Contract Price. The undersigned Bidder further agrees that the Bid Security accompanying this Bid shall become the property of the County if the Bidder fails to execute the Agreement.

All addenda will be published on Warren County’s website at <https://commissioners.warrencountyohio.gov/Bids/Projects/Index>, pursuant to SECTION 00 20 00, Paragraph 7, the undersigned acknowledges receipt of the following Addenda:

No. _____, dated _____, 2025

No. _____, dated _____, 2025

No. _____, dated _____, 2025

Bids shall include all costs incurred for the Work including materials, equipment, supplies, labor, permit fees, taxes, insurance, miscellaneous costs, overhead, and profit. All Material must comply with the specifications shown on the contract drawings.

The written/typed Total Bid price is for the convenience of the Owner in comparing bids. Any discrepancy between the actual sum of the line item totals and the written/typed total bid price shall be resolved in favor of the actual sum of the correct individual line item.

The undersigned hereby certifies under the penalty of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person or entity. The bid proposals shall remain in full force and effect for sixty (60) days after the date of opening bids. The full name and address of all persons and parties interested in the foregoing bids as principals are as follows:

Individual, Partnership, or Corporation

Signature of Corporate Officer, President, or Owner

Date

Notice of acceptance should be mail or delivered to the following:

COMPANY NAME: _____

CHIEF EXECUTIVE OFFICER: _____

ADDRESS: _____

PHONE NUMBER: _____

PROJECT CONTACT PERSON: _____

PHONE NUMBER: _____

E-MAIL ADDRESS: _____

FEDERAL ID #: _____

WEBSITE ADDRESS: _____

NOTE: The firm, corporate or individual name of the bidder must be signed in ink in the space provided for the signatures on the proposed blanks. In the case of a corporation, the title of the officer signing must be stated, and such officer must be thereunto duly authorized and the seal of said corporation duly affixed. In the case of a partnership, the signature of at least one of the partners must follow the firm name, using the term "member of the firm." In the case of an individual, use the terms "doing business as", or "sole owner."

**SECTION 00 10 30
 BID FORM**

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Mob., Demob., Bonds, and Insurance	1	LS		
2	Chain Link Security Fencing and Gates at Well Sites and Front Entrance	1	LS		
3	Wellfield Entry Gate (20' wide double gate, continuous arch, spear top)	1	EA		
4	Industrial Fencing, 8' Sections, Spear Top, 84" Tall, 6"x6" Posts	300	LF		
5	Crushed Stone Drive with Geogrid and Gravel with Geotextile at Well Sites	1	LS		
6	Security Cameras at Well Sites	3	EA		
7	Bollards Type 2	6	EA		
8	Seeding & Grading	1	LS		
9	Submersible Pump, Motor, & Drop Pipe	3	EA		
10	Pitless Adapter	3	EA		
11	8" Class 52 D.I. Water Main with fittings, glands, gaskets, restraints, and poly encasement	75	LF		
12	10" Class 52 D.I. Water Main with fittings, glands, gaskets, restraints, and poly encasement	600	LF		
13	12" Class 52 D.I. Water Main with fittings, glands, gaskets, restraints, and poly encasement	1,210	LF		
14	10" Gate Valve & Box	3	EA		
15	Precast Valve Meter Vault with Valves, Meters, Piping, Hatch, and Sample Station	3	EA		
16	Well Platform PW-2, Complete with Foundation, Stairs, Handrail, Steel Structure	1	LS		
17	Well Platform PW-1 & PW-3, Complete with Foundation, Stairs, Handrail, Steel Structure	2	LS		
18	Moving Generator for Revis & Installing on Middletown Junction	1	LS		
19	Electrical Components (Wire, VFD, MPZ, Disconnect Switch, Distribution Panel, ATS) - PW-2	1	LS		
20	Electrical Components (Wire, VFD, MPZ, Disconnect Switch) - PW-1 & PW-3	2	EA		
21	Underground Electrical Conduit and Wire between Wells	1	LS		
22	Conduit and Fiber from Revis to Well Platforms at Middletown Junction	1	LS		
23	Underground Conduit and Electrical wire from Duke Transformer (HDD) to PW-2	1,100	LF		
24	Instruments and Control Panels (Programming provided by others)	1	LS		
25	H-3 Fire Hydrant Assembly	3	EA		
26	Clearing and Grubbing	1	LS		
27	Final Cleanup and Restoration	1	LS		
28	Allowance for Clearing of Invasive Underbrush at Site	1	LS	\$ 15,000	\$ 15,000
29	Duke Energy Wire/Transformer Fee	1	LS	\$ 60,000	\$ 60,000
TOTAL BID					

**SECTION 00 10 50
EXCEPTION SHEET**

Exceptions: Exceptions to any bid specification must be clearly stated on this sheet. This sheet must be submitted with each bid. If there are no exceptions, please indicate “none” below.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

SECTION 00 20 00
GENERAL INSTRUCTION TO BIDDERS

1. **Receipt and Opening of Bids:** The Warren County Board of Commissioners (herein referred to as “Owner”), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the Office of the Warren County Board of Commissioners until 11:00 AM, Thursday, June 26, 2025 and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Warren County Board of Commissioners at 406 Justice Drive, Lebanon, Ohio 45036, and shall be clearly marked as follows:

Bid Opening
Middletown Junction Wellfield Development
11:00 AM, Thursday June 26, 2025

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered.

A non-mandatory pre-bid meeting will occur at 2:00 PM on Tuesday, June 10, 2025 at the Richard Renneker Water Treatment Plant, 6193 Striker Road, Hamilton Township, Ohio. The Owner will review the project requirements with potential bidders and receive questions. A project site walk through will be conducted at the Middletown Junction property and Revis Wellfield after the meeting. The Owner recommends that all bidders attend this meeting.

2. **Description of Project:** The project includes the construction of a 3.0 million gallon per day wellfield that includes the installation of three submersible well pumps, piping, pitless adapters, electrical service & gear, control panels, relocation of an existing diesel powered generator, instrumentation, security improvements, and fiber optic.
3. **Construction Cost:** The Engineer’s opinion of probable construction cost for the base bid work is \$3,000,000.
4. **Project Funding/Financing:** The project shall be financed using Owner’s reserved funds. No state or federal funds shall be used to finance this project.
5. **Time of Completion and Liquidated Damages:** The Bidder hereby agrees that the Contract Time shall commence on the date stipulated in the Notice to Proceed which will be issued by the Owner within 14 days of contract execution (estimated date: July 15) and to complete the work in accordance with the terms as stated in the Contract, and in accordance with the following schedule milestones:

Substantial Completion: 240 days from Notice to Proceed

Final Completion: 270 days from Notice to Proceed

Any delays in substantial completion of the work that are within the control of the Contractor, their Subcontractor, or Supplier shall be subject to liquidated damages in the sum of \$1,000.00 for each consecutive calendar day that the project extends beyond the substantial completion deadline. See the General Conditions and Supplemental Conditions for the definition and requirements of substantial completion.

6. **Bid Documents:** Bid documents, including terms, general conditions, supplemental conditions, drawings, addenda, and other information are available online, free of charge, at the Warren County's Website at <https://commissioners.warrencountyohio.gov/Bids/Projects/Index> . A planholders list, if maintained, will be posted on the County's website. All Addenda will be posted on the website and will not be mailed to bidders.

7. **Addenda and Interpretations:** No interpretations of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Every request for such interpretation must be in writing to Chris Brausch at cbrausch@warrencountyohio.gov . To be given consideration all questions must be received by 4:00 pm on Thursday June 19, 2025. All such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be posted on the Warren County Commissioners' website <https://commissioners.warrencountyohio.gov/Bids/Projects/Index>, no later than five days prior to the date fixed for opening of bids. Failure of any bidder to monitor the website and download any such addendum or interpretations shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents. Bidders shall be responsible for checking the website prior to submitting their bid.

8. **Required Forms:** Each bid must be submitted on the forms contained in the Contract Documents herein. All blank spaces for bid prices must be completed, in ink or typewritten, in both words and figures, and the foregoing certifications must be fully completed and executed when submitted. Each Bidder shall complete and submit the following forms with his/her bid:

Section 00 10 20	BID PROPOSAL
Section 00 10 30	EXCEPTION SHEET
Section 00 30 10	NONCOLLUSION AFFIDAVIT – FORM 1
Section 00 30 20	NONCOLLUSION AFFIDAVIT – FORM 2
Section 00 30 30	AFFIDAVIT OF NON-DELINQUENCY OF REAL AND/OR PERSONAL PROPERTY TAX
Section 00 30 40	FINDINGS FOR RECOVERY AFFIDAVIT
Section 00 30 50	EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS, BID CONDITIONS, NON-DISCRIMINATION, AND EQUAL EMPLOYMENT OPPORTUNITY AFFIDAVIT
Section 00 40 00	BONDING REQUIREMENTS
Section 00 40 10	BID GUARANTY AND CONTRACT BOND

9. **Modification or Withdraw of Bid:** Bids may be modified or withdrawn by any appropriate document duly executed (in the manner that a bid must be executed) and delivered to the place where bids are to be submitted at any time prior to the opening of bids.

After opening, a Bidder may withdraw their bid from consideration if the price bid was

substantially lower than the other bids, provided the bid was submitted in good faith and the reason for the price being substantially lower was a clerical mistake as opposed to a judgment mistake and was actually due to an unintentional omission of a substantial quantity of work, labor or material made directly in the compilation of the bid. Request to withdraw such bid must be made in writing and filed with the Owner within two business days after the opening of bids and prior to the acceptance thereof.

10. **Method of Award:** The Owner may reject all bids or may award the contract on the base bid or on the base bid combined with additions or deductible alternates, to the lowest and best bidder, as produces a net amount which is within the available funds.

To determine lowest and best bidder, the price of the bid will be given equal weight against the totality of the following factors: 1.) the bidder's information provided in the Section 00 50 10 Experience Statement which shall be used to judge responsibility, experience, skill, financial standing, feedback from references or prior clients—which may include Owner; 2.) the Section 00 10 30 Exception Sheet; 3.) availability.

If the total price received from the lowest and best bidder exceeds the amount of funds available to finance the contract, the Owner may:

- a. Reject all bids;
- b. Augment the funds available in the amount sufficient to enable award to the lowest and best bidder or bidders;
- c. Reduce the scope of the work by eliminated certain items of work to produce a total bid which is within the available funds;
- d. Reduce the scope of work by reducing the quantities of certain items of work to produce a total bid which is within the available funds;
- e. Reduce the scope of work by a combination of adjustments as outlined in “c” and “d” above to produce a total bid which is within available funds.
- f. The Owner may reject all bids or may award the contract on the base bid or on the base bid combined with additions or deductible alternative as produces a net amount which is within the available funds.

The Owner may consider informal and may reject any bid not prepared and submitted in accordance with the provisions hereof. The Owner reserves the right to reject all bids, to waive any informalities or irregularities in the bids received, and to accept any bid which is deemed lowest and best.

11. **Qualification of Bidder:** The Owner any make such investigations as he/she deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated herein; conditional bids will not be accepted.

12. **Conditions of Work:** Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not

relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provisions of his/her contract. Insofar as possible the contractor, in carrying out the work, must employ such methods or means or will not cause any interruption of or interference with the work of any other contractor. No plea of ignorance of conditions that exist or that may hereafter exist, or of conditions or difficulties that may be encountered in the execution of the work as the result of failure to make such examination and investigation, will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every respect, all the requirements of the Contract, nor will the same be accepted as a basis for any claim whatsoever for extra compensation or for an extension of time.

13. **Obligation of Bidder:** Each bidder shall and is hereby directed to inspect the entire site of the proposed work and judge for him/herself as to all the circumstances affecting the cost and progress of the work and shall assume all patent and latent risks in connection therewith. At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his/her bid.
14. **Non-Collusion Affidavit:** The successful bidder will be required to submit non-collusion affidavit on the form included in these Bid/Contract Documents (SECTION 00 30 10 and 00 30 20). These affidavits shall be dated and executed as part of this bid.
15. **Real and/or Personal Property Tax Affidavit:** All bidders must complete the Real and/or Personal property tax affidavit (Section 00 30 30) and submit with your bid. This section should be fully completed whether or not you as a vendor/contractor own property in Warren County, Ohio.
16. **EEO Compliance:** Equal Employment Opportunity (EEO) compliance requirements and affidavits are contained in SECTION 00 30 50. Owner contracts that receive state or federal funding including, but not limited to, grants, loans, and debt forgiveness shall not be executed unless the Contractor possesses a current Certificate of Compliance issued by the State EEO Coordinator.

Every contract for or on behalf of the County for the construction, alteration, or repair of any public building or public work shall include an affidavit certifying the contractor complies with EEO requirements specified in Ohio Revised Code Section 153.59.

17. **Bid Security:**

A bid guaranty, as required by Ohio Revised Code, Section 153.54, shall accompany each proposal submitted, as follows:

1. A Certified check, cashier's check, or letter of credit equal to ten (10) percent of the bid. A letter of credit may only be revocable by the Owner. Upon entering into a contract with the Owner, the contractor must file a performance bond for the amount of the contract, and the bid guaranty will then be return to the successful and unsuccessful bidders upon request.

OR

2. A form of bid guaranty bond (attached) for the full amount of the bid. Such bond is retained for the successful bidder but returned to unsuccessful bidders after the contract is executed.

Such cash, checks or bid bonds will be returned to bidders after the Owner has awarded the bid and has executed the contract, or, if no award has been made within 60 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he/she has not been notified of the acceptance of his/her bid.

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

18. **Liquidated Damages for Failure to Enter into Contract:** The successful bidder, upon his/her failure or refusal to execute and deliver the contract and bonds required within 10 working days after he/she has received the documents, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the bid security.

19. **Security for Faithful Performance:** Simultaneously with his/her delivery of the executed contract, the Contractor shall furnish a performance (surety) bond as security for faithful performance of this contract and for the payment of all persons performing labor on project under this contract and furnishing materials in connection with the contract. The surety on such bond or bonds shall be duly authorized surety company satisfactory to the Owner. Please note that upon execution of the Contract if a Bid Guaranty/Contract Bond was submitted with your original bid a Performance Bond will not be required.

20. **Required Insurance:** In accordance with the specifications and the Supplemental Conditions, the Contractor, without restricting the obligations and liabilities assumed under the Contract Documents, shall at his own cost and expense purchase and maintaining in force until final acceptance of his work, the forms of insurance coverage as described in Section 00 80 10 Supplemental Conditions 1.2.C. Article 5 – Bonds and Insurance.

Certificates from the insurance carrier stating the limits of liability and expiration date shall be filed with the Owner before operations are begin. Such certificates shall not merely name the types of policy provided but shall specifically refer to this Contract and shall name the Board of Warren County Commissioners as additionally insured.

All policies as hereinafter required shall be so written that the Owner will be notified of cancellation or restrictive amendment at least sixty days prior to the effective date of such cancellation or amendment.

If any part of the work is sublet, insurance of the same types and limits as required shall be provided by or on behalf of the Subcontractors to cover that part of the work they have contracted to perform including Property Damage Liability Special Hazards coverage if so required by this contract.

21. **Additional Obligations Upon Contract Award:** Upon award of the bid but prior to execution of the final agreement and notice to proceed, the Contractor shall submit all of the following documents, completed as required:

1. Contract
2. Performance Bond
3. Certificates of Insurance

22. **Wage Rates:** In the event that the rate of wages paid for any trade or occupant in the locality where such work is being performed are under current collective agreements or understandings between bona fide organizations of labor and employer, then the wages to be paid shall be not less than such agreed wage rates, nor less than the minimum rates compiled by the Federal Labor Standard Act. Copies of these prevailing wage rates have been included in these specifications. Every Contractor and Subcontractor who is subject to Ohio Revised Code, Chapter 4115 shall, as soon as he begins performance under his contract with the Owner, supply the Prevailing Wage Coordinator for the Owner a schedule of the dates on which he is required to pay wages to employees. He shall also deliver to the Prevailing Wage Coordinator within three weeks after each pay date, a certified copy of his payroll which shall exhibit for each employee paid any wages, name, current address, social security number, number of hours worked each day of the pay period and the total for each week, hourly rate of pay, job classification, fringe payments, and deductions from wages. The certification of each payroll shall be executed by the Contractor, Subcontractor, or duly appointed agent thereof and shall recite that the payroll is correct and complete and that the wage rate shown is not less than those required by the contract.

In case the Owner orders the Contractor to perform extra or additional work which may make it necessary for the Contractor or any Subcontractor under this contract to employ a person not herein specified, the Contractor will include in the contract change order for such extra or additional work, a minimum wage rate for such trade or occupation, and insofar as such extra or additional work is concerned, there shall be paid to each employee engaged in work of such trade or occupation, not less than the wage so included. Insofar as possible, local labor shall be employed on this work.

23. **Laws and Regulations:** The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities have jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

24. **Foreign Corporation and Contractors:** "Foreign Corporations" means a corporation incorporated under the laws of another state. No contract shall be entered into with a foreign corporation until the Secretary of State has certified that such corporation is authorized to do business in Ohio: and until, if the bidder so awarded the Contract is a person or partnership, it has filed with the Secretary of State a Power of Attorney designating the Secretary of State as its agent for the purpose of accepting service of summons in any action brought under Ohio Revised Code, Section 153.05 or under Sections 4123.01 to 4123.94, inclusive.

25. **Safety Standards and Accident Prevention:** With respect to all work performed under this Contract, the Contractor shall:

- a. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of title 29 of the code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, N. 75, Saturday, April 17, 1971.

- b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- c. Maintain at his/her office or other well-known place at the job site, all articles necessary for giving first aid to the injured and shall make standing arrangements for the immediate removal to a hospital or doctor's care of persons (including employees) who may be injured at the job site. In no case shall employees be permitted to work at a job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

26. **Permits:** Contractor shall keep a copy of all permits at the project site throughout the duration of the work. The permits required for the work, the permit applicant, and the entity paying for the permit is identified in the table below. All obtained permits acquired to date are included in SECTION 00 70 20.

Permit	Application No.	Regulatory Agency	Applicant & Fees
Nationwide Permit No. 57	LRH-2024-00908-LMR	US Army Corps of Engineers	Warren County
Permit to Install		Ohio EPA	Warren County

27. **Subcontracts:** Contractor shall provide upon request of the Owner a list of all subcontractors intended to be used in performance of the work. In the event the Owner does not object, Contractor may have such work performed by a subcontractor. Contractor shall bind every subcontractor to, and every subcontractor must agree to be bound by the terms of the Agreement, as far as applicable to the subcontractor's work particularly pertaining to Prevailing Wages and EEO requirements. Nothing contained in the Agreement shall create any contractual relationship between any subcontractor and Owner, nor create any obligations on the part of the Owner to pay or see to the payment of any sums to any subcontractor.

28. **Subletting of Contract:** The Contractor shall not sublet, sell, transfer, or assign any portion of the contract without written consent of the Owner or his designated agent. When such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with his own organization, work amounting to no less than fifty percent of the total contract cost, except that any time designated in the contract before computing the amount of work required to be performed by the Contractor with his own organization, no subcontract, or transfer of contract, shall in any way release the Contractor of his liability under the contract and bonds.

29. **CONFIDENTIAL DOCUMENTS & INFORMATION:** Do not submit confidential documents or documents of any type that contain trade secrets. All materials submitted become public records once opened and may be copied upon request to anybody including competitive bidders.

END OF SECTION

**SECTION 00 30 10
NONCOLLUSION AFFIDAVIT – FORM 1**

State of _____

BID Identification _____

CONTRACTOR _____ being first duly sworn, deposes and says that he is _____ (sole owner, a partner, president, secretary, etc.) of _____, the party making the foregoing BID; that such BID is not made in the interest of or on behalf of any undisclosed person, partnership, company, association, organization, or corporation; that such BID is genuine and not collusive or sham; that said BIDDER has not directly or indirectly colluded, conspired, connived or agreed with any BIDDER or anyone else to put in a sham BID, or that any one shall refrain from Bidding; that said BIDDER has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the BID price of said BIDDER or of any other BIDDER, or to fix any overhead, profit, or cost element of such BID price, or of that of any other BIDDER, or to secure any advantage against the OWNER awarding the contract or anyone interested in the proposed contract; that all statement contained in such BID are true; and, further, that said BIDDER has not, directly or indirectly, submitted his BID price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid and will not pay any fee in connection therewith, to any corporation, partnership, company, association, organization, BID depository, or to any member or agent thereof, or to any other individual except to such person or persons who have a partnership or other financial interest with said BIDDER in his general business.

Signed:

Subscribed and sworn to before

me this ___ day of _____, 2025.

Seal of Notary

**SECTION 00 30 20
NONCOLLUSION AFFIDAVIT – FORM 2**

STATE OF _____

COUNTY OF _____

I, _____, holding the title and position of _____ at the firm _____, affirm that I am authorized to speak on behalf of the company, board directors and owners in setting the price on the contract, bid or proposal. I understand that any misstatements in the following information will be treated as fraudulent concealment of true facts on the submission of the contract, bid or proposal.

I hereby swear and depose that the following statements are true and factual to the best of my knowledge:

The contract, bid or proposal is genuine and not made on the behalf of any other person, company or client, INCLUDING ANY MEMBER OF THE WARREN COUNTY BOARD OF COMMISSIONERS.

The price of the contract, bid or proposal was determined independent of outside consultation and was not influenced by other companies, clients, or contractors, INCLUDING ANY MEMBER OF THE WARREN COUNTY BOARD OF COMMISSIONERS.

No companies, clients, or contractors, INCLUDING ANY MEMBER OF THE WARREN COUNTY BOARD OF COMMISSIONERS have been solicited to propose a fake contract, bid or proposal for comparative purposes.

No companies, clients, or contractors, INCLUDING ANY MEMBER OF THE WARREN COUNTY BOARD OF COMMISSIONERS have been solicited to refrain from bidding or to submit any form of noncompetitive bidding.

Relative to sealed bids, the price of the bid or proposal has not been disclosed to any client, company or contractor, INCLUDING ANY MEMBER OF THE WARREN COUNTY BOARD OF COMMISSIONERS, and will not be disclosed until the formal bid/proposal opening date.

AFFIANT

Subscribed and sworn to before me this _____ day of _____ 2025.

(Notary Public),

_____ County.

My commission expires _____ 20__

SECTION 00 30 30
AFFIDAVIT OF NON-DELINQUENCY OF REAL AND/OR
PERSONAL PROPERTY TAX

THIS SECTION SHOULD BE FULLY COMPLETED WHETHER OR NOT YOU AS A VENDOR/CONTRACTOR OWN PROPERTY IN WARREN COUNTY, OHIO. MAKING A FALSE STATEMENT ON THIS AFFIDAVIT MAY BE PUNISHABLE BY A FINE AND/OR IMPRISONMENT.

STATE OF _____)

SS:

COUNTY OF _____)

_____ being duly cautioned and sworn, states as follows:

1. That he/she is _____ of
(Title)

(Name of Contracting Party)

2. That _____ is not presently charged with any
(Name of Contracting Party)

delinquent Real and/or Personal property taxes on the general tax list of Real and/or Personal property of Warren County.

-OR-

1. That _____ is charged with delinquent Real and/or
(Name of Contracting Party)

Personal property tax on the general tax list of Real and/or Personal property of Warren County. The amount of delinquent Real and/or Personal property tax due and unpaid including any due and unpaid penalty and interest is:

\$ _____

Further, affiant states not.

Affiant

Sworn to and subscribed in my presence this ____ day of _____ 2025.

Notary Public

This instrument was prepared by _____.

Note to Fiscal Office: If any Real and/or Personal property taxes are delinquent, you must send a copy of this statement to the County Treasurer within 30 days of the date it is submitted.

**SECTION 00 30 40
FINDINGS FOR RECOVERY AFFIDAVIT**

STATE OF _____

COUNTY OF _____, SS:

_____, upon being duly cautioned and sworn, hereby states the following based on personal knowledge:

- 1) That he/she is _____ (title), of _____ (name of bidder) and authorized to execute this affidavit; and,
- 2) That _____ (name of bidder) is not a person or entity against whom a finding for recovery has been issued by the Auditor of State, which finding for recovery is unresolved as defined in Ohio Revised Code [General Provisions] Section 9.24 (B); and,
- 3) That _____ (name of bidder) does not appear in the database of unresolved findings of recovery maintained by the Auditor of State pursuant to Ohio Revised Code [General Provisions] Section 9.24 (D).

Affiant

Sworn to and subscribed in my presence this _____ day of _____, 2025.

Notary Public

My Commission expires: _____

SECTION 00 30 50

EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS, BID CONDITIONS, NON-DISCRIMINATION, AND EQUAL EMPLOYMENT OPPORTUNITY AFFIDAVIT

Bidders shall submit a copy of a valid Certificate of Compliance issued by the State EEO Coordinator for Owner projects that receive state or federal funding. The source of financing and funding for this project is specified in SECTION 00 20 00 – INSTRUCTIONS TO BIDDERS. Bidders may contact the State of Ohio, Department of Administrative Services, Equal Opportunity Division for information on how to apply online for a certification using the Ohio Business Gateway.

Every contract for or on behalf of the County for the construction, alteration, or repair of any public building or public work shall include an affidavit certifying the contractor complies with EEO requirements specified in Ohio Revised Code Section 153.59. In addition to the affidavit, all bidders agree to the following State of Ohio standard conditions of contract for construction:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex. Such action shall include, but is not 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 for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will in all solicitations or advertisements for employees placed by or on behalf of the prime contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex.
3. The contractor agrees to fully cooperate with the County, the State Equal Employment Opportunity Coordinator and with any other official or agency, or the State or Federal government which seeks to eliminate unlawful employment discrimination, and with all other State and Federal efforts to assure equal employment practices under its contract and the contractor shall comply promptly with all requests and directions from the County, the State Equal Opportunity Coordinator and any of the State of Ohio officials and agencies in this regard, both before and during construction.
4. Full cooperation as expressed in clause (3), above, shall include, but not be limited to, being a witness and permitting employees to be witnesses and complainants in any proceedings involving questions of unlawful employment practices, furnishing all information requested by the County and the State Equal Employment Opportunity Coordinator, and permitting access to its books, records, and accounts by the County and the State Equal Employment Opportunity Coordinator for purposes of investigation to ascertain compliance with

applicable rules, regulations and orders.

5. In the event of the contractor's noncompliance with the nondiscrimination clauses of its contract or with any of the said rules, regulations, or orders, its contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further County construction contracts.

In the event that its contract is terminated for a material breach of EEO requirements, the contractor shall become liable for any and all damages which shall accrue to the County as a result of said breach.

6. The contractor will require the inclusion of language reflecting these same six covenants within every subcontract or purchase order it executes in the performance of its contract unless exempted by rules, regulations or orders of the State Equal Employment Opportunity Coordinator so that these provisions will be binding upon each subcontractor or vendor. The contractor will take such as the County may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in any litigation with a subcontractor, vendor or other party as a result of such direction by the County, the contractor may be requested to protect the interests of the County.

The bidder hereby adopts the foregoing covenants?

Yes No

PLEASE NOTE: The bidder's failure to adopt the Bidder's EEO Covenants, will cause the bidder's proposal to be rejected as being non-responsive.

CERTIFICATE OF COMPLIANCE NON-DISCRIMINATION AND EQUAL EMPLOYMENT
OPPORTUNITY AFFIDAVIT (CONTRACTOR)

STATE OF _____)

SS:

COUNTY OF _____)

_____ being first duly sworn, deposes and
says that he/she is _____ of _____

the party who made the foregoing proposal; that such party as bidder does not and shall not discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex. If awarded the bid and contract under this proposal, said party shall take affirmative action to insure that applicants are employed and that employees are treated, during employment, without regard to their race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex.. If successful as the lowest and best bidder under the foregoing proposal, this party shall post non-discrimination notices in conspicuous places available to employees and applicants for employment setting forth the provisions of this affidavit.

Furthermore, said party agrees to abide by the assurances found in Section 153.54 of the Ohio Revised Code in the Contract Provisions with the Owner if selected as the successful bidder by the Owner.

Signature

Affiant

Company/Corporation

Address

City/State/Zip Code

Sworn to and subscribed before me this _____ day of _____, 2025.

(seal)

Notary

CERTIFICATE OF COMPLIANCE NON-DISCRIMINATION AND EQUAL EMPLOYMENT
OPPORTUNITY AFFIDAVIT (SUB CONTRACTOR)

STATE OF _____)

SS:

COUNTY OF _____)

_____ being first duly sworn, deposes and
says that he _____ of _____

the party who made the foregoing proposal; that such party as bidder does not and shall not discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex. If awarded the bid and contract under this proposal, said party shall take affirmative action to insure that applicants are employed and that employees are treated, during employment, without regard to their race, color, religion, national origin, age, disability, Vietnam era Veteran status, ancestry or sex. If successful as the lowest and best bidder under the foregoing proposal, this party shall post non-discrimination notices in conspicuous places available to employees and applicants for employment setting forth the provisions of this affidavit.

Furthermore, said party agrees to abide by the assurances found in Section 153.54 of the Ohio Revised Code in the Contract Provisions with the Owner if selected as the successful bidder by the Owner.

Signature

Affiant

Company/Corporation

Address

City/State/Zip Code

Sworn to and subscribed before me this _____ day of _____, 2025.

(seal)

Notary

SECTION 00 40 00
BONDING REQUIREMENTS

Bid guaranty, as required by Ohio Revised Code, Section 153.54, shall accompany each proposal submitted, as follows, either:

1. A Certified check, cashier's check, or letter of credit equal to ten (10) percent of the bid. A letter of credit may only be revocable by the Owner.

OR

2. A form of bid guaranty and contract bond (attached) for the full amount of the bid. Such bond is retained for the successful bidder but returned to unsuccessful bidders after contract is executed.

Performance bond is required upon entering into a contract with the Owner for 100 percent of the contract price when the bid guaranty is a certified check, cashier's check, or letter of credit equal to ten percent. Otherwise, the bid guaranty and contract bond shall secure the performance of the contract with a penal sum of 100% of the bid. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

SECTION 00 40 10
BID GUARANTY AND CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

(Insert full name or legal title of Contractor and Address)

as Principal and

(Insert full name or legal title of Surety)

as Surety, are hereby held and firmly bound unto the Warren County Board of Commissioners hereinafter called the Obligee, in the penal sum of the dollar amount of the bid submitted by the Principal to the Obligee on _____ to undertake the project known as:

MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT

The penal sum referred to herein shall be the dollar amount of the Principal's bid to the Obligee, incorporating any additive or deductive alternate proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee, In no case shall the penal sum exceed the amount of _____ DOLLARS, \$ _____. If this item is left blank, the penal sum will be the full amount of the Principal's bid, including alternates. Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including alternates in dollars and cents. A percentage is not acceptable.

For the payment of the penal sum well and truly to be made we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a bid on the above referred to project;

NOW, THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the Principal pays to the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the Obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the Principal will pay the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect.

If the Obligee accepts the bid of the Principal and within TEN days after the awarding of the contract, enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made a part of this bond the same as though set forth herein; and

IF THE SAID PRINCIPAL SHALL well and faithfully perform each and every condition of such contract; and indemnify the Obligee against all damage suffered by failure to perform such contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefore; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract: we agreeing and assenting that this undertaking shall be for benefit of any materialman or laborer having a just claim, as well as for the Obligee herein; THEN THIS OBLIGATION SHALL be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of said contract or in or to the plans and specifications therefor shall in any wise affect the obligations of said surety on its bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

SIGNED AND SEALED this _____ day of _____ 2025.

PRINCIPAL

SURETY

By: _____

By: _____

Attorney-in-fact

Title: _____

Surety Agent's Name and Address:

**SECTION 00 40 20
PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called
(Corporation, Partnership or Individual)

Principal, and _____
(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

WARREN COUNTY OHIO, BOARD OF COMMISSIONERS
406 Justice Drive
Lebanon, OH 45036

hereinafter called OWNER, in the penal sum of _____ Dollars, \$(_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2021, a copy of which is hereto attached and made a part hereof for the construction of:

MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the guaranty period(s), and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition of the terms of the contract or the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect

its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in counterparts, each one of which shall be deemed an original, this the _____ day of _____ 2025.

ATTEST:

(Principal)

(SEAL)

By _____

ATTEST:

(SEAL)

(Surety)

IMPORTANT: Pursuant to Ohio Revised Code §122.87(A) defines surety company as, “. . . a company that is authorized by the department of insurance to issue bonds as a surety”.

**SECTION 00 50 10
EXPERIENCE STATEMENT**

The Bidder is required to state in detail in the space provided below, what work they have completed of a character similar to that included in the proposed contract, to give references and such other detailed information as will enable the Owner to judge their responsibility, experience, skill, and financial standing. Completion of this statement is required and must be submitted with the Bid in order to qualify for consideration for award of contract.

SUBMITTED FOR:

MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT

SUBMITTED BY:

Name: _____

(Print or Type Name of Bidder)
(A Corporation / A Partnership / An Individual)
[Bidder to strike out inapplicable terms.]

Address: _____

The undersigned certifies under oath the truth and correctness of all statements and of all answers to questions made hereinafter.

(Note: Attach Separate Sheets as Required)

1.0 How many years has your organization been in business as a construction contractor?

2.0 How many years has your organization been in business under its present name?

3.0 Has any construction contracts to which you have been a party been terminated by the owner; have you ever terminated work on a construction project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name, address, phone number, and contact person of owner, engineer, and surety, and name and date of project.

No _____ Yes _____, If yes, attach details described above.

10.0 List the states in which your organization is legally qualified to do business.

11.0 List name, address and telephone number of an individual who represents each of the following and whom OWNER may contact for a financial reference:

11.1 A surety:

Name _____

Contact _____

Address _____

_____ Phone No. _____

Financial Reference _____

11.2 A bank:

Name _____

Contact _____

Address _____

_____ Phone No. _____

Financial Reference _____

11.3 A major material supplier:

Name _____

Contact _____

Address _____

Phone No. _____

Financial Reference _____

12.0 Dated at _____ this ____ day of _____, 2025.

(Print or Type Name of Bidder)

By: _____

(Seal, if corporation)

------(Affidavit for Individual)-----

_____, being duly sworn, deposes and says that all of the foregoing qualification information is true, complete, and accurate.

------(Affidavit for Partnership)-----

_____, being duly sworn, deposes and says that he/she is a member of the partnership of _____ and that all of the foregoing qualification information is true, complete, and accurate.

------(Affidavit for Corporation)-----

_____, being duly sworn, deposes and says that he/she is _____ of _____, and that all of the (Full name of Corporation)

foregoing qualification information is true, complete, and accurate.

------(Affidavit for Joint Venture)-----

_____ and _____, being duly sworn, deposes and says that they are members of _____ (Full Name of Joint Venture)

, and that all of the foregoing qualification information is true, complete, and accurate.

------(Acknowledgment) -----

_____, being duly sworn, deposes and says that he/she is
of _____; that he/she is duly authorized to make the foregoing
(Name of Bidder)

affidavit and that he/she makes it on behalf of () himself/herself; () said partnership; ()
said corporation.

Sworn to before me this _____ day of _____, 2025, in the County
of _____, State of _____.

(Notary Public)

My commission expires _____

(Seal)

**SECTION 00 60 10
CONTRACT**

THIS AGREEMENT, made this _____ day of _____, 2025, with the Warren County Board of Commissioners, 406 Justice Drive, Lebanon, Ohio, hereinafter called "Owner" and **ENTER CONTRACTOR NAME**, doing businesses as (an individual, partner, a corporation) hereinafter called "Contractor."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Owner, the Contractor hereby agrees with the Owner to commence and complete the construction described as follows:

MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT

hereinafter called the project, for the sum of \$ **ENTER AMOUNT**, and all work in connection therewith, under the terms as stated in the General Conditions and Supplemental Conditions of the Contract; and as his (its or their) own proper cost and expense furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in Contract Documents. "Contract Documents" means and includes the following:

- Addendum
- Any and All Bid Documents
- General Conditions
- Supplemental Conditions
- Division 00 – Contract Requirements
- Technical Specifications
- Construction Drawings

CONTRACTOR hereby agrees to commence work under this contract on or before a date to be specified in a Written "Notice to Proceed" of the OWNER and shall complete all work within the following requirements:

Substantial Completion: 240 Days from Notice to Proceed

Final Completion: 270 Days from Notice to Proceed

Any delays in substantial completion of the work that are within the control of the Contractor, their Subcontractor, or Supplier shall be subject to liquidated damages in the sum of \$1000.00 for each consecutive calendar day that the project extends beyond the substantial completion deadline. See the General Conditions and Supplemental Conditions for the definition and requirements of substantial completion.

This Agreement may be terminated by either party upon written notice in the event of substantial failure by the other party to perform in accordance with the terms of this Agreement. The nonperforming party shall have fifteen calendar days from the date of the termination notice to cure or to submit a plan for cure acceptable to the other party.

OWNER may terminate or suspend performance of this Agreement for OWNER'S convenience upon written notice to the CONTRACTOR. CONTRACTOR shall terminate or suspend performance of the services/work on a schedule acceptable to the OWNER.

The CONTRACTOR will indemnify and save the OWNER, their officers and employees, harmless from loss, expenses, costs, reasonable attorney's fees, litigation expenses, suits at law or in equity, causes of action, actions, damages, and obligations arising from (a) negligent, reckless or willful and wanton acts, errors or omissions by CONTRACTOR, its agents, employees, licensees, consultants, or subconsultants; (b) the failure of the CONTRACTOR, its agents, employees, licensees, consultants or subconsultants to observe the applicable standard of care in providing services pursuant to this agreement; (c) the intentional misconduct of the CONTRACTOR, its agents, employees, licensees, consultants, or subconsultants that result in injury to persons or damage to property. for which the OWNER may be held legally liable.

The CONTRACTOR does hereby agree to indemnify and hold the OWNER harmless for any and all sums for which the OWNER may be required to pay or for which the OWNER may be held responsible for failure of the CONTRACTOR or any subcontractors to pay the prevailing wage upon this project.

The OWNER agrees to pay the CONTRACTOR in the manner and at such times as set forth in the General Conditions and as amended in the Supplemental Conditions and in such amounts as required by the Contract Documents.

This Contract shall be construed under the laws of the State of Ohio, and the parties hereby stipulate to the venue for any and all claims, disputes, interpretations, litigation of any kind arising out of this Contract being exclusively in the Warren County, Ohio Court of Common Pleas (unless both parties mutually agree in writing to alternate dispute resolution), as well as waiving any right to bring or remove such matters in or to any other state or federal court.

This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

Contractor shall bind every subcontractor to, and every subcontractor must agree to be bound by the terms of, this Agreement, as far as applicable to the subcontractor's work particularly pertaining to Prevailing Wages and EEO requirements. Nothing contained in this Agreement shall create any contractual relationship between any subcontractor and Owner, nor create any obligations on the part of the Owner to pay or see to the payment of any sums to any subcontractor.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in two counterparts, each of which shall be deemed an original on the date first above written.

ATTEST:

WARREN COUNTY BOARD OF COMMISSIONERS

(Owner)

Name

President

(Seal)

ATTEST:

ENTER NAME
(Contractor)

By: _____
Name

Title

Approved as to Form:

Assistant Prosecutor

SECTION 00 70 10
WAGE RATE DETERMINATION

Prevailing wage rates for the State of Ohio apply to this project. Contractors and Subcontractor(s) shall conform to the State of Ohio Department of Labor requirements, guidelines, and laws. Included in this section is a list of the Ohio Prevailing Wage Rates available at the time of publication. It is the responsibility of the Contractor and Subcontractor(s) to verify the wage rates prior to bidding and throughout the project. A complete list of Ohio Prevailing Wage Rates is available at the Ohio Wage and Hour website or from the Ohio Department of Commerce Wage and Hour Bureau.



Mike DeWine
Governor

Sheryl Maxfield
Director

PREVAILING WAGE GUIDE

WARREN COUNTY

OHIO DEPARTMENT OF COMMERCE

Division of Industrial Compliance
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
Phone: 614-644-2239
Fax: 614-728-8639
www.com.ohio.gov
TTY/TDD: 1-800-750-0750

The Ohio Department of Commerce is an Equal Opportunity Employer and Service Provider

This packet of information is provided as a summary of the Prevailing Wage guidelines and responsibilities. The Ohio Revised Code, Chapter 4115 should be referred to for the exact wording of the law. Also included are references and forms which should be helpful in the compliance of the Prevailing Wage Law.

PACKET INFORMATION INDEX

- A. The Ohio Department of Commerce-Division of Industrial Compliance, Wage and Hour Administration Investigators and their assigned counties**
- The Wage and Hour Investigators for the State of Ohio are listed with their contact information.
 - If you have questions or need assistance pertaining to Prevailing Wage, you can contact the Investigator in your area.
- B. Prevailing Wage Guide for Public Authorities**
- Notice of change of the Prevailing Wage Threshold Level.
 - A notification will be sent to you when there is a change of the Prevailing Wage threshold level
 - Outline of the Public Authority's responsibilities for Prevailing Wage.
 - Public Authority's Compliance Checklist form.
 - A form for tracking the progress of a Prevailing Wage project
 - Request form for Prevailing Wage Rates.
 - Prevailing Wage Rates can be obtained on the website www.com.ohio.gov
 - Prevailing Wage Determination Schedule of wages must be attached to and made part of the specifications for the project, and must be printed on the bidding blanks where the work is done by contract.
 - Bid Tabulation form
 - A form to be completed and returned to ODOC-DIC-Bureau of Wage and Hour Administration when the contract has been awarded.
 - Prevailing Wage Bonds form
 - Information needed to be kept on file by the Prevailing Wage Coordinator when bonds from the Public Authority are used for a project.
- C. Prevailing Wage Guidelines for the Public Authority's Coordinator**
- Guideline for the Prevailing Wage Coordinator
 - The Prevailing Wage complaint form and instructions can be obtained on the website www.com.ohio.gov
 - Record of the Certified Payroll Reports Received form
 - Helpful form for recording the Certified Payroll Reports and the dates received from the contractors and subcontractors.
 - Employee Interview form
 - Helpful form for the use by the Prevailing Wage Coordinator when making on-site visits.
 - Employee vs. Independent Contractor
 - Helpful questions when determining if a person is an Employee or an Independent Contractor.
- D. Prevailing Wage Guide for Contractors**
(Incorporate this section in the Specifications or supply copies for the pre-construction meeting.)
- Outline of responsibilities for the Prevailing Wage Contractor
 - Notification form from the Contractor to the Employee
 - The contractor must submit to employees a completed and signed notification form.
 - Some Prevailing Wage Coordinators may require a copy of the completed Notification to the Employee form be submitted with the Certified Payroll Reports.
 - Certified Payroll Report form
 - The contractor can use any form/format he chooses as long as **ALL** the information has been provided.
 - Certified Payroll Report form instruction sheet
 - Corrected Certified Payroll Report Example
 - Affidavit of Compliance form
 - No Public Authority shall make final payment unless the **Final Affidavits** have been filed by the contractors and subcontractors.



Mike DeWine
Governor

Sheryl Maxfield
Director

INVESTIGATORS CONTACT INFORMATION

OHIO DEPARTMENT OF COMMERCE

Division of Industrial Compliance
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
Phone: 614-644-2239
Fax: 614-728-8639
www.com.ohio.gov
TTY/TDD: 1-800-750-0750

The Ohio Department of Commerce is an Equal Opportunity Employer and Service Provider

OHIO DEPARTMENT OF COMMERCE
Division of Industrial Compliance
Bureau of Wage and Hour Administration
Chief, Stephen Clegg

6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
614-644-2239
fax: 614-728-8639
<http://www.com.ohio.gov>

INVESTIGATORS and THEIR HEADQUARTER COUNTY

#48 Dave Horvath PO Box 1512 Lima, Ohio 45802-1512 Voice: (419) 302-1200 Fax: (614) 728-8639 Dave.Horvath@com.state.oh.us	Allen *
#30 Mike McKee P.O. Box 1342 Cambridge, Ohio 43725-2247 Voice/Fax: (740) 432-1987 Michael.McKee@com.state.oh.us	Guernsey*
#56 Shawn Miles P.O. Box 2547 North Canton, Ohio 44720 Voice/Fax: (614) 496-9076 Shawn.Miles@com.state.oh.us	Stark *
#37 David Rice P.O. Box 41241 Dayton, Ohio 45441 Voice: (740) 502-0883 Fax: (614) 895-7768 Dave.Rice@com.state.oh.us	Montgomery *
#35 Sean Seibert P.O. Box 422 Painesville, Ohio 44077-3938 Voice: (614) 557-8662 Fax: (614) 232-9541 Sean.Seibert@com.state.oh.us	Lake *
#11 Kela D. Thompson 6606 Tussing Rd, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-5007 Fax: (614) 232-9537 Kela.Thompson@com.state.oh.us	Franklin *

* Headquarter County

Stephen Clegg, Chief 6606 Tussing Road, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-8686 Fax: (614) 728-8639 Stephen.Clegg@com.state.oh.us	#90 Jackie Clark, Supervisor 6606 Tussing Rd, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-5019 Fax: (614) 222-2357 Jackie.Clark@com.state.oh.us
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Mike DeWine
Governor

Sheryl Maxfield
Director

PREVAILING WAGE GUIDE FOR PUBLIC AUTHORITIES

OHIO DEPARTMENT OF COMMERCE

Division of Industrial Compliance
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
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Phone: 614-644-2239
Fax: 614-728-8639
www.com.ohio.gov
TTY/TDD: 1-800-750-0750

The Ohio Department of Commerce is an Equal Opportunity Employer and Service Provider

PREVAILING WAGE THRESHOLD LEVELS

IMPORTANT NOTICE

Before advertising for bids, contracting, or undertaking construction with its own forces, to construct a public improvement, the Public Authority shall have the Ohio Department of Commerce-Division of Industrial Compliance, Bureau of Wage and Hour Administration determine the prevailing rates of wages for workers employed on the public improvement. The wage determination must be included in the project specifications and printed on the bidding blanks where work is done by contract.

"New" construction threshold for <i>Building Construction</i>:	\$250,000
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"Reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting" threshold level for <i>Building Construction</i>:	\$75,000
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As of January 1, 2018:

"New" construction that involves <i>roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction</i> threshold level has been adjusted to:	\$91,150
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"Reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting" that involves <i>roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction</i> threshold level has been adjusted to:	\$27,309
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- A) Thresholds are to be adjusted biennially by the Director of the Ohio Department of Commerce.
- B) Biennial adjustments to threshold levels are made according to the Building Cost for Skilled Labor Index published by McGraw-Hill's Engineering News-Record, but may not increase or decrease more than 3% for any year.

If there are questions concerning this notification, please contact:

Ohio Department of Commerce
Division of Industrial Compliance
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
Phone: 614-644-2239
Fax: 614-728-8639
www.com.ohio.gov

Public Authority Responsibilities
ORC Chapter 4115: Wages and Hours on Public Works
(Prevailing Wage Coordinator)

1. Before advertising for bids, contracting, or undertaking construction with its own forces, to construct a public improvement, the public authority shall have the Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Wage and Hour Administration determine the prevailing rates of wages for workers employed on the public improvement. The wage determination must be included in the project specifications and printed on the bidding blanks where work is done by contract.
 - a) "New" construction has a threshold level of \$250,000.
 - b) "Reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting" has a threshold level of \$75,000.
 - c) "New" construction that involves roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction has a threshold level of \$84,314.
 - d) "Reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting" that involves roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction has a threshold of \$25,261.
 - i.) Thresholds are to be adjusted biennially by the Director of Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Wage and Hour Administration.
 - ii.) Biennial adjustments to threshold levels are made according to the Price Deflator for Construction Index, United States Department of Commerce, Bureau of the Census, but may not increase or decrease more than 3% for any year.
2. Every contract for public work shall contain a provision that each worker employed by the contractor or subcontractor, or other person about or upon the public work, must be paid the prevailing rate of wages.
3. If contracts are not awarded or construction undertaken within ninety days (90) from the date of the determination of the prevailing wage there shall be a re-determination of the wage rates before the contract is awarded.
4. Within seven (7) working days after the receipt of notification of a change in the prevailing wage rates, the public authority shall notify all affected contractors and subcontractors. If it is determined that a contractor or subcontractor has violated sections 4115.03 to 4115.16 of the Ohio Revised Code because they were not notified as required, **the public authority is liable** for any back wages, fines, damages, court costs and attorney's fees for the period of time covering the receipt of wage changes, until they give the required notice.
5. No public authority shall award a contract for a public improvement to any contractor or subcontractor whose name appears on the list of debarred contractors. This list is filed with the Secretary of State by the Ohio Department of Commerce-Division of Industrial Compliance & Labor-Bureau of Wage and Hour Administration **The filing of the notice of conviction with the secretary of state constitutes notice to all public authorities.** These contractors are prohibited from working on public improvements for periods ranging from one to three years. The list of debarred contractors can be located on the website www.com.ohio.gov/laws
6. A public authority must designate and appoint **one of its own employees** to serve as the Prevailing Wage Coordinator during the life of the contract for constructing the public improvement. A Prevailing Wage Coordinator must be appointed no later than ten days before the first payment of wages by contractors to employees working on the public improvement.

PUBLIC AUTHORITY'S COMPLIANCE CHECKLIST FOR PREVAILING WAGE

Project:		Number:
Department:		Phone#:
PW Coordinator:		Phone#:
Architect/Engineer:		Phone#:
Contractor:		Phone#:
Contact Person:		Title:
General Contractor:		Prime Contractor:
		Construction Mgr:
Date Completed		Compliance Item Description
	1.	Request Prevailing Wage Determination Schedule from ODOC-DIC-Wage & Hour
	2.	Received Prevailing Wage Determination Schedule
	3.	Incorporate Determination Schedule in Specs/Bidding Blanks
	4.	Incorporate notice of Prevailing Wage requirements in Invitation for Bids/Notice to Bidders
	5.	Incorporate Prevailing Wage requirements in Contract
	6.	Submit complete Invitation for Bid to ODOC-DIC-Wage & Hour
	7.	Invitation for Bids
	8.	Bid Opening
	9.	Check Listing of Violators
	10.	Award of Contract. (see note)
	11.	Submit Bid Tabulation/Award to ODOC-DIC-WAGE & HOUR
	12.	Notice to Successful Bidder
	13.	Work Commenced...(see note)
	14.	Appoint Prevailing Wage Coordinator
	15.	Received list of Subcontractors' names, addresses, phone #'s & email's
	16.	Received Payroll Date Schedule
	17.	Received Registered Apprenticeship Agreement Certifications
	18.	Received Deduction Agreements
	19.	Received Payroll Reports with Certification...(see attachment)
	20.	Visited project site
	21.	Received Changes to Determination Schedule
	22.	Notice to Contractors of Determination Schedule change
	23.	Request Final Compliance Affidavit from contractors & subcontractors
	24.	Received Final Affidavits from all contractors & subcontractors
	25.	Certify Final Payment

Note: If contract is not awarded or construction undertaken within 90 days from the date of establishment of the Prevailing Wage Rates, a re-determination of the Prevailing Wage Rates is required.

REQUEST FOR STATE OF OHIO PREVAILING WAGE RATES

Date		(Mark (X) One) <input type="checkbox"/> - Residential <input type="checkbox"/> - Construction
Project Information (only one project and one county per request form please)		
County of Project	Project Name	This form MUST be filled out COMPETELY & CORRECTLY for us to process your request. Forms not completed correctly will be RETURNED TO THE SENDER.
Site Address	City	
Owner/Public Authority		Prevailing Wage Rates can be obtained on the website www.com.ohio.gov
Address	Telephone Number	<div style="border: 2px solid black; padding: 5px; text-align: center;"> ODOC-DIC-WAGE & HOUR DATE STAMP </div>
City	Zip Code	
PW Coordinator	Telephone Number	
Issuing Authority of Bonds	Type of Financing	
Estimated Total Overall Project Cost		PLEASE MAIL THIS REQUEST TO: Ohio Department of Commerce Division of Industrial Compliance Bureau of Wage & Hour Administration 6606 Tussing Road, PO Box 4009 Reynoldsburg, Ohio 43068-9009 PHONE: (614) 644-2239 FAX: (614) 728-8639
<input type="checkbox"/> New Construction <input type="checkbox"/> "Old" Construction * A copy of this form will be returned to you with your wage rates. You must send that copy to us with your bid tabulations once the contract has been awarded.		
Expected Date of Contract Award		
Projected Completion Date		
Send Wage Rates to: (contractors are charged \$5.00 per county)		
<input type="checkbox"/> Mail <input type="checkbox"/> Pick Up <input type="checkbox"/> Federal Express Account Number		<div style="border: 2px solid black; padding: 5px; text-align: center;"> ODOC-DIC-W&H DATE STAMP (bid tab) </div>
Name	Company or Public Authority	
Address		
City	Zip	
* "Old" construction is reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting.		

INDUSTRIAL DEVELOPMENT BONDS

Bond Projects require the Public Authority to keep the following information on file			
1. Type of Bonds issued:		Amount:	
2. The total cost of the Project:			
3. The other type of financing involved in the project:			
4. Portion of the project being constructed with each type of financing:			
5. Are Prevailing Wage Rates being applied to all construction on the project: <input type="checkbox"/> Yes <input type="checkbox"/> No			
6. The name of the political subdivision who issued the bonds:			
7. When were the bonds issued:			
8. For what purpose were the bonds issued:			
9. Who handles the funds once the bonds are sold:			
10. Who is the lending institution that purchased the bonds:			
11. How are the funds to be paid out:			
12. When are the funds to be paid out:			
13. Who is the Bond Council:			
14. Who has been appointed as the Prevailing Coordinator:			
PWC Address:			
City:	OHIO	Zip:	Telephone #:
15. Obtain a copy of the inducement and other official documents for the issuance of the bonds.			



Mike DeWine
Governor

Sheryl Maxfield
Director

PREVAILING WAGE GUIDELINES
FOR THE
PUBLIC AUTHORITY'S
PW COORDINATOR

OHIO DEPARTMENT OF COMMERCE

Division of Industrial Compliance and Labor
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
Phone: 614-644-2239
Fax: 614-728-8639
www.com.ohio.gov
TTY/TDD: 1-800-750-0750

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Prevailing Wage Coordinator Guidelines

For more detailed information please refer to Chapter 4115 of the Ohio Revised Code

- A. Attend any pre-bid and/or pre-construction meetings.
 - 1. To explain the prevailing wage rate requirements.
 - 2. To explain the contractor's responsibilities.
- B. Set up and maintain files containing all contractors' and subcontractors' payroll reports, affidavits, and related documents. These files must be available for public inspection.
- C. Obtain from each contractor a list of their subcontractors' names, addresses, telephone numbers, and email addresses.
- D. Require each contractor and subcontractor to provide their project dates. This will be used to make a time schedule for receiving their certified payrolls.
- E. Obtain from each contractor, the name and address of their Bonding/Surety Company.
- F. Obtain from out-of-state corporations, the name and address of their Statutory Agent. (This agent must be located in the State of Ohio and registered with the Ohio Secretary of State.)
 - 1. Records made in connection with the public improvement must not be removed from the State of Ohio for the period of one year following the completion of the project.
- G. Supply contractors with any changes in the Prevailing Wage Rates.
- H. Within two weeks after the first pay, obtain a certified payroll report from each contractor. A certified report is one that is sworn to and signed by the contractor.
 - 1. If the job will exceed four months, all reports after the initial report can be filed once per month. (The initial report must be filed within two weeks.)
 - 2. If the job will last less than four months, all reports are to be filed weekly after the initial report.
- I. Establish and follow procedures to monitor compliance by contractors and subcontractors.
 - 1. Visit project to verify posting requirements and job classifications.
 - 2. Review certified payroll reports to ensure they are submitted in a timely fashion and complete with the following information for each employee:
 - a) Name, current address, and their social security number or last 4 when permitted
 - b) Classification (must be specific for laborers and operators, including level)
 - c) Hours worked on the project
 - d) Hourly rate
 - e) Fringe benefits, if applicable
 - f) Total hours worked for the week (all jobs)
 - g) Gross wages, all deductions, net pay
 - 3. Compare rates and fringes reported to rates in prevailing wage schedule.
- J. Upon completion of the project and prior to the final payment, require an affidavit of compliance from each contractor and subcontractor. **No public authority shall make final payment to any contractor or subcontractor unless the final affidavits have been filed by the respective contractor and subcontractor. (O.R.C. section 4115.07)**
- K. Report any non-compliance to Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Wage & Hour Administration. The PW complaint form and instructions can be obtained on the website www.com.ohio.gov.

RECORD OF THE CERTIFIED PAYROLL REPORTS RECEIVED

Project:		Number:	
Contractor:		Phone #: Email:	
General Contractor:	Prime Contractor:	Subcontractor:	
Date work commenced:	Completed:	Final Affidavit:	

Payroll	Payroll Date	Date Received		Payroll	Payroll Date	Date Received
1				33		
2				34		
3				35		
4				36		
5				37		
6				38		
7				39		
8				40		
9				41		
10				42		
11				43		
12				44		
13				45		
14				46		
15				47		
16				48		
17				49		
18				50		
19				51		
20				52		
21				53		
22				54		
23				55		
24				56		
25				57		
26				58		
27				59		
28				60		
29				61		
30				62		
31				63		
32				64		

PREVAILING WAGE INVESTIGATION EMPLOYEE INTERVIEW

Failure to complete this interview form may reduce our ability to recover back wages which may be owed to you.

Project:		Case #:	
Address:		City:	County:
Employee Name:		Last 4 digits of the SS#:	
Address:		City:	State: Zip:
Telephone #: (Home)	(Work)	Email:	Best time to be reached:
Another source by which we can contact you. (Someone not living at your address):			
Name:		Relationship:	Telephone #:
Contractor's Name:		Telephone #:	
Address:		City:	State: Zip:
Date hired:	Date started on this project:	Approximate hours - Straight time:	Overtime:
Method of recording hours: <input type="checkbox"/> Time Card <input type="checkbox"/> Called into office		Recorded by: <input type="checkbox"/> Employee <input type="checkbox"/> Foreman	
Did you keep a personal record of your hours worked on this project? <input type="checkbox"/> Yes <input type="checkbox"/> No		Do you have check stubs? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Did anyone else keep a personal record? <input type="checkbox"/> Yes <input type="checkbox"/> No		If yes, who:	
List your job classification(s):		<input type="checkbox"/> Journeyman <input type="checkbox"/> Helper <input type="checkbox"/> Apprentice - Level	
List your specific job duties:		List tools/equipment used:	
Hourly rate of pay for this project:		Your regular rate of pay:	
Fringe benefits paid by contractor: <input type="checkbox"/> None <input type="checkbox"/> Health Insurance <input type="checkbox"/> Life Insurance <input type="checkbox"/> Pension <input type="checkbox"/> Bonus ~ Vacation - Amount _____ <input type="checkbox"/> Holidays - Amount _____ <input type="checkbox"/> Apprenticeship training <input type="checkbox"/> Profit Sharing ~ Other (list): _____			
Did you work overtime? <input type="checkbox"/> Yes <input type="checkbox"/> No		Were hours over 40 per week paid at time and one half? <input type="checkbox"/> Yes <input type="checkbox"/> No	
When is your pay day?		Method of payment: <input type="checkbox"/> Check <input type="checkbox"/> Cash <input type="checkbox"/> Direct Deposit	
List names of co-workers on this project:			
Comments:		Please provide a detailed list of the dates, times and hours worked within each classification that may apply to the work performed on a separate sheet.	
SIGNATURE AND NOTARY			
Affiant is further informed that Section 2921.13 of the Ohio Revised Code provides a penalty of a misdemeanor of the first degree and that prosecution will be pursued of those persons who "knowingly swear or affirm the truth of a false statement when ...the statement is sworn or affirmed before a notary public..." Sworn to before me and subscribed by the said: _____ In my presence this _____ day of _____, 20_____. _____ Notary Public		I hereby certify that this is a true statement to the best of my knowledge and belief. Signature _____ Date _____ Return to: Ohio Department of Commerce Division of Industrial Compliance & Labor Bureau of Wage and Hour Administration 6606 Tussing Road P.O. Box 4009 Reynoldsburg, Ohio 43068-9009 (614) 644-2239 www.com.ohio.gov	
Signature of PW Coordinator:			Date:

EMPLOYEE VS. INDEPENDENT CONTRACTOR

EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the employer have the right to control and direct worker?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the worker receive instructions about how and where the work is to be done instead of the employer merely specifying the desired result?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Is payment based on time spent rather than a set price for the work to be performed?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the worker devote virtually all his working time to the employer rather than offering services to the general public?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the worker performing services make their services available to the general public and/or other businesses?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Is there a continuing relationship between employer and worker?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Can the worker be discharged at will?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Did the employer train the worker for the job?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the employer have employees performing the same work as the independent contractor?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR

EMPLOYEE VS. INDEPENDENT CONTRACTOR-continued

EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the worker perform services personally rather than delegating them to others?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the employer set a specific time when the individual services are to be performed?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Does the employer furnish the tools and materials used by the worker performing services?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input checked="" type="checkbox"/> YES	Is the employer assuming all the financial risk, rather than the worker making a significant financial investment in the job and having the opportunity to realize a profit or loss from the work?	<input type="checkbox"/> NO	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input type="checkbox"/> NO	Does the individual performing the services publicly advertise these services in for example, the newspaper or yellow pages ?	<input checked="" type="checkbox"/> YES	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input type="checkbox"/> NO	Does the individual performing the services have a business license?	<input checked="" type="checkbox"/> YES	↔	INDEPENDENT CONTRACTOR
EMPLOYEE	↔	<input type="checkbox"/> NO	Does the individual performing the services operate d.b.a. or under a tradename?	<input checked="" type="checkbox"/> YES	↔	INDEPENDENT CONTRACTOR



Mike DeWine
Governor

Sheryl Maxfield
Director

PREVAILING WAGE GUIDE FOR CONTRACTORS

OHIO DEPARTMENT OF COMMERCE

Division of Industrial Compliance
Bureau of Wage and Hour Administration
6606 Tussing Road, PO Box 4009
Reynoldsburg, Ohio 43068-9009
Phone: 614-644-2239
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OHIO DEPARTMENT OF COMMERCE
Division of Industrial Compliance
Bureau of Wage and Hour Administration
Chief, Stephen Clegg

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INVESTIGATORS and THEIR HEADQUARTER COUNTY

<p>#48 Dave Horvath PO Box 1512 Lima, Ohio 45802-1512 Voice: (419) 302-1200 Fax: (614) 728-8639 Dave.Horvath@com.state.oh.us</p>	Allen *
<p>#30 Mike McKee P.O. Box 1342 Cambridge, Ohio 43725-2247 Voice/Fax: (740) 432-1987 Michael.McKee@com.state.oh.us</p>	Guernsey*
<p>#56 Shawn Miles P.O. Box 2547 North Canton, Ohio 44720 Voice/Fax: (614) 496-9076 Shawn.Miles@com.state.oh.us</p>	Stark *
<p>#37 David Rice P.O. Box 41241 Dayton, Ohio 45441 Voice/Fax: (740) 502-0883 Dave.Rice@com.state.oh.us</p>	Montgomery *
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<p>#11 Kela D. Thompson 6606 Tussing Rd, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-5007 Fax: (614) 232-9537 kela.thompson@com.state.oh.us</p>	Franklin *

* Headquarter County

<p>Stephen Clegg, Chief 6606 Tussing Road, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-8686 Fax: (614) 728-8639 Stephen.Clegg@com.state.oh.us</p>	<p>#90 Jackie Clark, Supervisor 6606 Tussing Rd, PO Box 4009 Reynoldsburg, Ohio 43068-9009 Voice: (614) 728-5019 Fax: (614) 222-2357 Jackie.Clark@com.state.oh.us</p>
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PREVAILING WAGE CONTRACTOR RESPONSIBILITIES

This is a summary of prevailing wage contractors' responsibilities. For more detailed information please refer to Chapter 4115 of the Ohio Revised Code

General Information

Ohio's prevailing wage laws apply to all public improvements financed in whole or in part by public funds when the total overall project cost is fairly estimated to be more than \$250,000 for new construction or \$75,000 for reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting.

Ohio's prevailing wage laws apply to all public improvements financed in whole or in part by public funds when the total overall project cost is fairly estimated to be more than \$91,150 for new construction that involves roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction or \$27,309 for reconstruction, enlargement, alteration, repair, remodeling, renovation, or painting of a public improvement that involves roads, streets, alleys, sewers, ditches and other works connected to road or bridge construction.

- a) Thresholds are to be adjusted biennially by the Administrator of Ohio Department of Commerce, Division of Industrial Compliance and Labor, Bureau of Wage and Hour Administration
- b) Biennial adjustments to threshold levels are made according to the Price Deflator for Construction Index, United States Department of Commerce, Bureau of the Census*, but may not increase or decrease more than 3% for any year

Penalties for violation

Violators are to be assessed the wages owed, plus a penalty of 100% of the wages owed.

Intentional Violations

If an intentional violation is determined to have occurred, the contractor is prohibited from contracting directly or indirectly with any public authority for the construction of a public improvement. Intentional violation means "a willful, knowing, or deliberate disregard for any provision" of the prevailing wage law and includes but is not limited to the following actions:

- Intentional failure to submit payroll reports as required, or knowingly submitting false or erroneous reports.
- Intentional misclassification of employees for the purpose of reducing wages.
- Intentional misclassification of employees as independent contractors or as apprentices.
- Intentional failure to pay the prevailing wage.
- Intentional failure to comply with the allowable ratio of apprentices to skilled workers as required by the regulations established by Ohio Department of Commerce, Division of Industrial Compliance and Labor, Bureau of Wage and Hour Administration.
- Intentionally employing an officer, of a contractor or subcontractor, that is known to be prohibited from contracting, directly or indirectly, with a public authority.



Responsibilities

- A. Pay the prevailing rate of wages as shown in the wage rate schedules issued by the Ohio Department of Commerce, Division of Industrial Compliance and Labor, Bureau of Wage and Hour Administration, for the classification of work being performed.
 - 1. Wage rate schedules include all modifications, corrections, escalations, or reductions to wage rates issued for the project.
 - 2. Overtime must be paid at time and one-half the employee's base hourly rate. Fringe benefits are paid at straight time rate for all hours including overtime.
 - 3. Prevailing wages must be paid in full without any deduction for food, lodging, transportation, use of tools, etc.; unless, the employee has voluntarily consented to these deductions in writing. The public authority and the Director of Ohio Department of Commerce, Division of Industrial Compliance and Labor, Bureau of Wage and Hour Administration - must approve these deductions as fair and reasonable. Consent and approval must be obtained before starting the project.

- B. Use of Apprentices and Helpers cannot exceed the ratios permitted in the wage rate schedules.
 - 1. Apprentices must be registered with the U.S. Department of Labor Bureau of Apprenticeship and Training.
 - 2. Contractors must provide the Prevailing Wage Coordinator a copy of the Apprenticeship Agreement for each apprentice on the project.

- C. Keep full and accurate payroll records available for inspection by any authorized representative of the Ohio Department of Commerce, Division of Industrial Compliance, and Labor, Bureau of Wage and Hour Administration or the contracting public authority, including the Prevailing Wage Coordinator. Records should include but are not limited to:
 - 1. Time cards, time sheets, daily work records, etc.
 - 2. Payroll ledger/journals and canceled checks/check register.
 - 3. Fringe benefit records must include program, address, account number, & canceled checks.
 - 4. Records made in connection with the public improvement must not be removed from the State for one year following the completion of the project.
 - 5. Out-of-State Corporations must submit to the Ohio Secretary of State the full name and address of their Statutory Agent in Ohio.

- D. Prevailing Wage Rate Schedule must be posted on the job site where it is accessible to all employees.

- E. Prior to submitting the initial payroll report, supply the Prevailing Wage Coordinator with your project dates to schedule reporting of your payrolls.

- F. Supply the Prevailing Wage Coordinator a list of all subcontractors including the name, address, and telephone number for each.
 - 1. **Contractors are responsible for their subcontractors' compliance with requirements of Chapter 4115 of the Ohio Revised Code.**



- G. Before employees start work on the project, supply them with written notification of their job classification, prevailing wage rate, fringe benefit amounts, and the name of the Prevailing Wage Coordinator for the project. A copy of the completed signed notification should be submitted to Prevailing Wage Coordinator.
- H. Supply all subcontractors with the Prevailing Wage Rates and changes.
- I. Submit certified payrolls within two (2) weeks after the initial pay period. Payrolls must include the following information:
 - 1. Employees' names, addresses, and social security numbers.
 - a. Corporate officers/owners/partners and any salaried personnel who do physical work on the project are considered employees. All rate and reporting requirements are applicable to these individuals.
 - 2. Employees' work classification.
 - a. Be specific about the laborers and/or operators (Group)
 - b. For all apprentices, show level/year and percent of journeyman's rate
 - 3. Hours worked on the project for each employee.
 - a. The number of hours worked in each day and the total number of hours worked each week.
 - 4. Hourly rate for each employee.
 - a. The minimum rate paid must be the wage rate for the appropriate classification. The Department's Wage Rate Schedule sets this rate.
 - b. All overtime worked is to be paid at time and one-half for all hours worked more than forty (40) per week.
 - 5. Where fringes are paid into a bona fide plan instead of cash, list each benefit and amount per hour paid to program for each employee.
 - a. When the amount contributed to the fringe benefit plan and the total number of hours worked by the employee on all projects for the year are documented, the hourly amount is calculated by dividing the total contribution of the employer by the total number of hours worked by the employee.
 - b. When the amount contributed to the fringe benefit is documented but not the total hours worked, the hourly amount is calculated by **dividing the total yearly contribution by 2080.**
 - 6. Gross amount earned on all projects during the pay period.
 - 7. Total deductions from employee's wages.
 - 8. Net amount paid.
- J. The reports shall be certified by the contractor, subcontractor, or duly appointed agent stating that the payroll is correct and complete; and that the wage rates shown are not less than those required by the O.R.C. 4115.
- K. Provide a Final Affidavit to the Prevailing Wage Coordinator upon the completion of the project.

PREVAILING WAGE NOTIFICATION to EMPLOYEE

4115.05...the contractor or subcontractor shall furnish each employee NOT covered by a collective bargaining agreement written notification of the job classification to which the employee is assigned, the prevailing wage determined to be applicable to that classification, separated into the hourly rate of pay and the fringe payments, and the identity of the prevailing wage coordinator appointed by the public authority. The contractor or subcontractor shall furnish the same notification to each affected employee every time the job classification of the employee is changed.

Project Name:	Job Number:
Contractor:	
Project Location:	
Prevailing Wage Coordinator	Employee
Public Authority:	Name:
Name of PWC:	Street:
Street:	City:
City:	State/Zip:
State/Zip:	Phone:
	Email:
Phone:	Last 4 Digits of SS #:

You will be performing work on this project that falls under these classifications. You will be paid the appropriate rate for the type of work you are performing.

Classification:	Prevailing Wage Rate Total Package:	Minus your fringe benefits *:	Your hourly base rate and overtime:
			/
			/
			/
			/
			/
			/

Hourly fringe benefits paid on your behalf by this company (Yearly amount the company pays divided by 2080):

Fringe	Amount	Fringe	Amount
Health Insurance		Vacation	
Life Insurance		Holiday	
Pension		Sick Pay	
Other (Specify)		Training	
Other (Specify)		Total Hourly Fringes *	

Contractor's Signature:	Date:
Employee's Signature:	Date:

INSTRUCTIONS FOR PREPARING CERTIFIED PAYROLL REPORTS

General

Contractors and subcontractors are required by law to submit certified payroll reports for work on projects covered by Ohio's Prevailing Wage Law. This form meets the reporting requirements established by Ohio Revised Code Chapter 4115. The use of this form is not mandatory; employers may submit their own forms provided that all of the required information is included. This form may be reproduced, or additional copies obtained from:

Ohio Department of Commerce
Division of Industrial Compliance and Labor
Bureau of Wage & Hour Administration
6606 Tussing Rd, P. O. Box 4009
Reynoldsburg, OH 43068-9009
Phone: (614) 644-2239
www.com.ohio.gov

Certified Payroll Heading

Employer name and address: Company's full name and address... Indicate if the company is a subcontractor.

Subcontractor: Check and list the name of the General Contractor or Prime.

Project: Name and location of the project, including county.

Contracting Public Authority: Name and address of the contracting public authority... (Owner of the project).

Week Ending: Month, day, and year for the last day of the reporting period.

Payroll #: Indicate first, second, third, etc. payroll filed by the company for the project.

Page Indicator: number of pages included in the report.

Project Number: Determined by the public authority... if there is no number leave it blank.

Payroll Information by Column

- Employee Name, Address and Social Security number:** This information must be provided for all employees that perform physical labor on the project. Corporate officers, partners, and salaried employees are considered employees and must be paid the prevailing rate. Individual sole proprietors do not have to pay themselves prevailing rate but must report their hours on the project.
- Work Class:** List classification of work actually performed by employee. If unsure of work classification, consult the Ohio department of Commerce, Wage and Hour Bureau. Employees working more than one classification should have separate line entries for each classification. Indicate what year/level for Apprentices. Be specific when using laborer and operator classifications; for example, Backhoe Operator or Asphalt Laborer.
- Hours Worked, Day & Date:** In the first row of column 3 enter days of pay period example; M T W T H F S S. The second row is for the date that corresponds with each day for the pay period. In the employee information section enter the number of hours worked on the prevailing wage project and which day the hours were worked. Separate rows are labeled for (ST) straight time hours and (OT) overtime hours. All hours worked after 40, must be paid at the appropriate overtime rate.
- Project Total Hours:** Total the hours entered for pay period.
- Base Rate:** Enter actual rate per hour paid to the employee. The overtime hourly rate is time and one-half the base rate listed in the prevailing wage schedule plus fringe benefits at straight time rate. The prevailing wage schedule lists the base rate plus fringe benefit amounts. These amounts added together equal the total prevailing wage rate. Employers must pay this total amount in one of three ways.
 - Total rate may be paid in entirety in the base rate to the employee; in which case, the cash designation will be checked for fringe benefits.
 - Total rate may be paid as listed in prevailing wage rate schedule with total fringe amounts paid approved plans.
 - Total rate may be paid with a combination of base rate and fringe payments to approved plans in amounts other than those listed in schedule.
- Project Gross:** Enter total gross wages earned on the project for straight time and overtime. Project hours X base rate should equal project gross.
- Fringes:** If fringe benefits are paid in the hourly base rate, indicate this by marking the **Cash** space. If fringe benefits are paid to approved plans as listed in the prevailing wage rate schedule, mark the space **Approved Plans**. If fringe benefits are paid partially in the base rate and partially to approved plans, mark the space **Cash & Approved plans**. List the hourly amount paid to approved plans for each fringe. If payments are not made on a per hour basis, calculate the hourly fringe credit by dividing the yearly employer contribution by the lesser of: hours actually worked in the year (these must be documented) or 2080. Fringe benefits include: Employer's share of health insurance, life insurance, retirement plan, bonus/profit sharing, sick pay, holiday pay, personal leave, vacation, and education/training programs. If unsure of a possible fringe benefit, contact the Ohio Department of Commerce - Division of Industrial Compliance and Labor - Bureau of Wage & Hour Administration.
- Total Hours All Jobs:** Total all hours worked during the pay period including non-prevailing wage jobs.
- Total Gross All Jobs:** Gross amount earned in the pay period for all hours worked.
- Self explanatory.
- Self explanatory.

Certified Payroll Report

Report for: _____ Check if Subcontractor¹⁾ Contract No: _____ Payroll No: _____
 Company:¹⁾ _____ If Sub, GC/Prime Contractor Name: _____
 Address: _____ Project Name & Location: _____ Week Ending: _____
 City, State, Zip _____ Public Authority (Owner): _____
 Phone No: _____ Sheet:²⁾ _____ of _____

1. Employee Name, Address, & SS# (Last 4 digits if permitted)	2. Work Class ³⁾	3. Prevailing Wage Project Hours Worked - Day & Date					4. Total Hours	5. Base Rate	6. Project Gross	7. Fringes: <input type="checkbox"/> Cash <input type="checkbox"/> Approved Plans <input type="checkbox"/> Cash & Approved Plans						Weekly Payroll Amount			
		Fringe Rate Your Company Pays Per Hour								8. Total Hrs for all Jobs	9. Total Gross on All Jobs	10. Total Deductions	11. Net Pay on All Jobs						
		H&W	Pens	Vac	Hol	Other								Total					
	OT																		
	ST																		
	OT																		
	ST																		
	OT																		
	ST																		
	OT																		
	ST																		

1) By signing below, I certify that: (1) I pay, or supervise the payment of the employees shown above; (2) during the pay period reported on this form, all hours worked on this project have been paid at the appropriate prevailing wage rate for the class of work done; (3) the fringe benefits have been paid as indicated above; (4) no rebates or deductions have been or will be made, directly or indirectly from the total wages earned, other than permissible deductions as defined in ORC Chapter 4115; and (5) apprentices are registered with the U.S. Dept. of Labor, Bureau of Apprenticeship and Training. I understand that the willful falsification of any of the above statements may subject the Contractor or Subcontractor to civil or criminal prosecution.

Type or Print Name and Title _____ Signature _____ Date _____

DO NOT REDO FORM AND CHANGE RATES IF AN ERROR HAS BEEN MADE! SUBMIT A CORRECTED REPORT

*** CORRECTED ***

Fill out all other areas of the form as usual

Certified Payroll Report

Total Hours being corrected for this indiv.

Difference in base rate & corrected base rate if applicable

Report for:

Company:¹⁾ _____
 Address: _____
 City, State, Zip: _____
 Phone No: _____

Check if Subcontractor¹⁾
 If Sub, GC/Prime Contractor Name: _____
 Public Authority (Owner): _____

Contract No: _____
 Project Name & Location: _____

Payroll No: _____
 Week Ending: _____
 Sheet²⁾ _____ of _____

1. Employee Name, Address, & SS# (Last 4 digits if permitted)	2. Work Class ²⁾	3. Prevailing Wage Project Hours Worked - Day & Date	4. Total Hours	5. Base Rate	6. Project Gross	7. Fringes: <input type="checkbox"/> Cash <input type="checkbox"/> Approved Plans <input type="checkbox"/> Cash & Approved Plans							Weekly Payroll Amount				
						Fringe Rate Your Company Pays Per Hour							8. Total Hrs for all Jobs	9. Total Gross on All Jobs	10. Total Deductions	11. Net Pay on All Jobs	
						M&W	Pens	Vac	Hol	Other	Total						
Name Address Last 4 SSN	Class	OT ST OT ST OT ST OT ST															

Put the period that is being corrected, i.e.: Oct 26 to Nov 02, not individual weekly dates

Difference in fringes & corrected fringes if applicable.

The net paid will be the total of difference paid and the total hours being corrected. Provide check # in the margin.

1) By signing below, I certify that: (1) I pay, or supervise the payment of the employees shown above; (2) during the pay period reported on this form, all hours worked on this project have been paid at the appropriate prevailing wage rate for the class of work done; (3) the fringe benefits have been paid as indicated above; (4) no rebates or deductions have been or will be made, directly or indirectly from the total wages earned, other than permissible deductions as defined in ORC Chapter 4115; and (5) apprentices are registered with the U.S. Dept. of Labor, Bureau of Apprenticeship and Training. I understand that the willful falsification of any of the above statements may subject the Contractor or Subcontractor to civil or criminal prosecution.

Type or Print Name and Title Complete Signature Sign Date Date

11/14 jc ³⁾ Attach additional sheets as necessary. ⁴⁾ Type in continuous line, text will wrap.

Send cover letter stating what happened along with a signed letter from the employee acknowledging that they were underpaid, received payment, check or transaction number. Contractor provided cancelled endorsed bank check.

IMPORTANT NOTICE - This process may be different if the Public Authority is using **LCPtracker** or some other online system to collect Certified Payroll Report from the contractors.



Affidavit of Compliance

Prevailing Wages

I, _____
(Name of person signing affidavit) (Title)

do hereby certify that the wages paid to all employees of

(Company Name)

for all hours worked on the

(Project name and location)

project, during the period from _____ to _____ are in
(Project Dates)

compliance with prevailing wage requirements of Chapter 4115 of the Ohio Revised Code. I further certify that no rebates or deductions have been or will be made, directly or indirectly, from any wages paid in connection with this project, other than those provided by law.

(Signature of Officer or Agent)


Sworn to and subscribed in my presence this _____ day of _____, 20_____.

(Notary Public)

The above affidavit must be executed and sworn to by the officer or agent of the contractor or subcontractor who supervises the payment of employees. This affidavit must be submitted to the owner (public authority) before the surety is released or final payment due under the terms of the contract is made.

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Prevailing Wage Determination Cover Letter

County: 
Determination Date: 04/10/2025
Expiration Date: 07/10/2025

THE FOLLOWING PAGES ARE PREVAILING RATES OF WAGES ON PUBLIC IMPROVEMENTS FAIRLY ESTIMATED TO BE MORE THAN THE AMOUNT IN O.R.C. SEC. 4115.03 (b) (1) or (2), AS APPLICABLE.

Section 4115.05 provides, in part: "Where contracts are not awarded or construction undertaken within ninety days from the date of the establishment of the prevailing wages, there shall be a redetermination of the prevailing rate of wages before the contract is awarded." The expiration date of this wage schedule is listed above for your convenience only. This wage determination is not intended as a blanket determination to be used for all projects during this period without prior approval of this Department.

Section 4115.04, Ohio Revised Code provides, in part: "Such schedule of wages shall be attached to and made a part of the specifications for the work, and shall be printed on the bidding blanks where the work is done by contract..."

The contract between the letting authority and the successful bidder shall contain a statement requiring that mechanics and laborers be paid a prevailing rate of wage as required in Section 4115.06, Ohio Revised Code.

The contractor or subcontractor is required to file with the contracting public authority upon completion of the project and prior to final payment therefore an affidavit stating that he has fully complied with Chapter 4115 of the Ohio Revised Code.

The wage rates contained in this schedule are the "Prevailing Wages" as defined by Section 4115.03, Ohio Revised Code (the basic hourly rates plus certain fringe benefits). These rates and fringes shall be a minimum to be paid under a contract regulated by Chapter 4115 of the Ohio Revised Code by contractors and subcontractors. The prevailing wage rates contained in this schedule include the effective dates and wage rates currently on file. In cases where future effective dates are not included in this schedule, modifications to the wage schedule will be furnished to the Prevailing Wage Coordinator appointed by the public authority as soon as prevailing wage rates increases are received by this office.

"There shall be posted in a prominent and accessible place on the site of work a legible statement of the Schedule of Wage Rates specified in the contract to the various classifications of laborers, workmen, and mechanics employed, said statement to remain posted during the life of such contract." Section 4115.07, Ohio Revised Code.

Apprentices will be permitted to work only under a bona fide apprenticeship program if such program exists and if such program is registered with the Ohio Apprenticeship Council.

Section 4115.071 provides that no later than ten days before the first payment of wages is due to any employee of any contractor or subcontractor working on a contract regulated by Chapter 4115, Ohio Revised Code, the contracting public authority shall appoint one of his own employees to act as the prevailing wage coordinator for said contract. The duties of the prevailing wage coordinator are outlined in Section 4115.071 of the Ohio Revised Code.

Section 4115.05 provides for an escalator in the prevailing wage rate. Each time a new rate is established, that rate is required to be paid on all ongoing public improvement projects.

A further requirement of Section 4115.05 of the Ohio Revised Code is: "On the occasion of the first pay date under a contract, the contractor shall furnish each employee not covered by a collective bargaining agreement or understanding between employers and bona fide organizations of Labor with individual written notification of the job classification to which the employee is assigned, the prevailing wage determined to be applicable to that classification, separated into the hourly rate of pay and the fringe payments, and the identity of the prevailing wage Coordinator appointed by the public authority. The contractor or subcontractor shall furnish the same notification to each affected employee every time the job classification of the employee is changed."

Work performed in connection with the installation of modular furniture may be subject to prevailing wage.

THIS PACKET IS NOT TO BE SEPARATED BUT IS TO REMAIN COMPLETE AS IT IS SUBMITTED TO YOU. (Reference guidelines and forms are included in this packet to be helpful in the compliance of the Prevailing Wage law.)

wh1500

Prevailing Wage Rate Skilled Crafts

Name of Union: Asbestos Local 50 Heat & Frost Insulators

Change # : LCN03-2024ibAsbLoc50

Craft : Asbestos Worker Effective Date : 10/30/2024 Last Posted : 10/30/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Asbestos Insulation Mechanic	\$38.56	\$9.20	\$8.85	\$0.50	\$0.00	\$3.75	\$0.00	\$0.00	\$0.00	\$60.86	\$80.14
Firestop Technician	\$38.56	\$9.20	\$8.85	\$0.50	\$0.00	\$3.75	\$0.00	\$0.00	\$0.00	\$60.86	\$80.14
Apprentice	Percent										
1st year	60.00	\$23.14	\$9.20	\$4.52	\$0.50	\$0.00	\$0.50	\$0.00	\$0.00	\$37.86	\$49.42
2nd year	70.00	\$26.99	\$9.20	\$4.52	\$0.50	\$0.00	\$0.85	\$0.00	\$0.00	\$42.06	\$55.56
3rd year	80.00	\$30.85	\$9.20	\$6.76	\$0.50	\$0.00	\$1.25	\$0.00	\$0.00	\$48.56	\$63.98
4th year	85.00	\$32.78	\$9.20	\$6.76	\$0.50	\$0.00	\$1.50	\$0.00	\$0.00	\$50.74	\$67.12

Special Calculation Note :

Ratio :

1 Journeymen to 1 Apprentice
4 Journeymen to 1 Apprentice thereafter

Jurisdiction (* denotes special jurisdictional note) :

ATHENS, AUGLAIZE, BUTLER*, CHAMPAIGN, CLARK, CLINTON, CRAWFORD, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GREENE, GUERNSEY, HARDIN, HOCKING, KNOX, LICKING, LOGAN, MADISON, MARION, MIAMI, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PREBLE, ROSS, SHELBY, UNION, VINTON, WARREN*

Special Jurisdictional Note : Township of Butler County: Townships of Lemon and Madison.
Warren County: Township of Cleer Creek, Franklin, Massie, Turtle Creek and Wayne

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Asbestos Local 8 Heat & Frost Insulators

Change # : LCN01-2025ibLoc8

Craft : Asbestos Worker Effective Date : 03/01/2025 Last Posted : 02/26/2025

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Asbestos Insulators	\$35.23		\$9.24	\$9.35	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$58.27	\$75.89
Apprentice Rates for those that began BEFORE March 1, 2024												
1st Year	\$19.38		\$9.24	\$5.10	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$38.17	\$47.86
2nd Year	\$21.14		\$9.24	\$6.65	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$41.48	\$52.05
3rd Year	\$22.90		\$9.24	\$6.65	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$43.24	\$54.69
4th Year	\$24.66		\$9.24	\$6.65	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$45.00	\$57.33
Apprentice Rates for those that began AFTER March 1, 2024	Percent											
1st Year	55.00	\$19.38	\$9.24	\$5.10	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.17	\$43.85
2nd Year	60.00	\$21.14	\$9.24	\$6.65	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.48	\$48.05
3rd Year	65.00	\$22.90	\$9.24	\$6.65	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$43.24	\$54.69
4th Year	70.00	\$24.66	\$9.24	\$6.65	\$0.45	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$45.00	\$57.33

Special Calculation Note :

Ratio :

- 1 Journeyman to 1 Apprentice
- 2 Journeymen to 2 Apprentices
- 3 Journeymen to 3 Apprentices
- 3 Journeymen to 1 Apprentice thereafter

Jurisdiction (* denotes special jurisdictional note)

ADAMS, BROWN, BUTLER*, CLERMONT, HAMILTON, HIGHLAND, WARREN*

Special Jurisdictional Note : In Butler County: townships of fairfield, Hanover, Liberty, Milford, Morgan, Oxford, Ripley, Ross, St. Clair, Union & Wayne. In Warren County: Townships of Deerfield, Hamilton, Harlan, Salem, Union & Washington

Details :

All work in connection with Asbestos Removal, Abatement, Encapsulation, Lead Abatement, Hazardous Materials and

Fire Stopping which is performed by employees in the Mechanic or Apprentice Classification shall be covered under the terms of this Agreement..

Prevailing Wage Rate Skilled Crafts

Name of Union: Asbestos Local 207

Change # : LCR01-2024ibLoc207

Craft : Asbestos Worker Effective Date : 07/24/2024 Last Posted : 07/24/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Asbestos Abatement	\$30.00		\$10.45	\$7.00	\$0.65	\$3.25	\$0.00	\$0.00	\$0.00	\$0.00	\$51.35	\$66.35
Trainee												
	Percent											
Trainee	65.15	\$19.55	\$10.45	\$1.60	\$0.65	\$1.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.25	\$43.02

Special Calculation Note :

Ratio :

3 Journeymen to 1 Trainee

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ASHLAND, ASHTABULA*, ATHENS, AUGLAIZE, BROWN, BUTLER*, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, ERIE*, FAIRFIELD, FAYETTE, FRANKLIN, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARDIN, HARRISON, HIGHLAND, HOCKING, HOLMES, HURON, KNOX, LAKE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MIAMI, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PORTAGE, PREBLE, RICHLAND, ROSS, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN*, WAYNE

Special Jurisdictional Note : Ashtabula County: (post offices & townships of Ashtabula, Austinburg, Geneva, Harperfield, Jefferson, Plymouth & Saybrook) (townships of Andover, Cherry Valley, Colbrook, Canneau, Denmark, Dorset, East Orwell, Hartsgrove, Kingville, Lenox, Monroe, Morgan, New Lyme, North Kingsville, Orwell, Pierpoint, Richmond Rock Creek, Rome, Sheffield, Trumbull, Wayne, Williamsfield & Windsor)

Butler County: (townships of Fairfield, Hanover, Liberty, Milford, Morgan, Oxford, Ripley, Ross, St. Clair, Union & Wayne) (Lemon & Madison)

Erie County: (post offices & townships of Berlin, Berlin Heights, Birmingham, Florence, Huron, Milan,

Shinrock & Vermilion)

Warren County: (townships of: Deerfield, Hamilton, Harlan, Salem, Union & Washington) (Clear Creek, Franklin, Mossie, Turtle Creek & Wayne)

Details :

Asbestos & lead paint abatement including, but not limited to the removal or encapsulation of asbestos & lead paint, all work in conjunction with the preparation of the removal of same & all work in conjunction with the clean up after said removal. The removal of all insulation materials, whether they contain asbestos or not, from mechanical systems (pipes, boilers, ducts, flues, breaching, etc.) is recognized as being the exclusive work of the Asbestos Abatement Workers.

On all mechanical systems (pipes, boilers, ducts, flues, breaching, etc.) that are going to be demolished, the removal of all insulating materials whether they contain asbestos or not shall be the exclusive work of the Laborers.

An Abatement Journeyman is anyone who has more than 600 hours in the Asbestos Abatement field.

Prevailing Wage Rate Skilled Crafts

Name of Union: **Boilermaker Local 105**

Change # : **LCN02-2013fbLoc 105**

Craft : **Boilermaker** Effective Date : **10/01/2013** Last Posted : **09/25/2013**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Boilermaker	\$35.26		\$7.07	\$13.28	\$0.89	\$0.00	\$3.00	\$0.55	\$0.00	\$0.00	\$60.05	\$77.68
Apprentice	Percent											
1st 6 months	70.03	\$24.69	\$7.07	\$11.30	\$0.89	\$0.00	\$2.10	\$0.55	\$0.00	\$0.00	\$46.60	\$58.95
2nd 6 months	75.02	\$26.45	\$7.07	\$11.30	\$0.89	\$0.00	\$2.25	\$0.55	\$0.00	\$0.00	\$48.51	\$61.74
3rd 6 months	80.00	\$28.21	\$7.07	\$11.30	\$0.89	\$0.00	\$2.40	\$0.55	\$0.00	\$0.00	\$50.42	\$64.52
4th 6 months	85.02	\$29.98	\$7.07	\$11.30	\$0.89	\$0.00	\$2.55	\$0.55	\$0.00	\$0.00	\$52.34	\$67.33
5th 6 months	87.52	\$30.86	\$7.07	\$13.28	\$0.89	\$0.00	\$2.63	\$0.55	\$0.00	\$0.00	\$55.28	\$70.71
6th 6 months	90.03	\$31.74	\$7.07	\$13.28	\$0.89	\$0.00	\$2.70	\$0.55	\$0.00	\$0.00	\$56.23	\$72.11
7th 6 months	92.50	\$32.62	\$7.07	\$13.28	\$0.89	\$0.00	\$2.78	\$0.55	\$0.00	\$0.00	\$57.19	\$73.49
8th 6 months	95.00	\$33.50	\$7.07	\$13.28	\$0.89	\$0.00	\$2.85	\$0.55	\$0.00	\$0.00	\$58.14	\$74.89

Special Calculation Note : Other is Supplemental Health and Welfare

Ratio :

5 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ATHENS, BROWN, BUTLER,
CHAMPAIGN, CLARK, CLERMONT, CLINTON,
FAIRFIELD, FAYETTE, FRANKLIN, GALLIA,
GREENE, GUERNSEY, HAMILTON, HIGHLAND,
HOCKING, JACKSON, LAWRENCE, LICKING,
MADISON, MEIGS, MIAMI, MONTGOMERY,
MORGAN, MUSKINGUM, NOBLE, PERRY,
PICKAWAY, PIKE, PREBLE, ROSS, SCIOTO,
VINTON, WARREN

Special Jurisdictional Note :

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: **Boilermaker Local 154**

Change # : **LCN01-2012kpLoc 154**

Craft : **Boilermaker** Effective Date : **03/22/2012** Last Posted : **03/22/2012**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Boilermaker	\$36.17		\$8.57	\$11.28	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$62.56	\$80.65
Trainee 60%	\$23.25		\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$41.95	\$53.57
Trainee 70%	\$27.13		\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$45.83	\$59.40
Trainee 80%	\$31.00		\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$49.70	\$65.20
Trainee 90%	\$34.88		\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$53.58	\$71.02
Apprentice Registered After 11/01/2005	Percent											
1st 6 months	60.00	\$21.70	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$40.40	\$51.25
2nd 6 months	65.00	\$23.51	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$42.21	\$53.97
3rd 6 months	70.00	\$25.32	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$44.02	\$56.68
4th 6 months	75.00	\$27.13	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$45.83	\$59.39
5th 6 months	80.00	\$28.94	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$47.64	\$62.10
6th 6 months	85.00	\$30.74	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$49.44	\$64.82
7th 6 months	90.00	\$32.55	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$51.25	\$67.53
8th 6 months	95.00	\$34.36	\$8.57	\$3.59	\$0.55	\$0.00	\$4.25	\$0.34	\$0.00	\$1.40	\$53.06	\$70.24

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

Jurisdiction (* denotes special jurisdictional note) :

5 Journeymen to 1 Apprentice

BUTLER, COLUMBIANA, FAYETTE, JEFFERSON,
LAWRENCE, MERCER, WARREN, WASHINGTON

Special Jurisdictional Note :

Details :

Work includes but not limited to: boiler making, acetylene burning, riveting, chipping, caulking, rigging, fitting-up, grinding, reaming, impact machine operating, unloading, and handling of boilermaker's material and equipment. Boilermakers, Blacksmiths, Forgers, Iron Shipbuilders

Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 23 Heavy Hwy (A)

Change # : LCN01-2024ibLoc23HevHwyA

Craft : Bricklayer Effective Date : 06/05/2024 Last Posted : 06/05/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Cement Mason Bricklayer Sewer Water Works A	\$33.39		\$10.00	\$9.53	\$0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$53.45	\$70.14
Apprentice	Percent											
1st year	70.00	\$23.37	\$10.00	\$9.53	\$0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.43	\$55.12
2nd year	80.00	\$26.71	\$10.00	\$9.53	\$0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.77	\$60.13
3rd year	90.00	\$30.05	\$10.00	\$9.53	\$0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.11	\$65.14

Special Calculation Note : NOT FOR BUILDING CONSTRUCTION.

Ratio :

- 3 Journeymen to 1 Apprentice
- 6 Journeymen to 2 Apprentice
- 9 Journeymen to 3 Apprentice
- 12 Journeymen to 4 Apprentice
- 15 Journeymen to 5 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

(A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site Heavy Construction, Airport Construction Or Railroad Construction Work.

(B) Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work ,Pollution Control,Sewer Plant, Waste Plant, & Water Treatment Facilities, Construction.

Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 23 Heavy Hwy (B)

Change # : LCN01-2024ibLoc23HevHwyB

Craft : Bricklayer Effective Date : 06/05/2024 Last Posted : 06/05/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Cement Mason Bricklayer Power Plants Tunnels Amusement Parks B	\$34.39		\$10.00	\$9.52	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$54.45	\$71.65
Apprentice	Percent											
1st year	70.00	\$24.07	\$10.00	\$9.52	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$44.13	\$56.17
2nd year	80.00	\$27.51	\$10.00	\$9.52	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.57	\$61.33
3rd year	90.00	\$30.95	\$10.00	\$9.52	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$51.01	\$66.49

Special Calculation Note : NOT FOR BUILDING CONSTRUCTION.

Ratio :

- 3 Journeymen to 1 Apprentice
- 6 Journeymen to 2 Apprentice
- 9 Journeymen to 2 Apprentice
- 12 Journeymen to 4 Apprentice
- 15 Journeymen to 5 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT,

TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

(A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site Heavy Construction, Airport Construction Or Railroad Construction Work.

(B) Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work ,Pollution Control,Sewer Plant, Waste Plant, & Water Treatment Facilities, Construction.

Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 23 (Cincinnati)

Change # : LCN01-2024ibLoc23Cinci

Craft : Bricklayer Effective Date : 06/05/2024 Last Posted : 06/05/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer	\$35.00		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.18	\$69.68
Stone Mason	\$35.00		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.18	\$69.68
Pointer Caulker Cleaner	\$35.00		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.18	\$69.68
Refractory Workers	\$36.00		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$53.18	\$71.18
Refractory Worker Hot Pay	\$38.00		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$55.18	\$74.18
Sawman	\$35.25		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.43	\$70.05
Layout Man	\$35.25		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.43	\$70.05
Free Standing Chimney	\$35.50		\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.68	\$70.43
Apprentice	Percent											
1st 6 months	70.00	\$24.50	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.68	\$53.93
2nd 6 months	74.00	\$25.90	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.08	\$56.03
3rd 6 months	78.00	\$27.30	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$44.48	\$58.13
4th 6 months	82.00	\$28.70	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.88	\$60.23
5th 6 months	86.00	\$30.10	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.28	\$62.33
6th 6 months	90.00	\$31.50	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$48.68	\$64.43
7th 6 months	94.00	\$32.90	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.08	\$66.53
8th 6 months	98.00	\$34.30	\$9.79	\$6.64	\$0.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$51.48	\$68.63

MASON FINISHER 1-90 Days	45.00	\$15.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$15.75	\$23.62
90-365 Days	45.00	\$15.75	\$9.79	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.54	\$33.42
366+ Days	50.00	\$17.50	\$9.79	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$27.29	\$36.04

Special Calculation Note : **In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.

Mason Trainees Health and Welfare after 180 days

Ratio :

- 1-2 Journeyman to 1 Apprentice
- 3-4 Journeyman to 2 Apprentice
- 5-6 Journeyman to 2 Apprentice
- 7-10 Journeyman to 3 Apprentice

- 1 Apprentice permits 1 Mason Trainee
- 2 Apprentice permits 1 Mason Trainee
- 3 Apprentice permits 2 Mason Trainees
- 4 Apprentice permits 2 Mason Trainees

For each additional 5 Journeyman to 1 Apprentice,
for every 3 additional Apprentices, 1 Mason Finisher
may be added

Special Jurisdictional Note : In Preble County the following townships are included: (Dixon, Gasper, Graits, Israel, Lanier and Somers)

Details :

MASON FINISHER:duties shall be to work in all aspects of Masonry construction taking direction from the employer and the Journeyman Bricklayer & Stone Mason's working on the job. Mason Finisher's may work on job site only when a registered apprentice is on job and the ratios in table above will strictly be enforced.

Refractory work is classified as working with any of the following materials:

Acid brick, carbon black brick or carbon black block, firebrick grinding, plastics (with a gun) and any resinous cement.

Fifty cents (\$0.50) per hour above scale shall be paid to employees working on free standing industrial or institutional chimneys which are completely detached from any building structure.

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, HAMILTON,
PREBLE*, WARREN

Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 23 Tile Finisher

Change # : LCN01-2023ibLoc23TF

Craft : Bricklayer Effective Date : 09/01/2023 Last Posted : 08/30/2023

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer Tile Marble Terrazzo Finisher	\$27.87		\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$44.18	\$58.12
Terrazzo Base Grinder	\$28.37		\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$44.68	\$58.87
Marble Sander Polisher	\$27.97		\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$44.28	\$58.27
Apprentices	Percent											
1st 6 months 0-600 hrs	65.00	\$18.12	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$34.43	\$43.48
2nd 6 months 601-1200 hrs	70.00	\$19.51	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$35.82	\$45.57
3rd 6 months 1201-1800 hrs	75.00	\$20.90	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$37.21	\$47.66
4th 6 months 1801-2400 hrs	80.00	\$22.30	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$38.61	\$49.75
5th 6 months 2401-3000 hrs	85.00	\$23.69	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$40.00	\$51.84
6th 6 months 3001-3600	95.00	\$26.48	\$9.67	\$5.85	\$0.54	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$42.79	\$56.02
1-30 Days Prior to Entering Apprenticeship	60.00	\$16.72	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$16.72	\$25.08

Special Calculation Note : Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page.

Ratio :

- 1 Journeyman to 1 Apprentice
- 5 Journeymen to 1 Apprentice
- 10 Journeymen to 2 Apprentices
- 15 Journeymen to 3 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

- ADAMS, BROWN, BUTLER, CLERMONT, GALLIA, HAMILTON, LAWRENCE, PREBLE*, SCIOTO, WARREN, WARREN*

20 Journeymen to 4 Apprentices

25 Journeymen to 5 Apprentices

Special Jurisdictional Note : Warren in the townships of Dixon, Gasper, Isrsel, Somers & Gratis in Prebble County

Details :

****In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.****

Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 23 Tile Mechanic

Change # : LCN01-2023ibLoc23TM

Craft : Bricklayer Effective Date : 09/01/2023 Last Posted : 08/30/2023

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer Tile Terrazzo Marble Mason Mechanic	\$32.41		\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$48.75	\$64.95
Marble Layout Work	\$32.91		\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$49.25	\$65.70
Swing Scaffold Worker	\$33.91		\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$50.25	\$67.20
Apprentice after 2 years (2400 hrs) as Apprentice Finisher	Percent											
5th/6 Months 0- 600 hrs	70.00	\$22.69	\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$39.03	\$50.37
6th/6 months 601-1200 hrs	80.00	\$25.93	\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$42.27	\$55.23
7th/6 months 1201-1800 hrs.	85.00	\$27.55	\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$43.89	\$57.66
8th/6 months 1801-2400 hrs.	90.00	\$29.17	\$9.67	\$5.85	\$0.57	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$45.51	\$60.09
.												

Special Calculation Note : Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page.

Ratio :

1 Journeyman to 1 Apprentice
5 Journeymen to 1 Apprentice
10 Journeymen to 2 Apprentices
15 Journeymen to 3 Apprentices
20 Journeymen to 4 Apprentices
25 Journeymen to 5 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, BROWN, BUTLER, CLERMONT, GALLIA,
HAMILTON, LAWRENCE, PREBLE*, SCIOTO,
WARREN

Special Jurisdictional Note : In Preble County the Townships of Dixon, Israel, Gasper, Lanier, Somers and Gratis.

Details :

In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.

Prevailing Wage Rate Skilled Crafts

Name of Union: Carpenter Floorlayer SW District G

Change # : LCN01-2025ibLocSWG

Craft : Carpenter Effective Date : 02/19/2025 Last Posted : 02/19/2025

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter Floorlayer	\$30.96		\$8.39	\$6.95	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$49.56	\$65.04
Apprentice	Percent											
1st 6 months	70.00	\$21.67	\$8.39	\$2.00	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$35.32	\$46.16
2nd 6 months	70.00	\$21.67	\$8.39	\$2.00	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$35.32	\$46.16
3rd 6 months	80.00	\$24.77	\$8.39	\$5.56	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$41.98	\$54.36
4th 6 months	80.00	\$24.77	\$8.39	\$5.56	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$41.98	\$54.36
5th 6 months	90.00	\$27.86	\$8.39	\$6.26	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$45.77	\$59.71
6th 6 months	90.00	\$27.86	\$8.39	\$6.26	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$45.77	\$59.71
7th 6 months	95.00	\$29.41	\$8.39	\$6.60	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$47.66	\$62.37
8th 6 months	95.00	\$29.41	\$8.39	\$6.60	\$0.60	\$0.00	\$2.50	\$0.16	\$0.00	\$0.00	\$47.66	\$62.37

Special Calculation Note : Other: UBC National Fund and Install

Ratio :

1 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, GREENE, HAMILTON, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY, WARREN

Special Jurisdictional Note :

Details :

Scope of work shall include, but not be limited to: receiving,unloading,handling,distribution and installation of all carpeting materials,carpet padding or matting materials and all resilient materials whether for use on walls, floors,counter, sink,table and all preparation work necessary in connection therewith, including sanding work. the installation of nonstructural under-layment and the work of removing, cleaning waxing of any of the above.

Carpeting shall include any floor covering composed of either natural or synthetic fibers that are made in breadths to be sewed, fastened or directly glued to floors or over cushioning sound-proofing materials. Resilient Floors shall consist of and include the laying of all special designs of wood, wood block, wood composition, cork, linoleum, asphalt, mastic, plastic, rubber tile, whether nailed or glued.

Prevailing Wage Rate Skilled Crafts

Name of Union: Carpenter Millwright Local 1090 SW Zone I

Change # : LCN01-2024ibLoc1090SWZ1

Craft : Carpenter Effective Date : 10/02/2024 Last Posted : 10/02/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter Millwright	\$35.30		\$8.42	\$6.95	\$0.62	\$0.00	\$7.77	\$0.19	\$0.00	\$0.00	\$59.25	\$76.90
Apprentice	Percent											
1st 6 months	60.00	\$21.18	\$8.42	\$4.27	\$0.62	\$0.00	\$4.66	\$0.19	\$0.00	\$0.00	\$39.34	\$49.93
2nd 6 months	65.02	\$22.95	\$8.42	\$4.61	\$0.62	\$0.00	\$5.05	\$0.19	\$0.00	\$0.00	\$41.84	\$53.32
3rd 6 months	70.00	\$24.71	\$8.42	\$4.94	\$0.62	\$0.00	\$5.44	\$0.19	\$0.00	\$0.00	\$44.32	\$56.67
4th 6 months	75.02	\$26.48	\$8.42	\$5.28	\$0.62	\$0.00	\$5.83	\$0.19	\$0.00	\$0.00	\$46.82	\$60.06
5th 6 months	80.00	\$28.24	\$8.42	\$5.61	\$0.62	\$0.00	\$6.22	\$0.19	\$0.00	\$0.00	\$49.30	\$63.42
6th 6 months	85.00	\$30.00	\$8.42	\$5.95	\$0.62	\$0.00	\$6.60	\$0.19	\$0.00	\$0.00	\$51.78	\$66.79
7th 6 months	90.00	\$31.77	\$8.42	\$6.28	\$0.62	\$0.00	\$6.99	\$0.19	\$0.00	\$0.00	\$54.27	\$70.15
8th 6 months	95.02	\$33.54	\$8.42	\$6.62	\$0.62	\$0.00	\$7.38	\$0.19	\$0.00	\$0.00	\$56.77	\$73.54

Special Calculation Note : Other (\$0.19) \$0.14 National Fund and National Millwright Fund \$0.05

Ratio :

3 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, CLINTON,
HAMILTON, WARREN

Special Jurisdictional Note :

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Carpenter NE District Industrial Dock & Door

Change # : LCN01-2014fbCarpNEStatewide

Craft : Carpenter Effective Date : 03/05/2014 Last Posted : 03/05/2014

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter	\$19.70		\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.90	\$35.75
Trainee	Percent											
1st Year	60.00	\$11.82	\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.02	\$23.93
2nd Year	80.20	\$15.80	\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$22.00	\$29.90

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

1 Journeymen to 1 Trainee

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note : Industrial Dock and Door is the installation of overhead doors, roll up doors and dock leveling equipment

Details :

10/27/10 New Contract jc

Prevailing Wage Rate Skilled Crafts

Name of Union: Carpenter & Pile Driver SW District HevHwy

Change # : LCR01-2024ibCarpSWHevHwy

Craft : Carpenter Effective Date : 05/03/2024 Last Posted : 05/03/2024

	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification												
Journeyman	\$34.25		\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$55.59	\$72.71
Apprentice	Percent											
1st 6 Months	60.00	\$20.55	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$41.89	\$52.17
2nd 6 Months	65.00	\$22.26	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$43.60	\$54.73
3rd 6 Months	70.02	\$23.98	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$45.32	\$57.31
4th 6 Months	75.00	\$25.69	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$47.03	\$59.87
5th 6 Months	80.00	\$27.40	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$48.74	\$62.44
6th 6 Months	85.00	\$29.11	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$50.45	\$65.01
7th 6 Months	90.02	\$30.83	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$52.17	\$67.59
8th 6 Months	95.00	\$32.54	\$8.57	\$6.95	\$0.60	\$0.00	\$5.06	\$0.16	\$0.00	\$0.00	\$53.88	\$70.15

Special Calculation Note : Other is UBC National Fund.

Ratio :

1 Journeymen to 1 Apprentice

An employer shall have the right to employ one (1) Apprentice for one (1) Journeyman Carpenter in its employment for the first Apprentice employed, and 1 (1) Apprentice for two (2) Journeyman Carpenter for additional Apprentices employed.

Thereafter, every third additional carpenter hired shall be an apprentice, if available, and if practical for the type of work being performed.

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, GREENE, HAMILTON, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY, WARREN

Special Jurisdictional Note :

Details :

Highway Construction, Airport Construction, Heavy Construction but not limited to:(tunnels,subways,drainage projects,flood control,reservoirs). Railroad Construction,Sewer Waterworks & Utility Construction but not limited to: (storm sewers, waterlines, gaslines). Industrial & Building Site, Power Plant, Amusement Park, Athletic Stadium Site, Sewer and Water Plants.

When the Contractor furnishes the necessary underwater gear for the Diver, the Diver shall be paid one and one half (1&1/2) times the journeyman rate for the time spent in the water.

Prevailing Wage Rate Skilled Crafts

Name of Union: Carpenter & Pile Driver SW Zone 2

Change # : LCN01-2024ibLocSWZone2

Craft : Carpenter Effective Date : 07/31/2024 Last Posted : 07/31/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter	\$32.26		\$8.48	\$6.95	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$51.52	\$67.65
Pile Driver	\$32.26		\$8.48	\$6.95	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$51.52	\$67.65
Apprentice	Percent											
1st 6 Months	70.00	\$22.58	\$8.48	\$2.00	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$36.89	\$48.18
2nd 6 Months	70.00	\$22.58	\$8.48	\$2.00	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$36.89	\$48.18
3rd 6 Months	80.00	\$25.81	\$8.48	\$5.56	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$43.68	\$56.58
4th 6 Months	80.00	\$25.81	\$8.48	\$5.56	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$43.68	\$56.58
5th 6 Months	90.00	\$29.03	\$8.48	\$6.26	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$47.60	\$62.12
6th 6 Months	90.00	\$29.03	\$8.48	\$6.26	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$47.60	\$62.12
7th 6 Months	95.00	\$30.65	\$8.48	\$6.60	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$49.56	\$64.88
8th 6 Months	95.00	\$30.65	\$8.48	\$6.60	\$0.60	\$0.00	\$3.07	\$0.16	\$0.00	\$0.00	\$49.56	\$64.88

Special Calculation Note : Other is for UBC National Fund.

Ratio :

1 Journeyman to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, CLINTON, HAMILTON, WARREN

Special Jurisdictional Note :

Details :

Carpenter duties shall include but not limited to: Pile driving, milling, fashioning, joining, assembling, erecting, fastening, or dismantling of all material of wood, plastic, metal, fiber, cork, and composition, and all other substitute materials: pile driving, cutting, fitting, and placing of lagging, and the handling, cleaning, erecting, installing, and dismantling of machinery, equipment, and erecting pre-engineered metal buildings.

Pile Drivers work but not limited to: unloading, assembling, erection, repairs, operation, signaling, dismantling, and reloading all equipment that is used for pile driving including pile butts. pile butts is defined as sheeting or scrap piling. Underwater work that may be required in connection with the installation of piling. The diver and his tender work as a team and shall arrive at their own financial arrangements with the contractor. Any configuration of wood, steel, concrete, or composite that is jetted, driven, or vibrated onto the ground by conventional pile driving equipment for the purpose of supporting a future load that may be permanent or temporary.

Driving bracing, plumbing, cutting off and capping of all piling whether wood, metal, pipe piling or composite. loading, unloading, erecting, framing, dismantling, moving, and handling of pile driving equipment. piling used in the construction and repair of all wharves, docks, piers, trestles, caissons, cofferdams, and the erection of all sea walls and breakwaters. All underwater and marine work on bulkheads, wharves, docks, shipyards, caissons, piers, bridges, pipeline work, viaducts, marine cable and trestles, as well as salvage and reclamation work where divers are employed.

Rate shall include carpenters, acoustic, and ceiling installers, drywall installers, pile drivers, and floorlayers.

Prevailing Wage Rate Skilled Crafts

Name of Union: Cement Mason Statewide HevHwy

Change # : LCN01-2024ibCementHevHwy

Craft : Cement Mason Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Cement Mason	\$34.74	\$8.80	\$7.65	\$0.75	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$54.26	\$71.63
Apprentice	Percent										
1st Year	70.00	\$24.32	\$8.80	\$7.65	\$0.75	\$0.00	\$2.25	\$0.07	\$0.00	\$43.84	\$56.00
2nd Year	80.00	\$27.79	\$8.80	\$7.65	\$0.75	\$0.00	\$2.25	\$0.07	\$0.00	\$47.31	\$61.21
3rd Year	90.00	\$31.27	\$8.80	\$7.65	\$0.75	\$0.00	\$2.25	\$0.07	\$0.00	\$50.79	\$66.42
4th Year	95.00	\$33.00	\$8.80	\$7.65	\$0.75	\$0.00	\$3.25	\$0.07	\$0.00	\$53.52	\$70.02

Special Calculation Note : Other \$0.07 is for International Training Fund

4th Year Apprentice Rate (95%) is only applicable to the jurisdiction of Local 404, this includes Ashtabula, Cuyahoga, Geauga, Lake, and Lorain counties.

Ratio :

1 Journeymen to 1 Apprentice
2 to 1 thereafter

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA*,
ATHENS, AUGLAIZE, BELMONT, BROWN,
BUTLER, CARROLL, CHAMPAIGN, CLARK,
CLERMONT, CLINTON, COLUMBIANA,
COSHOCOTON, CRAWFORD, CUYAHOGA*,
DARKE, DEFIANCE, DELAWARE, ERIE,
FAIRFIELD, FAYETTE, FRANKLIN, FULTON*,
GALLIA, GEAUGA*, GREENE, GUERNSEY,
HAMILTON, HANCOCK*, HARDIN, HARRISON,
HENRY*, HIGHLAND, HOCKING, HOLMES,
HURON, JACKSON, JEFFERSON, KNOX, LAKE*,
LAWRENCE, LICKING, LOGAN, LORAIN,
LUCAS*, MADISON, MAHONING, MARION,
MEDINA, MEIGS, MERCER, MIAMI, MONROE,
MONTGOMERY, MORGAN, MORROW,
MUSKINGUM, NOBLE, OTTAWA, PAULDING,
PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,
PUTNAM*, RICHLAND, ROSS, SANDUSKY,
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD*, WYANDOT

Special Jurisdictional Note : (A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site, Heavy Construction, Airport Construction Or Railroad Construction Work, Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work, Pollution Control, Sewer Plant, Waste & Water Plant, Water Treatment Facilities Construction.

*For Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work, Pollution Control, Sewer Plant, Waste & Water Plant, Water Treatment Facility Construction work in the following Counties: Ashtabula, Cuyahoga, Fulton, Geauga, Hancock, Henry, Lake, Lucas, Putnam and Wood Counties, those counties will use the Cement Mason Statewide Heavy Highway Exhibit B District 1 Wage Rate.

Details :

This rate replaces the previous Cement Mason Heavy Highway Statewide Rates (Exhibit A and Exhibit B rates), except for Cement Mason Statewide Heavy Highway Exhibit B Dist 1. sks

Prevailing Wage Rate Skilled Crafts

Name of Union: Cement Mason Local 132 (Cincinnati)

Change # : LCN01-2024ibLoc132

Craft : Cement Effective Date : 06/05/2024 Last Posted : 06/05/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Cement Mason	\$32.00	\$8.00	\$6.50	\$0.75	\$0.00	\$0.44	\$0.06	\$0.00	\$0.00	\$47.75	\$63.75
Apprentice	Percent										
1st Year	70.00	\$22.40	\$8.00	\$6.50	\$0.75	\$0.44	\$0.06	\$0.00	\$0.00	\$38.15	\$49.35
2nd Year	80.00	\$25.60	\$8.00	\$6.50	\$0.75	\$0.44	\$0.06	\$0.00	\$0.00	\$41.35	\$54.15
3rd Year	90.00	\$28.80	\$8.00	\$6.50	\$0.75	\$0.44	\$0.06	\$0.00	\$0.00	\$44.55	\$58.95

Special Calculation Note : Other: International Training Fund

Ratio :

- 1 Journeyman to 1 Apprentice
- 4 Journeymen to 2 Apprentices
- 7 Journeymen to 3 Apprentices
- 10 Journeymen to 4 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, HAMILTON, HIGHLAND, WARREN

Special Jurisdictional Note :

Details :

- *Cement Masons working on silo & slip form work shall receive \$.50 per hour over Journeyman scale.
- *Cement Masons working on swinging scaffolds shall receive \$.50 per hour over Journeyman scale.
- *Cement Masons working on high lifts from 20' and above shall receive \$.50 per hour over Journeyman scale.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 High Tension Pipe Type Cable

Change # : LCN02-2024ibLoc71HTPC

Craft : Lineman Effective Date : 01/06/2025 Last Posted : 12/31/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$52.94	\$7.50	\$1.59	\$0.53	\$0.00	\$12.71	\$0.75	\$0.00	\$0.00	\$76.02	\$102.49
Certified Lineman Welder	\$52.94	\$7.50	\$1.59	\$0.53	\$0.00	\$12.71	\$0.75	\$0.00	\$0.00	\$76.02	\$102.49
Certified Cable Splicer	\$52.94	\$7.50	\$1.59	\$0.53	\$0.00	\$12.71	\$0.75	\$0.00	\$0.00	\$76.02	\$102.49
Operator A	\$47.43	\$7.50	\$1.42	\$0.47	\$0.00	\$11.38	\$0.75	\$0.00	\$0.00	\$68.95	\$92.66
Operator B	\$41.99	\$7.50	\$1.26	\$0.42	\$0.00	\$10.08	\$0.75	\$0.00	\$0.00	\$62.00	\$83.00
Operator C	\$33.74	\$7.50	\$1.01	\$0.34	\$0.00	\$8.10	\$0.75	\$0.00	\$0.00	\$51.44	\$68.31
Groundman 0-12 months Exp	\$26.47	\$7.50	\$0.79	\$0.26	\$0.00	\$6.35	\$0.75	\$0.00	\$0.00	\$42.12	\$55.35
Groundman 0-12 months Exp w/CDL	\$29.12	\$7.50	\$0.87	\$0.29	\$0.00	\$6.99	\$0.75	\$0.00	\$0.00	\$45.52	\$60.08
Groundman 1 yr or more	\$29.12	\$7.50	\$0.87	\$0.29	\$0.00	\$6.99	\$0.75	\$0.00	\$0.00	\$45.52	\$60.08
Groundman 1 yr or more w/CDL	\$34.41	\$7.50	\$1.03	\$0.34	\$0.00	\$8.26	\$0.75	\$0.00	\$0.00	\$52.29	\$69.50
Equipment Mechanic A	\$41.99	\$7.50	\$1.26	\$0.42	\$0.00	\$10.08	\$0.75	\$0.00	\$0.00	\$62.00	\$83.00
Equipment Mechanic B	\$37.86	\$7.50	\$1.14	\$0.38	\$0.00	\$9.09	\$0.75	\$0.00	\$0.00	\$56.72	\$75.65
Equipment Mechanic C	\$33.74	\$7.50	\$1.01	\$0.34	\$0.00	\$8.10	\$0.75	\$0.00	\$0.00	\$51.44	\$68.31

X-Ray Technician	\$52.94	\$7.50	\$1.59	\$0.53	\$0.00	\$12.71	\$0.75	\$0.00	\$0.00	\$76.02	\$102.49	
Apprentice	Percent											
1st 1000 hrs	60.00	\$31.76	\$7.50	\$0.95	\$0.32	\$0.00	\$7.62	\$0.75	\$0.00	\$0.00	\$48.90	\$64.79
2nd 1000 hrs	65.00	\$34.41	\$7.50	\$1.03	\$0.34	\$0.00	\$8.26	\$0.75	\$0.00	\$0.00	\$52.29	\$69.50
3rd 1000 hrs	70.00	\$37.06	\$7.50	\$1.11	\$0.37	\$0.00	\$8.89	\$0.75	\$0.00	\$0.00	\$55.68	\$74.21
4th 1000 hrs	75.00	\$39.71	\$7.50	\$1.19	\$0.40	\$0.00	\$9.53	\$0.75	\$0.00	\$0.00	\$59.07	\$78.93
5th 1000 hrs	80.00	\$42.35	\$7.50	\$1.27	\$0.42	\$0.00	\$10.16	\$0.75	\$0.00	\$0.00	\$62.45	\$83.63
6th 1000 hrs	85.00	\$45.00	\$7.50	\$1.35	\$0.45	\$0.00	\$10.80	\$0.75	\$0.00	\$0.00	\$65.85	\$88.35
7th 1000 hrs	90.00	\$47.65	\$7.50	\$1.43	\$0.48	\$0.00	\$11.44	\$0.75	\$0.00	\$0.00	\$69.25	\$93.07

Special Calculation Note : Other is Health Retirement Account

Operator "A"

John Henry Rock Drill, D-6 (or equivalent) and above, Trackhoe Digger, (320 Track excavator), Cranes (greater then 25 tons and less than 45 tons).

Operator "B"

Cranes (greater than 6 tons and up to 25 tons), Backhoes, Road Tractor, Dozer up to D-5, Pressure Digger- wheeled or tracked, all Tension wire Stringing equipment.

Operator "C"

Trench, Backhoe, Riding type vibratory Compactor, Ground Rod Driver, Boom Truck (6 ton & below), Skid Steer Loaders, Material Handler.

*All Operators of cranes 45 ton or larger shall be paid the journeyman rate of pay. \$0.30 is for Health Retirement Account.

Ratio :

1 Journeyman to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO,

SHELBY, STARK, SUMMIT, TRUMBULL,
TUSCARAWAS, UNION, VINTON, WARREN,
WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

Heli - Arc Welding will be paid \$.30 above Journeyman rate. Additional compensation of 10% over the Journeyman Lineman and Journeyman Technician for performing work on structures outside of buildings such as water towers, smoke stacks, radio and television towers, more than 75' above the ground.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 Outside Cincinnati

Change # : LCN01-2024ibLoc71Cincinnati

Craft : Lineman Effective Date : 02/07/2024 Last Posted : 02/07/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$44.52	\$7.25	\$1.34	\$0.45	\$0.00	\$8.90	\$0.50	\$0.00	\$0.00	\$62.96	\$85.22
Traffic Signal & Lighting Journeyman	\$42.93	\$7.25	\$1.29	\$0.42	\$0.00	\$8.59	\$0.50	\$0.00	\$0.00	\$60.98	\$82.45
Equipment Operator	\$39.11	\$7.25	\$1.17	\$0.39	\$0.00	\$7.82	\$0.50	\$0.00	\$0.00	\$56.24	\$75.79
Groundman 0-12 months (W/O CDL)	\$23.71	\$7.25	\$0.71	\$0.24	\$0.00	\$4.74	\$0.50	\$0.00	\$0.00	\$37.15	\$49.01
Groundman 0-21 Months (W/CDL)	\$25.90	\$7.25	\$0.77	\$0.26	\$0.00	\$5.18	\$0.50	\$0.00	\$0.00	\$39.86	\$52.81
Groundman 1 Year or More (W/CDL)	\$28.11	\$7.25	\$0.84	\$0.28	\$0.00	\$5.62	\$0.50	\$0.00	\$0.00	\$42.60	\$56.66
Traffic Signal Apprentices											
1st 1,000 hours	\$25.76	\$7.25	\$0.77	\$0.26	\$0.00	\$5.15	\$0.50	\$0.00	\$0.00	\$39.69	\$52.57
2nd 1,000 hours	\$27.90	\$7.25	\$0.84	\$0.28	\$0.00	\$5.58	\$0.50	\$0.00	\$0.00	\$42.35	\$56.30
3rd 1,000 hours	\$30.05	\$7.25	\$0.90	\$0.30	\$0.00	\$6.01	\$0.50	\$0.00	\$0.00	\$45.01	\$60.03
4th 1,000 hours	\$32.20	\$7.25	\$0.97	\$0.32	\$0.00	\$6.44	\$0.50	\$0.00	\$0.00	\$47.68	\$63.78
5th 1,000 hours	\$34.34	\$7.25	\$1.03	\$0.34	\$0.00	\$6.87	\$0.50	\$0.00	\$0.00	\$50.33	\$67.50
6th 1,000 hours	\$38.64	\$7.25	\$1.16	\$0.39	\$0.00	\$7.73	\$0.50	\$0.00	\$0.00	\$55.67	\$74.99

Apprentice Lineman	Percent												
1st 1,000 Hours	60.00	\$26.71	\$7.25	\$0.80	\$0.27	\$0.00	\$5.34	\$0.50	\$0.00	\$0.00	\$40.87	\$54.23	
2nd 1,000 Hours	65.00	\$28.94	\$7.25	\$0.87	\$0.29	\$0.00	\$5.79	\$0.50	\$0.00	\$0.00	\$43.64	\$58.11	
3rd 1,000 Hours	70.00	\$31.16	\$7.25	\$0.93	\$0.31	\$0.00	\$6.23	\$0.50	\$0.00	\$0.00	\$46.38	\$61.97	
4th 1,000 Hours	75.00	\$33.39	\$7.25	\$1.00	\$0.33	\$0.00	\$6.68	\$0.50	\$0.00	\$0.00	\$49.15	\$65.84	
5th 1,000 Hours	80.00	\$35.62	\$7.25	\$1.07	\$0.36	\$0.00	\$7.12	\$0.50	\$0.00	\$0.00	\$51.92	\$69.72	
6th 1,000 Hours	85.00	\$37.84	\$7.25	\$1.14	\$0.38	\$0.00	\$7.57	\$0.50	\$0.00	\$0.00	\$54.68	\$73.60	
7th 1,000 Hours	90.00	\$40.07	\$7.25	\$1.20	\$0.40	\$0.00	\$8.01	\$0.50	\$0.00	\$0.00	\$57.43	\$77.46	

Special Calculation Note : Other is Health Reimbursement Account

Ratio :

1 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, HAMILTON, WARREN

Special Jurisdictional Note :

Details :

A groundman when directed shall assist a Journeyman in the performance of his/her work on the ground, including the use of hand tools. A Groundman under no circumstances shall climb poles, towers, ladders, or work from an elevated platform or bucket truck.

No more than three (3) Groundmen shall work alone. Jobs with more than three Groundmen shall be supervised by a Groundcrew Foreman, Journeyman Lineman, Journeyman Traffic Signal Technician or an Equipment Operator.

Scope of Work: installation and maintenance of highway and street lighting, highway and street sign lighting, electronic message boards and traffic control systems, camera systems, traffic signal work, substation and line construction including overhead and underground projects for private and industrial work as in accordance with the IBEW Constitution. This Agreement includes the operation of all tools and equipment necessary for the installation of the above projects.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 Outside Utility Power

Change # : LCN01-2024ibLoc71

Craft : Lineman Effective Date : 01/06/2025 Last Posted : 12/31/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$50.15	\$7.50	\$1.50	\$0.50	\$0.00	\$12.04	\$0.75	\$0.00	\$0.00	\$72.44	\$97.51
Substation Technician	\$50.15	\$7.50	\$1.50	\$0.50	\$0.00	\$12.04	\$0.75	\$0.00	\$0.00	\$72.44	\$97.51
Cable Splicer	\$52.52	\$7.50	\$1.58	\$0.52	\$0.00	\$12.60	\$0.75	\$0.00	\$0.00	\$75.47	\$101.73
Operator A	\$44.95	\$7.50	\$1.35	\$0.45	\$0.00	\$10.79	\$0.75	\$0.00	\$0.00	\$65.79	\$88.27
Operator B	\$39.73	\$7.50	\$1.19	\$0.40	\$0.00	\$9.53	\$0.75	\$0.00	\$0.00	\$59.10	\$78.96
Operator C	\$31.89	\$7.50	\$0.96	\$0.32	\$0.00	\$7.65	\$0.75	\$0.00	\$0.00	\$49.07	\$65.01
Groundman 0-12 months Exp	\$25.07	\$7.50	\$0.75	\$0.25	\$0.00	\$6.02	\$0.75	\$0.00	\$0.00	\$40.34	\$52.88
Groundman 0-12 months Exp w/CDL	\$27.58	\$7.50	\$0.83	\$0.28	\$0.00	\$6.62	\$0.75	\$0.00	\$0.00	\$43.56	\$57.35
Groundman 1 yr or more	\$27.58	\$7.50	\$0.83	\$0.28	\$0.00	\$6.62	\$0.75	\$0.00	\$0.00	\$43.56	\$57.35
Groundman 1 yr or more w/CDL	\$32.60	\$7.50	\$0.98	\$0.33	\$0.00	\$7.82	\$0.75	\$0.00	\$0.00	\$49.98	\$66.28
Equipment Mechanic A	\$39.73	\$7.50	\$1.19	\$0.40	\$0.00	\$9.54	\$0.75	\$0.00	\$0.00	\$59.11	\$78.97
Equipment Mechanic B	\$35.82	\$7.50	\$1.07	\$0.36	\$0.00	\$8.60	\$0.75	\$0.00	\$0.00	\$54.10	\$72.01
Equipment Mechanic C	\$31.89	\$7.50	\$0.96	\$0.32	\$0.00	\$7.65	\$0.75	\$0.00	\$0.00	\$49.07	\$65.01
Line Truck w/auger	\$35.16	\$7.50	\$1.05	\$0.35	\$0.00	\$8.44	\$0.75	\$0.00	\$0.00	\$53.25	\$70.83

Apprentice	Percent											
1st 1000 hrs	60.00	\$30.09	\$7.50	\$0.90	\$0.30	\$0.00	\$7.22	\$0.75	\$0.00	\$0.00	\$46.76	\$61.80
2nd 1000 hrs	65.00	\$32.60	\$7.50	\$0.98	\$0.33	\$0.00	\$7.82	\$0.75	\$0.00	\$0.00	\$49.98	\$66.28
3rd 1000 hrs	70.00	\$35.10	\$7.50	\$1.05	\$0.35	\$0.00	\$8.43	\$0.75	\$0.00	\$0.00	\$53.18	\$70.74
4th 1000 hrs	75.00	\$37.61	\$7.50	\$1.13	\$0.38	\$0.00	\$9.03	\$0.75	\$0.00	\$0.00	\$56.40	\$75.21
5th 1000 hrs	80.00	\$40.12	\$7.50	\$1.20	\$0.40	\$0.00	\$9.63	\$0.75	\$0.00	\$0.00	\$59.60	\$79.66
6th 1000 hrs	85.00	\$42.63	\$7.50	\$1.28	\$0.43	\$0.00	\$10.23	\$0.75	\$0.00	\$0.00	\$62.82	\$84.13
7th 1000 hrs	90.00	\$45.14	\$7.50	\$1.35	\$0.45	\$0.00	\$10.83	\$0.75	\$0.00	\$0.00	\$66.01	\$88.58

Special Calculation Note : Other is Health Reimbursement Account

Operator "A"

John Henry Rock Drill, D-6 (or equivalent) and above, Trackhoe Digger, (320 Track excavator), Cranes (greater than 25 tons and less than 45 tons).

Operator "B"

Cranes (greater than 6 tons and up to 25 tons), Backhoes, Road Tractor, Dozer up to D-5, Pressure Digger- wheeled or tracked, all Tension wire Stringing equipment.

Operator "C"

Trench, Backhoe, Riding type vibratory Compactor, Ground Rod Driver, Boom Truck (6 ton & below), Skid Steer Loaders, Material Handler.

Ratio :

(1) Journeyman Lineman to (1) Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN, WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

Heli - Arc Welding will be paid \$.30 above Journeyman rate. Additional compensation of 10% over the

Journeyman Lineman and Journeyman Technician for performing work on structures outside of buildings such as water towers, smoke stacks, radio and television towers, more than 75' above the ground.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 Underground Residential Distribution

Change # : LCN02-2024lbLoc7URD

Craft : Lineman Effective Date : 01/06/2025 Last Posted : 12/31/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
URD Electrician	\$38.05		\$7.50	\$1.14	\$0.38	\$0.00	\$9.13	\$0.75	\$0.00	\$0.00	\$56.95	\$75.97
Equipment Operator A	\$34.04		\$7.50	\$1.02	\$0.34	\$0.00	\$8.17	\$0.75	\$0.00	\$0.00	\$51.82	\$68.84
Equipment Operator B	\$31.26		\$7.50	\$0.94	\$0.31	\$0.00	\$7.50	\$0.75	\$0.00	\$0.00	\$48.26	\$63.89
Directional Drill Locator	\$34.04		\$7.50	\$1.02	\$0.34	\$0.00	\$8.17	\$0.75	\$0.00	\$0.00	\$51.82	\$68.84
Directional Drill Operator	\$31.26		\$7.50	\$0.94	\$0.31	\$0.00	\$7.50	\$0.75	\$0.00	\$0.00	\$48.26	\$63.89
Groundman 0-12 months Exp	\$24.70		\$7.50	\$0.74	\$0.25	\$0.00	\$5.93	\$0.75	\$0.00	\$0.00	\$39.87	\$52.22
Groundman 0-12 months Exp w/CDL	\$27.24		\$7.50	\$0.82	\$0.27	\$0.00	\$6.54	\$0.75	\$0.00	\$0.00	\$43.12	\$56.74
Groundman 1 yr or more	\$27.24		\$7.50	\$0.82	\$0.27	\$0.00	\$6.54	\$0.75	\$0.00	\$0.00	\$43.12	\$56.74
Groundman 1 yr or more w/CDL	\$32.26		\$7.50	\$0.97	\$0.32	\$0.00	\$7.74	\$0.75	\$0.00	\$0.00	\$49.54	\$65.67
Apprentice	Percent											
1st 1000 hrs	80.00	\$30.44	\$7.50	\$0.91	\$0.30	\$0.00	\$7.31	\$0.75	\$0.00	\$0.00	\$47.21	\$62.43
2nd 1000 hrs	85.00	\$32.34	\$7.50	\$0.97	\$0.32	\$0.00	\$7.76	\$0.75	\$0.00	\$0.00	\$49.64	\$65.81
3rd 1000 hrs	90.00	\$34.25	\$7.50	\$1.03	\$0.34	\$0.00	\$8.22	\$0.75	\$0.00	\$0.00	\$52.09	\$69.21

4th 1000 hrs	95.00	\$36.15	\$7.50	\$1.08	\$0.36	\$0.00	\$8.68	\$0.75	\$0.00	\$0.00	\$54.52	\$72.59
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Special Calculation Note : Other: Health Reimbursement Account

Ratio :

(1) Journeyman Lineman to (1) Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN, WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

This work applies to projects designated for any outside Underground Residential Distribution construction work for electrical utilities, municipalities and rural electrification projects.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 Voice Data Video Outside

Change # : LCN02-2024ibLoc71VDV

Craft : Voice Data Video Effective Date : 03/06/2024 Last Posted : 03/06/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrical Installer Technician I	\$35.39		\$7.25	\$1.06	\$0.00	\$0.00	\$1.77	\$0.00	\$0.00	\$0.00	\$45.47	\$63.17
Installer Technician II	\$33.37		\$7.25	\$1.00	\$0.00	\$0.00	\$1.67	\$0.00	\$0.00	\$0.00	\$43.29	\$59.97
Installer Repairman	\$33.37		\$7.25	\$1.00	\$0.00	\$0.00	\$1.67	\$0.00	\$0.00	\$0.00	\$43.29	\$59.97
Equipment Operator II	\$24.98		\$7.25	\$0.75	\$0.00	\$0.00	\$1.25	\$0.00	\$0.00	\$0.00	\$34.23	\$46.72
Cable Splicer	\$35.39		\$7.25	\$1.06	\$0.00	\$0.00	\$1.77	\$0.00	\$0.00	\$0.00	\$45.47	\$63.17
Ground Driver W/CDL	\$16.69		\$7.25	\$0.50	\$0.00	\$0.00	\$0.83	\$0.00	\$0.00	\$0.00	\$25.27	\$33.62
Groundman	\$14.57		\$7.25	\$0.44	\$0.00	\$0.00	\$0.73	\$0.00	\$0.00	\$0.00	\$22.99	\$30.28
Trainees	Percent											
Trainee F	50.01	\$17.70	\$7.25	\$0.53	\$0.00	\$0.89	\$0.00	\$0.00	\$0.00	\$0.00	\$26.37	\$35.22
Trainee E	58.00	\$20.53	\$7.25	\$0.62	\$0.00	\$1.03	\$0.00	\$0.00	\$0.00	\$0.00	\$29.43	\$39.69
Trainee D	66.00	\$23.36	\$7.25	\$0.70	\$0.00	\$1.17	\$0.00	\$0.00	\$0.00	\$0.00	\$32.48	\$44.16
Trainee C	74.00	\$26.19	\$7.25	\$0.79	\$0.00	\$1.31	\$0.00	\$0.00	\$0.00	\$0.00	\$35.54	\$48.63
Trainee B	82.00	\$29.02	\$7.25	\$0.87	\$0.00	\$1.45	\$0.00	\$0.00	\$0.00	\$0.00	\$38.59	\$53.10
Trainee A	90.00	\$31.85	\$7.25	\$0.96	\$0.00	\$1.59	\$0.00	\$0.00	\$0.00	\$0.00	\$41.65	\$57.58

Special Calculation Note :

Ratio :

1 Trainee to 1 Journeyman

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA,

GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN, WASHINGTON, WAYNE

Special Jurisdictional Note :

Details :

Cable Splicer: Inspect and test lines or cables, analyze results, and evaluate transmission characteristics. Cover conductors with insulation or seal splices with moisture-proof covering. Install, splice, test, and repair cables using tools or mechanical equipment. This will include the splicing of fiber.

Installer Technician I: Must know all aspects of telephone and cable work. This is to include aerial, underground, and manhole work. Must know how to climb and run bucket. Must have all the tools required to perform these tasks. Must be able to be responsible for the safety of the crew at all times. Must also have CDL license and have at least 5 years experience.

Installer Repairman: Perform tasks of repairing, installing, and testing phone and CATV services.

Installer Technician II: Have at least three years of telephone and CATV experience. Must have the knowledge of underground, aerial, and manhole work. Must be able to climb and operate bucket. Must have CDL. Must have all tools needed to perform these tasks.

Equipment Operator II: Able to operate a digger derrick or bucket truck. Have at least 3 years of experience and must have a valid CDL license.

Groundman W/CDL: Must have a valid CDL license and be able to perform tasks such as: climbing poles, pulling down guys, making up material, and getting appropriate tools for the job. Must have at least 5 year's experience.

Groundman: Perform tasks such as: climbing poles, pulling down guys, making up material, and getting appropriate tools for the job. Experience 0-5 years.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 648 Inside

Change # : LCN01-2024ibLoc648in

Craft : Electrical Effective Date : 08/26/2024 Last Posted : 08/21/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrician	\$36.00		\$7.75	\$7.25	\$0.73	\$0.00	\$6.25	\$1.08	\$0.00	\$0.00	\$59.06	\$77.06
Apprentice	Percent											
1st period 0-1000 hrs	50.00	\$18.00	\$4.62	\$0.00	\$0.42	\$0.00	\$3.32	\$0.54	\$0.00	\$0.00	\$26.90	\$35.90
2nd period 1001- 2000 hrs	50.00	\$18.00	\$4.62	\$0.00	\$0.42	\$0.00	\$3.32	\$0.54	\$0.00	\$0.00	\$26.90	\$35.90
3rd period 2001- 3500 hrs	55.00	\$19.80	\$7.75	\$3.99	\$0.45	\$0.00	\$4.29	\$0.59	\$0.00	\$0.00	\$36.87	\$46.77
4th period 3501- 5000 hrs	60.00	\$21.60	\$7.75	\$4.35	\$0.48	\$0.00	\$4.45	\$0.65	\$0.00	\$0.00	\$39.28	\$50.08
5th period 5001- 6500 hrs	65.00	\$23.40	\$7.75	\$4.71	\$0.51	\$0.00	\$4.64	\$0.70	\$0.00	\$0.00	\$41.71	\$53.41
6th period 6501- 8000 hrs	75.00	\$27.00	\$7.75	\$5.44	\$0.57	\$0.00	\$4.97	\$0.81	\$0.00	\$0.00	\$46.54	\$60.04

Special Calculation Note : Other is NEBF (Natioanl Electrical Benefit Fund.)

Ratio :

1-3 Journeyman to 2 Apprentices or fraction thereof:
 4-6 Journeymen to 4 Apprentice
 7-9 Journeymen to 6 Apprentice
 10-12 Journeymen to 8 Apprentice
 first person assigned to any job site shall be a journeyman

Jurisdiction (* denotes special jurisdictional note) :

BUTLER, WARREN*

Special Jurisdictional Note : In Warren County the following townships are included: (Deerfield, Hamilton, Harlan, Massie, Salem, Turtle Creek, Union, and Washington)

Details :

Electricians while splicing cable shall receive \$.50 an hour above the regular electrical rate.

All work that requires the use of gas masks or respirators, shall be paid 50% above the appropriate rate of pay. Work up to & including 40 feet shall be paid \$.50 over the journeyman rate. All work from a Boatswain Chair, Swinging Scaffold, or Barrel shall be at double the Journeyman rate. Workmen required to work 50 feet or more below the surface of the earth will be paid 50% above the Journeyman rate.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 648 Lt Commercial South West

Change # : LCN01-2024ibLoc648in

Craft : Electrical Effective Date : 01/10/2024 Last Posted : 01/10/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrician	\$34.00	\$7.45	\$7.64	\$0.51	\$0.00	\$5.36	\$0.38	\$0.00	\$0.20	\$55.54	\$72.54
CE-3 12,001- 14,000 Hrs	\$27.05	\$6.67	\$0.81	\$0.88	\$0.00	\$0.81	\$0.00	\$0.00	\$0.00	\$36.22	\$49.75
CE-2 10,001- 12,000 Hrs	\$21.64	\$6.67	\$0.65	\$0.88	\$0.00	\$0.65	\$0.00	\$0.00	\$0.00	\$30.49	\$41.31
CE-1 8,001- 10,000 Hrs	\$19.83	\$6.67	\$0.59	\$0.88	\$0.00	\$0.59	\$0.00	\$0.00	\$0.00	\$28.56	\$38.48
CW-4 6,001- 8,000 Hrs	\$18.03	\$6.67	\$0.54	\$0.88	\$0.00	\$0.54	\$0.00	\$0.00	\$0.00	\$26.66	\$35.68
CW-3 4,001- 6,000 Hrs	\$16.23	\$6.67	\$0.49	\$0.88	\$0.00	\$0.49	\$0.00	\$0.00	\$0.00	\$24.76	\$32.88
CW-2 2,001- 4,000 Hrs	\$15.33	\$6.67	\$0.46	\$0.88	\$0.00	\$0.46	\$0.00	\$0.00	\$0.00	\$23.80	\$31.46
CW-1 0- 2,000 Hrs	\$14.42	\$6.67	\$0.43	\$0.88	\$0.00	\$0.43	\$0.00	\$0.00	\$0.00	\$22.83	\$30.04

Special Calculation Note : Other is for NEBF (National Electrical Benefit Fund)

Ratio :

Construction Electrician and Construction Wireman Ratio

There shall be a minimum ratio of one inside Journeyman to every (4) employees of different classification per jobsite. An inside Journeyman Wireman is required on the project as the fifth (5th) worker or when apprentices are used

Jurisdiction (* denotes special jurisdictional note) :

BUTLER, WARREN*

Special Jurisdictional Note : In Warren County the following townships are included: (Deerfield, Hamilton, Harlan, Massie, Salem, Turtle Creek, Union, and Washington)

The scope of work for the light commercial agreement shall apply to the following facilities not to exceed 200,000 square feet; office buildings, shopping centers, auto sales agencies and garages, churches, funeral homes, nursing homes, hotels, retail and wholesale facilities, small stand-alone manufacturing facilities when free standing and not part of a larger facility (not to exceed 50,000 square feet), solar projects (500 panels or less) unless otherwise covered under the agreement, lighting retrofits (when not associated with remodels involving branch re-circuiting) lighting retrofits shall be defined as the changing of lamps and ballasts in existing light fixtures and shall also include the one for one replacement of existing fixtures, warehouses, gas stations, food service centers, restaurants, entertainment facilities, hospitals, clinics, motels, residential buildings.

Details :

Electricians while splicing cable shall receive \$.50 an hour above the regular electrical rate.

All work that requires the use of gas masks or respirators, shall be paid 50% above the appropriate rate of pay. Work up to & including 40 feet shall be paid \$.50 over the journeyman rate. All work from a Boatswain Chair, Swinging Scaffold, or Barrel shall be at double the Journeyman rate. Workmen required to work 50 feet or more below the surface of the earth will be paid 50% above the Journeyman rate.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 648 Voice Data Video

Change # : LCN01-2024ibLoc648VDV

Craft : Voice Data Video Effective Date : 11/25/2024 Last Posted : 11/20/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrical Installer Technician A	\$30.40		\$7.15	\$0.91	\$0.58	\$0.00	\$4.50	\$0.00	\$0.00	\$0.00	\$43.54	\$58.74
Electrical Installer Technician B	\$28.88		\$7.15	\$0.87	\$0.55	\$0.00	\$4.50	\$0.00	\$0.00	\$0.00	\$41.95	\$56.39
JW Installer Technician B	\$27.36		\$7.15	\$0.82	\$0.52	\$0.00	\$4.50	\$0.00	\$0.00	\$0.00	\$40.35	\$54.03
Non BICSI Installer	\$19.46		\$4.42	\$0.59	\$0.38	\$0.00	\$2.00	\$0.00	\$0.00	\$0.00	\$26.85	\$36.58
Apprentice	Percent											
1st period 0-800 hrs	55.00	\$16.72	\$4.32	\$0.50	\$0.32	\$0.00	\$2.48	\$0.00	\$0.00	\$0.00	\$24.34	\$32.70
2nd period 801-1600 hrs	55.00	\$16.72	\$4.32	\$0.50	\$0.32	\$0.00	\$2.48	\$0.00	\$0.00	\$0.00	\$24.34	\$32.70
3rd period 1601-2400 hrs	65.00	\$19.76	\$7.05	\$0.59	\$0.38	\$0.00	\$2.93	\$0.00	\$0.00	\$0.00	\$30.71	\$40.59
4th period 2401-3200 hrs	65.00	\$19.76	\$7.05	\$0.59	\$0.38	\$0.00	\$2.93	\$0.00	\$0.00	\$0.00	\$30.71	\$40.59
5th period 3201-4000 hrs	75.00	\$22.80	\$7.07	\$0.68	\$0.43	\$0.00	\$3.38	\$0.00	\$0.00	\$0.00	\$34.36	\$45.76
6th period 4001-4800 hrs	75.00	\$22.80	\$7.07	\$0.68	\$0.43	\$0.00	\$3.38	\$0.00	\$0.00	\$0.00	\$34.36	\$45.76
7th period 4801-4900hr	80.00	\$24.32	\$7.09	\$0.73	\$0.46	\$0.00	\$4.50	\$0.00	\$0.00	\$0.00	\$37.10	\$49.26

8th period 4901- 5000hrs	80.00	\$24.32	\$7.09	\$0.73	\$0.46	\$0.00	\$4.50	\$0.00	\$0.00	\$0.00	\$37.10	\$49.26
Cable Puller	50.00	\$15.20	\$4.32	\$0.46	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$20.48	\$28.08

Special Calculation Note :

Ratio :

- 1Technician to 2 Apprentice
- 2Technician to 4 Apprentice
- 3Technician to 6 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BUTLER, WARREN*

Special Jurisdictional Note : The following townships In Warren County are included: (Deerfield, Hamilton, Harlan, Massie, Salem, Turtle Creek, Union, and Washington)

Details :

The following work is excluded from the Teledata Technician work scope:

- *The installation of computer systems in industrial applications such as assembly lines, robotics, computer controller manufacturing systems.
- *The installation of conduit and/or raceways shall be installed by Inside Wireman. On sites where there is no Inside Wireman employed, the Teledata Technician may install raceway or conduit not greater than 10 ft.
- *Fire Alarm work is excluded on all new construction sites or wherever the fire alarm system is installed in conduit
- *All HVAC control work.

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 82 Inside

Change # : LCR01-2024ibLoc82in

Craft : Electrical Effective Date : 09/11/2024 Last Posted : 09/11/2024

	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification												
Electrician	\$36.00		\$7.55	\$9.83	\$0.61	\$0.00	\$4.00	\$0.00	\$0.00	\$0.00	\$57.99	\$75.99
Apprentice	Percent											
1st period 0 - 1000 hrs	46.00	\$16.56	\$4.18	\$0.70	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$21.72	\$30.00
2nd period 1001-2000 hrs	46.00	\$16.56	\$4.18	\$0.70	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$21.72	\$30.00
3rd period 2001-3500 hrs	50.00	\$18.00	\$7.05	\$4.92	\$0.31	\$0.00	\$2.00	\$0.00	\$0.00	\$0.00	\$32.28	\$41.28
4th period 3501-5000 hrs	52.00	\$18.72	\$7.07	\$5.11	\$0.32	\$0.00	\$2.08	\$0.00	\$0.00	\$0.00	\$33.30	\$42.66
5th period 5001-6500 hrs	62.00	\$22.32	\$7.17	\$6.10	\$0.38	\$0.00	\$2.48	\$0.00	\$0.00	\$0.00	\$38.45	\$49.61
6th period 6501-8000 hrs	77.00	\$27.72	\$7.32	\$7.57	\$0.47	\$0.00	\$3.08	\$0.00	\$0.00	\$0.00	\$46.16	\$60.02

Special Calculation Note : Other: Contractor Administrative Fund (Western Ohio Electrical Contractors Administration Fund (WOECAF))

Ratio :

1 to 3 Journeymen to 4 Apprentices
4 to 6 Journeymen to 8 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

CLINTON, DARKE, GREENE, MIAMI,
MONTGOMERY, PREBLE, WARREN*

Special Jurisdictional Note : The following townships in Warren County are included: Clearcreek, Franklin and Wayne.

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 82 Inside Lt Commercial South West

Change # : LCN01-2024ibLoc82in

Craft : Electrical Effective Date : 10/30/2024 Last Posted : 10/30/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrician	\$36.00		\$7.55	\$8.75	\$0.61	\$0.00	\$4.00	\$1.08	\$0.00	\$0.00	\$57.99	\$75.99
CE-3 10,001-12,000	\$27.05		\$6.67	\$0.81	\$0.87	\$0.00	\$0.81	\$0.00	\$0.00	\$0.10	\$36.31	\$49.84
CE-2 9,001-10,000 Hrs	\$21.64		\$6.67	\$0.65	\$0.87	\$0.00	\$0.65	\$0.00	\$0.00	\$0.10	\$30.58	\$41.40
CE-1 8,001-9,000 Hrs	\$19.83		\$6.67	\$0.59	\$0.87	\$0.00	\$0.59	\$0.00	\$0.00	\$0.10	\$28.65	\$38.57
CW-4 6,001-8,000 Hrs	\$18.03		\$6.67	\$0.54	\$0.87	\$0.00	\$0.54	\$0.00	\$0.00	\$0.10	\$26.75	\$35.77
CW-3 4,001-6,000 Hrs	\$16.23		\$6.67	\$0.49	\$0.87	\$0.00	\$0.49	\$0.00	\$0.00	\$0.10	\$24.85	\$32.97
CW-2 2,001-4,000 Hrs	\$15.33		\$6.67	\$0.46	\$0.87	\$0.00	\$0.46	\$0.00	\$0.00	\$0.10	\$23.89	\$31.56
CW-1 0-2,000 Hrs	\$14.42		\$6.67	\$0.43	\$0.87	\$0.00	\$0.43	\$0.00	\$0.00	\$0.10	\$22.92	\$30.13
Apprentice	Percent											
1st period 0 - 1000 hrs	46.00	\$16.56	\$4.18	\$0.70	\$0.28	\$0.00	\$0.00	\$0.50	\$0.00	\$0.00	\$22.22	\$30.50
2nd period 1001-2000 hrs	46.00	\$16.56	\$4.18	\$0.70	\$0.28	\$0.00	\$0.00	\$0.50	\$0.00	\$0.00	\$22.22	\$30.50
3rd period 2001-3500 hrs	50.00	\$18.00	\$7.05	\$4.38	\$0.31	\$0.00	\$2.00	\$0.54	\$0.00	\$0.00	\$32.28	\$41.28
4th period 3501-5000 hrs	52.00	\$18.72	\$7.07	\$4.55	\$0.32	\$0.00	\$2.08	\$0.56	\$0.00	\$0.00	\$33.30	\$42.66

5th period 5001-6500 hrs	62.00	\$22.32	\$7.17	\$5.43	\$0.38	\$0.00	\$2.48	\$0.67	\$0.00	\$0.00	\$38.45	\$49.61
6th period 6501-8000 hrs	77.00	\$27.72	\$7.32	\$6.64	\$0.47	\$0.00	\$3.08	\$0.83	\$0.00	\$0.00	\$46.06	\$59.92

Special Calculation Note : Other: National Electrical Benefit Fund
Misc: Administrative Fees

Ratio :

1 to 3 Journeymen to 4 Apprentices
4 to 6 Journeymen to 8 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

CLINTON, DARKE, GREENE, MIAMI,
MONTGOMERY, PREBLE, WARREN*

Construction Electrician and Construction Wireman Ratio

There shall be a minimum ratio of one inside Journeyman to every (4) employees of different classification per jobsite. An inside Journeyman Wireman is required on the project as the fifth (5th) worker or when apprentices are used.

Special Jurisdictional Note : The following townships in Warren County are included: Clearcreek, Franklin and Wayne.

The scope of work for the light commercial agreement shall apply to the following facilities not to exceed 200,000 square feet; office buildings, shopping centers, auto sales agencies and garages, churches, funeral homes, nursing homes, hotels, retail and wholesale facilities, small stand-alone manufacturing facilities when free standing and not part of a larger facility (not to exceed 50,000 square fee), solar projects (500 panels or less) unless otherwise covered under the agreement, lighting retrofits (when not associated with remodels involving branch re-circuiting) lighting retrofits shall be defined as the changing of lamps and ballasts in existing light fixtures and shall also include the one for one replacement of existing fixtures, warehouses, gas stations, food service centers, restaurants, entertainment facilities, hospitals, clinics, motels, residential buildings.

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 82 Lightning Rod

Change # : LCN02-2022ibLoc82

Craft : Electrical Effective Date : 12/05/2022 Last Posted : 11/23/2022

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lightning Rod Technican	\$32.79	\$7.45	\$9.58	\$0.00	\$0.00	\$3.50	\$0.00	\$0.00	\$0.00	\$53.32	\$69.71

Special Calculation Note : No Apprentice approved by OSAC.

Ratio :

Jurisdiction (* denotes special jurisdictional note) :

CLINTON, DARKE, GREENE, MIAMI,
MONTGOMERY, PREBLE, WARREN*

Special Jurisdictional Note : The following townships in Warren County are included: (Clearcreek, Franklin and Wayne)

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 82 Voice Data Video

Change # : LCN01-2023ibLoc82VDV

Craft : Voice Data Video Effective Date : 11/27/2023 Last Posted : 11/22/2023

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrical Installer Technician A	\$27.70		\$6.70	\$6.83	\$0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.76	\$55.61
Electrical Installer Technician B	\$26.32		\$6.70	\$6.79	\$0.50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.31	\$53.47
JW Installer Technician	\$24.93		\$6.70	\$6.75	\$0.47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.85	\$51.32
NON BICSI Installer	\$18.01		\$3.94	\$0.54	\$0.34	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$22.83	\$31.83
Apprentice	Percent											
1st 0-1000 hours	55.00	\$15.24	\$3.94	\$3.76	\$0.29	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.23	\$30.84
2nd 1001-2000 hours	55.00	\$15.24	\$3.94	\$3.76	\$0.29	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.23	\$30.84
3rd 2001-3000 hours	65.00	\$18.00	\$6.65	\$4.44	\$0.34	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$29.44	\$38.44
4th 3001-4000 hours	65.00	\$18.00	\$6.65	\$4.44	\$0.34	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$29.44	\$38.44
5th 4001-5000 hours	75.00	\$20.77	\$6.66	\$6.62	\$0.39	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.45	\$44.83
6th 5001-6000 hours	75.00	\$20.77	\$6.66	\$6.62	\$0.39	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.45	\$44.83
7th 6001-7000 hours	80.00	\$22.16	\$6.67	\$6.66	\$0.42	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.91	\$46.99
8th 7001 hours	80.00	\$22.16	\$6.67	\$6.66	\$0.42	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.91	\$46.99
Cable Puller	50.00	\$13.85	\$3.94	\$0.42	\$0.26	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$18.72	\$25.65

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

1 Journeymen to 2 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

CLINTON, DARKE, GREENE, MIAMI,
MONTGOMERY, PREBLE, WARREN*

Special Jurisdictional Note : The following townships in Warren County are included: (Clearcreek, Franklin and Wayne)

Details :

Work covered but not limited to: installation which utilize transmission and/or transference of voice, sound, vision or digital for commercial, education, security and entertainment purposes for the following:

TV monitoring and surveillance, background-foreground music, intercom and telephone interconnect, inventory control systems, microwave transmission, multimedia, multiplex, nurse call system, radio page, school intercom, sound and low voltage master clock systems.

Fire Alarm work is excluded on all new construction sites or wherever the fire alarm system is installed in conduit.

All HVAC control work is not covered by this wage rate but by the Inside Electrical wage rate.

Prevailing Wage Rate Skilled Crafts

Name of Union: Elevator Local 11

Change # : LCN01-2025ibLoc11

Craft : Elevator Effective Date : 01/29/2025 Last Posted : 01/29/2025

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Elevator Mechanic	\$57.41		\$16.27	\$10.96	\$0.80	\$4.59	\$10.40	\$2.16	\$0.00	\$0.00	\$102.59	\$131.29
Probationary Apprentice	50.01	\$28.71	\$0.00	\$0.00	\$0.00	\$1.72	\$0.00	\$0.00	\$0.00	\$0.00	\$30.43	\$44.79
1st year	55.00	\$31.58	\$16.27	\$10.96	\$0.80	\$1.89	\$10.40	\$1.32	\$0.00	\$0.00	\$73.22	\$89.00
2nd year	65.00	\$37.32	\$16.27	\$10.96	\$0.80	\$2.24	\$10.40	\$1.56	\$0.00	\$0.00	\$79.55	\$98.20
3rd year	70.00	\$40.19	\$16.27	\$10.96	\$0.80	\$2.41	\$10.40	\$1.68	\$0.00	\$0.00	\$82.71	\$102.80
4th year	80.00	\$45.93	\$16.27	\$10.96	\$0.80	\$2.76	\$10.40	\$1.92	\$0.00	\$0.00	\$89.04	\$112.00
Helper	70.00	\$40.19	\$16.27	\$10.96	\$0.80	\$3.22	\$10.40	\$1.68	\$0.00	\$0.00	\$83.52	\$103.61
Assistant Mechanic	80.00	\$45.93	\$16.27	\$10.96	\$0.80	\$3.67	\$10.40	\$1.92	\$0.00	\$0.00	\$89.95	\$112.91

Special Calculation Note : Other: Holiday Pay

Ratio :

- 1 Journeyman to 1 Apprentice
- 1 Journeyman to 1 Helper
- 1 Journeyman to 1 Assistant Mechanic

Jurisdiction (* denotes special jurisdictional note) :

- ADAMS, BROWN, BUTLER, CLERMONT,
- CLINTON, DARKE, GREENE, HAMILTON,
- HIGHLAND, MIAMI, MONTGOMERY, PREBLE,
- SCIOTO, SHELBY, WARREN

Special Jurisdictional Note :

Details :

Prevailing Wage Rate

Skilled Crafts

Name of Union: Glazier Local 387

Change # : LCN01-2024ibLoc387

Craft : Glazier Effective Date : 11/01/2024 Last Posted : 10/30/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Glazier	\$33.85		\$6.50	\$11.60	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.40	\$69.32
Apprentice	Percent											
1st Year	65.00	\$22.00	\$6.50	\$8.15	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.10	\$48.10
2nd Year	75.00	\$25.39	\$6.50	\$9.14	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.48	\$54.17
3rd Year	85.00	\$28.77	\$6.50	\$10.12	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.84	\$60.23
4th Year	95.00	\$32.16	\$6.50	\$11.11	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.22	\$66.30

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

Each employer may employ and train Apprentices in the following ratio to journeymen workers employed.
1 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, FAYETTE*, GREENE, HAMILTON, HIGHLAND, MIAMI, MONTGOMERY, PREBLE, WARREN

Special Jurisdictional Note : Fayette County: Eastern portion of route #41 being the dividing line between locals 372 and 387. Local 387 has jurisdiction of projects built on property which borders route #41 East.

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Ironworker Local 290

Change # : LCN01-2024ibLoc290

Craft : Ironworker Effective Date : 06/05/2024 Last Posted : 06/05/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate	
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)			
Classification												
Ironworker Structural	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Welder	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Fence Erector	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Reinforcing Rods	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Machinery Mover	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Sheeter	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Metal Building Erector	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Rigger & Erector	\$35.39	\$9.20	\$9.50	\$0.65	\$0.00	\$5.00	\$0.01	\$0.00	\$0.00	\$59.75	\$77.45	
Apprentice	Percent											
1st Year	64.22	\$22.73	\$9.20	\$9.50	\$0.65	\$0.00	\$3.50	\$0.01	\$0.00	\$0.00	\$45.59	\$56.95
2nd Year	74.22	\$26.27	\$9.20	\$9.50	\$0.65	\$0.00	\$3.50	\$0.01	\$0.00	\$0.00	\$49.13	\$62.26
3rd Year	84.22	\$29.81	\$9.20	\$9.50	\$0.65	\$0.00	\$3.50	\$0.01	\$0.00	\$0.00	\$52.67	\$67.57
4th Year	94.24	\$33.35	\$9.20	\$9.50	\$0.65	\$0.00	\$3.50	\$0.01	\$0.00	\$0.00	\$56.21	\$72.89

Special Calculation Note : Other is for Industry Fund.

Ratio :

1 Journeyman to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ALLEN*, AUGLAIZE, BUTLER*, CHAMPAIGN*, CLARK, CLINTON, DARKE, FAYETTE*, GREENE, HARDIN*, HIGHLAND*, LOGAN*, MADISON*, MERCER*, MIAMI, MONTGOMERY, PREBLE, SHELBY, VAN WERT*, WARREN*

Special Jurisdictional Note : Allen County Twps included are: Auglaize, Perry, Shawnee, Amanda, Spencer, Marion, Sugar Creek, American, Bath, Jackson.

Butler County Twps included are: Milford, Wayne, Madison, Lemon.

Champaign County Twps included are: Union, Urbana, Jackson, Concord, Salem, Mad River, Johnson, Harrison, Adams.

Fayette County Twps included are: Green, Jasper, Concord, Jefferson.

Hardin County Twps included are: Round Head, Marion, Liberty.

Highland County Twps included are: Fairfield, Penn, Union, Marshall, Liberty, Paint, Brush Creek.

Logan County Twps included are: Richland, Stokes, Bloomfield, Washington, Harrison, McArthur, Lake, Liberty, Pleasant, Miami.

Madison County Twps included are: Stokes.

Mercer County Twps included are: Dublin, Washington, Jefferson, Recovery, Gibson, Union, Liberty, Butler, Granville, Center, Hopewell, Franklin, Marion.

VanWert County Twps included are: Jennings.

Warren County Twps included are: Franklin, Clear Creek, Turtle Creek, Wayne, Massie, Washington, Salem, Union.

Details :

Structural Iron Work but not limited to: field fabrication, all loading to and including the erecting, rigging, assembly, dismantling, placing, temporary and permanent securing by any means of all structural iron, steel, ornamental lead, bronze, brass, copper, aluminum, glass all ferrous and non ferrous metal and composite material, precast prestressed and post-stressed concrete structures. Bridges and bridge rails, bridge viaducts, bucks bulkheads, bumper and bumper post, canopies and unistrut canopies, corrugated ferrous and non ferrous sheets when attached to steel frames, columns, beams, bar-joists, trusses, grinders, roof decking, electrical supports, elevator cars, elevator fronts and enclosures, erection of steel towers, flag poles, gymnasium equipment, stadium and arena seating, jail cell work, jail cell beds, benches, bunks, chairs, tables, mirrors, jail cell access doors, rigging and installation of machinery and equipment (erecting, aligning, anchoring and dismantling, erection and dismantling of tower cranes, derrick monorail systems, Chicago booms, overhead cranes, gantries, material and personnel hoists, tanks, hoppers and conveyors. All pre-engineered metal buildings and their entirety including siding, roofing, gutters, downspouts and erection of all.

Ornamental Iron Work but not limited to: all work in connection with field fabrication, handling including loading/off loading, sorting, cutting, fastening, anchoring, bending, hoisting, placing, burning, welding, and tying, dismantling of all materials used in miscellaneous iron or steel, for stairs, hand railings, rolling doors, rolling gates, rolling shutters, fence, windows, curtain wall, erection and welding of all metal, sash, architectural and ornamental treatments, but not necessarily limited to all sizes and types of ornamental, steel iron, lead, bronze, brass, copper, aluminum, all ferrous and non ferrous metals and composite materials

Fence Erector Iron Worker but not limited to: All work in connection with the field fabrication and erection of chain link fence, which includes but not limited to the loading and of the fence fabric and posts also the installation of the above.

Reinforcing Iron Worker but not limited to: work in connection with field fabrication, handling, racking, sorting, cutting, bending, hoisting, placing, burning, welding and tying all materials used to reinforce concrete construction, except loading and unloading by hand. Re-aligning of the reinforced iron, wire mesh placing, bricking, pulling and similar reinforcing materials, placing steel dowels, as well as re-fasten. Reinforcing steel and wire mesh in roadways and sidewalks in connection with building construction. Also, erection and fabrication of pre-connection with building construction, also erection and fabrication of pre-stressed and precast

joists, beams, columns, slabs; walls, roofs, tanks, manholes, trenches and covers. Handling of "J" or jack bars on slip forms. Metal decking similar to "corruflex" when used for floor forms over metal or concrete supports either welded or clipped. Post tension, all loading and unloading, hoisting, placing and tying of all post tensioning cables. Placing and tying of all duct work in bonded post tension. All of the wrecking of cones, wedging of the tendons, stressing, cutting, repairing and grouting of bonded post tension.

Prevailing Wage Rate Skilled Crafts

Name of Union: Ironworker Local 44

Change # : LCN01-2024ibLoc44

Craft : Ironworker Effective Date : 07/17/2024 Last Posted : 07/17/2024

Classification	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Ironworker Reinforcing	\$35.87		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$59.47	\$77.40
Structural	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Ornamental	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Machine Mover/Rigger	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Conveyer Mechanic	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Maintenance/Heavy Hwy	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Welder A	\$35.62		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$59.22	\$77.03
Welder B	\$35.87		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$59.47	\$77.40
Sheeter	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
Fence Erector	\$33.60		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$57.20	\$74.00
Ironworker	\$35.37		\$9.20	\$9.50	\$0.60	\$0.00	\$4.30	\$0.00	\$0.00	\$0.00	\$58.97	\$76.65
1st yr A	60.00	\$21.52	\$9.20	\$9.50	\$0.60	\$0.00	\$1.08	\$0.00	\$0.00	\$0.00	\$41.90	\$52.66
1st yr B	65.00	\$23.32	\$9.20	\$9.50	\$0.60	\$0.00	\$1.08	\$0.00	\$0.00	\$0.00	\$43.70	\$55.35
2nd yr A	70.00	\$25.11	\$9.20	\$9.50	\$0.60	\$0.00	\$1.08	\$0.00	\$0.00	\$0.00	\$45.49	\$58.04
2nd yr B	75.00	\$26.90	\$9.20	\$9.50	\$0.60	\$0.00	\$1.08	\$0.00	\$0.00	\$0.00	\$47.28	\$60.73
3rd yr A	80.00	\$28.70	\$9.20	\$9.50	\$0.60	\$0.00	\$2.15	\$0.00	\$0.00	\$0.00	\$50.15	\$64.49
3rd yr B	85.00	\$30.49	\$9.20	\$9.50	\$0.60	\$0.00	\$2.15	\$0.00	\$0.00	\$0.00	\$51.94	\$67.18
4th yr A	90.00	\$32.28	\$9.20	\$9.50	\$0.60	\$0.00	\$3.23	\$0.00	\$0.00	\$0.00	\$54.81	\$70.95
4th yr B	95.00	\$34.08	\$9.20	\$9.50	\$0.60	\$0.00	\$3.23	\$0.00	\$0.00	\$0.00	\$56.61	\$73.64
4th yr C	100.00	\$35.87	\$9.20	\$9.50	\$0.60	\$0.00	\$3.23	\$0.00	\$0.00	\$0.00	\$58.40	\$76.33

Special Calculation Note :

Ratio :

1 Journeymen to 1 Apprentice
2 Journeymen to 2 Apprentice
10 Journeymen to 10 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

ADAMS*, BROWN, BUTLER*, CLERMONT,
CLINTON*, HAMILTON, HIGHLAND*, WARREN*

Special Jurisdictional Note : Adams County Twps included: Bratton, Scott, Winchester, Wayne.
Butler County Twps included: Oxford, St. Clair, Fairfield, Morgan, Liberty, Union, Ross, Reilly, Hanover, West Chester.
Clinton County, Manchester and South West Borrow.
Highland County Twps included: Dotson, Salem, Clay, White Oak, Hamer, New Market, Concord, Jackson, Washington.
Warren County Twps included: Harlan, Deerfield, Hamilton.

Details :

Structural Iron Work but not limited to:field fabrication, all loading to and including the erecting,rigging,assembly,dismantling, placing, temporary and permanent securing by any means of all structural iron,steel,ornamental lead,bronze,brass,copper,aluminum,glass all ferrous and non ferrous metal and composite material, precast prestressed and post-stressed concrete structures. Bridges and bridge rails,bridge viaducts,bucks bulkheads,bumper and bumper post,canopies and unistrut canopies,corrugated ferrous and non ferrous sheets when attached to steel frames,columns,beams,bar-joists,trusses,grinders,roof decking,electrical supports,elevator cars,elevator fronts and enclosures,erection of steel towers,flag poles, gymnasium equipment,stadium and arena seating,jail cell work,jail cell beds,benches,bunks,chairs,tables,mirrors,jail cell access doors,rigging and installation of machinery and equipment(erection,aligning,anchoring and dismantling, erection and dismantling of tower cranes,derrick monorail systems, Chicago booms,overhead cranes,gantries,material and personnel hoists,tanks,hoppers and conveyors. All pre-engineered metal buildings and their entirety including siding,roofing, gutters, downspouts and erection of all.

Reinforcing Iron Work but not limited to: Any work in connection with field fabrication, handling, racking, sorting, cutting, bending, hoisting, placing, burning, welding and tying of all materials used to reinforce concrete construction, except that loading and unloading by hand and carrying to a centralized point adjacent to or upon site of the project on which such materials are to be used. Realigning of reinforcing iron, wire mesh placing, bricking, pulling and similar reinforcing materials, placing steel dowels, as well as refastening and resetting same while concrete is being poured. Reinforcing steel and wire mesh in roadways and sidewalks in connection with building construction, also erection and fabrication of preconnection with building construction, also erection and fabrication of prestressed and precast joist, beams, columns, and slabs, walls, roofs, tanks, manholes, trenches and covers. The handling and placing of "J" of Jack bars on slip form construction; the placing of all clips, bolts, steel rods and wire fabric or mesh pertaining to gunite construction; the placing of steel-tex or paper-back mesh used for reinforcing and placing wire mesh to reinforce gypsum roof construction. Metal decking similar "corruform" used for floor forms over metal or concrete supports whether welded or clipped. Post tension. All loading and unloading, hosting, placing and tying of all post tensioning cables. Wrecking of cones, wedging of tendons, stressign, cutting and repairing.

Ornamental Iron Work but not limited to:all work in connection with field fabrication, handling including loading/off loading,sorting,cutting,fastening,anchoring,bending,hoisting,placing,burning,welding,and tying, dismantling of all materials used in miscellaneous iron or steel, for stairs, hand railings, rolling doors, rolling gates, rolling shutters,fence,windows,curtain wall, erection and welding of all metal, sash, architectural and ornamental treatments, but not necessarily limited to all sizes and types of ornamental, steel iron,lead,bronze,brass,copper,aluminum,all ferrous and non ferrous metals and composite materials

Fence Erector Iron Worker but not limited to: All work in connection with the field fabrication and erection of chain link fence,which includes but not limited to the loading and of the fence fabric and posts also the installation of the above.

Prevailing Wage Rate Skilled Crafts

Name of Union: Labor Local 534 Building

Change # : LCN01-2024ibLoc534

Craft : Laborer Effective Date : 06/12/2024 Last Posted : 06/12/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Laborer Group 1	\$32.49		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.09	\$63.34
Laborer Group 2	\$32.59		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.19	\$63.49
Laborer Group 3	\$32.69		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.29	\$63.64
Laborer Group 4	\$32.82		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.42	\$63.83
Laborer Group 5	\$33.07		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.67	\$64.20
Laborer Group 6	\$32.84		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.44	\$63.86
Laborer Group 7	\$32.04		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$46.64	\$62.66
Apprentice	Percent											
0-1000 hrs	80.00	\$25.99	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$40.59	\$53.59
1001-2000 hrs	85.00	\$27.62	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$42.22	\$56.02
2001-3000 hrs	90.00	\$29.24	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$43.84	\$58.46
3001-4000	95.00	\$30.87	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$45.47	\$60.90
4001+	100.00	\$32.49	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$47.09	\$63.34

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

1 Journeyman to 1 Apprentice
3 Journeyman to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

BUTLER, WARREN

Special Jurisdictional Note :

Details :

Note:

Group 1: Building & Common Laborer; All general laborers work including all forms of landscaping, Rough Rider - all pump's 4 inch or smaller, Small Pump Portable Generators-Bobcat to Cleanup, Firewatch and Monitor, (Safety Person)

Group 2: Asphalt Raker, Tamper, Smoother, Hand Air Pump, Hand air Tamper, Chisel, Power Tamper, Operator, Switch, Assemblies, Handling & Laying Precast Concrete Floors & Deck Tool Repairman.

Group 3: Concrete Specialist; Skid Steers (with attachments to perform Laborer's duties) Jack Hammer * Concrete Busterman, Barco Tamper Man, Power Georgia Buggy Man, Power Sweeper Man, Vibrator, Concrete Saw Man, Rail Spikers, Acetylene Burner, Pipelayers, Bos'n Cradleman, Bottom Man, Chipping Hammer Grade Checker, Radio Operator, Form Cleanout & blowout Man, Red Concrete Coloring Man (Electrical Safety)

Group 4: Mason Tender, Mortar Mixers & Scaffold Builders

Group 5: Fork Lift for Mason, all work involving Refractory Materials Including Demolition of Refractory Materials.

Asbestos Removal and Hazardous Waste Removal (handling, control, removal abatement, encapsulation or disposal of asbestos & hazardous waste),

Group 6: Gunnite Man, Sand Blaster, Concrete & Grout Pump & Hose Man, Blast Trac, Miners & Muckers, Free Air, Powderman or Blaster, Mortar or Gypsum Machineman, Welder, Scuba Diver.

Group 7: Watchman & Tool Checker/Toolroom Man

Prevailing Wage Rate Skilled Crafts

Name of Union: Labor Hwy 3

Change # : LCN01-2024ibLocalHwy3

Craft : Laborer Group 1 Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Laborer Group 1	\$35.52		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$50.12	\$67.88
Group 2	\$35.69		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$50.29	\$68.13
Group 3	\$36.02		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$50.62	\$68.63
Group 4	\$36.47		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$51.07	\$69.30
Watch Person	\$28.25		\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$42.85	\$56.98
Apprentice	Percent											
0-1000 hrs	60.00	\$21.31	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$35.91	\$46.57
1001-2000 hrs	70.00	\$24.86	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$39.46	\$51.90
2001-3000 hrs	80.00	\$28.42	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$43.02	\$57.22
3001-4000 hrs	90.00	\$31.97	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$46.57	\$62.55
More than 4000 hrs	100.00	\$35.52	\$8.40	\$4.15	\$0.45	\$0.00	\$1.50	\$0.00	\$0.10	\$0.00	\$50.12	\$67.88

Special Calculation Note : Watchmen have no Apprentices. Tunnel Laborer rate with air-pressurized add \$1.00 to the above wage rate.

Ratio :

- 1 Journeymen to 1 Apprentice
- 3 Journeymen to 1 Apprentice thereafter

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW,

MUSKINGUM, NOBLE, PAULDING, PERRY,
PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND,
ROSS, SCIOTO, SENECA, SHELBY,
TUSCARAWAS, UNION, VAN WERT, VINTON,
WARREN, WASHINGTON, WAYNE, WILLIAMS,
WYANDOT

Special Jurisdictional Note : Hod Carriers and Common Laborers - Heavy, Highway, Sewer, Waterworks, Utility, Airport, Railroad, Industrial and Building Site, Sewer Plant, Waste Water Treatment Facilities Construction

Details :

Group 1

Laborer (Construction); Plant Laborer or Yardman, Right-of-way Laborer, Landscape Laborer, Highway Lighting Worker, Signalization Worker, (Swimming) Pool Construction Laborer, Utility Man, *Bridge Man, Handyman, Joint Setter, Flagperson, Carpenter Helper, Waterproofing Laborer, Slurry Seal, Seal Coating, Surface Treatment or Road Mix Laborer, Riprap Laborer & Grouter, Asphalt Laborer, Dump Man (batch trucks), Guardrail & Fence Installer, Mesh Handler & Placer, Concrete Curing Applicator, Scaffold Erector, Sign Installer, Hazardous Waste (level D), Diver Helper, Zone Person and Traffic Control.

*Bridge Man will perform work as per the October 31, 1949, memorandum on concrete forms, by and between the United Brotherhood of Carpenters and Joiners of America and the Laborers' International Union of North America, which states in; "the moving, cleaning, oiling and carrying to the next point of erection, and the stripping of forms which are not to be re-used, and forms on all flat arch work shall be done by members of the Laborers' International Union of North America."

Group 2

Asphalt Raker, Screwman or Paver, Concrete Puddler, Kettle Man (pipeline), All Machine-Driven Tools (Gas, Electric, Air), Mason Tender, Brick Paver, Mortar Mixer, Skid Steer, Sheeting & Shoring Person, Surface Grinder Person, Screedperson, Water Blast, Hand Held Wand, Power Buggy or Power Wheelbarrow, Paint Striper, Plastic fusing Machine Operator, Rodding Machine Operator, Pug Mill Operator, Operator of All Vacuum Devices Wet or Dry, Handling of all Pumps 4 inches and under (gas, air or electric), Diver, Form Setter, Bottom Person, Welder Helper (pipeline), Concrete Saw Person, Cutting with Burning Torch, Pipe Layer, Hand Spiker (railroad), Underground Person (working in sewer and waterline, cleaning, repairing and reconditioning). Tunnel Laborer (without air), Caisson, Cofferdam (below 25 feet deep), Air Track and Wagon Drill, Sandblaster Nozzle Person, Hazardous Waste (level B), ***Lead Abatement, Hazardous Waste (level C)

***Includes the erecting of structures for the removal, including the encapsulation and containment of Lead abatement process.

Group 3

Blast and Powder Person, Muckers will be defined as shovel men working directly with the miners, Wrencher (mechanical joints & utility pipeline), Yarnier, Top Lander, Hazardous Waste (level A), Concrete Specialist, Curb Setter and Cutter, Grade Checker, Concrete Crew in Tunnels. Utility pipeline Tappers, Waterline, Caulker, Signal Person will receive the rate equal to the rate paid the Laborer classification for which the Laborer is signaling.

Group 4

Miner, Welder, Guniting Nozzle Person

A.) The Watchperson shall be responsible to patrol and maintain a safe traffic zone including but not limited to barrels, cones, signs, arrow boards, message boards etc.

The responsibility of a watchperson is to see that the equipment, job and office trailer etc. are secure.

1st Year	50.00	\$22.07	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$38.67	\$49.71
2nd Year	60.00	\$26.48	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$43.08	\$56.33
3rd Year	70.00	\$30.90	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$47.50	\$62.95
4th Year	80.00	\$35.31	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$51.91	\$69.57

Special Calculation Note : Other: Education & Safety

Misc: National Training

Ratio :

For every (3) Operating Engineer Journeymen employed by the company there may be employed (1) Registered Apprentice or trainee Engineer through the referral when they are available. An apprentice, while employed as part of a crew per Article VIII, paragraph 78, will not be subject to the apprenticeship ratios in this collective bargaining agreement

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WYANDOT

Special Jurisdictional Note :

Details :

Note: There will be a 10% increase for the apprentices on top of the percentages listed above provided they are operating mobile equipment. Mechanic Trainees will receive 10% increase if required to have CDL

Group A- Barrier Moving Machines; Boiler Operators or Compressor Operators, when compressor or boiler is mounted on crane (Piggyback Operation); Boom Trucks (all types); Cableways Cherry Pickers; Combination - Concrete Mixers & Towers; All Concrete Pumps with Booms; Cranes (all types); Compact Cranes, track or rubber over 4,000 pounds capacity; Cranes self-erecting, stationary, track or truck (all configurations); Derricks (all types); Draglines; Dredges (dipper, clam or suction) 3-man crew; Elevating Graders or Euclid Loaders; Floating Equipment; Forklift (rough terrain with winch/hoist); Gradalls; Helicopter Operators, hoisting building materials; Helicopter Winch Operators, Hoisting building materials; Hoes (All types); Hoists (with two or more drums in use); Horizontal Directional Drill; Hydraulic Gantry (lift system); Laser Finishing Machines; Laser Screed and like equipment; Lift Slab or Panel Jack Operators; Locomotives (all types); Maintenance Operator/Technician (Mechanic Operator/Technician and/or Welder); Mixers, paving (multiple drum); Mobile Concrete Pumps, with booms; Panelboards, (all types on site); Pile Drivers; Power Shovels; Prentice Loader; Rail Tamper (with automatic lifting and aligning device); Rotary Drills (all), used on caissons for foundations and sub-structure; Side Booms; Slip Form Pavers; Straddle Carriers (Building Construction on site); Trench Machines (over 24" wide); Tug Boats.

Group B - Articulating/end dumps (minus \$4.00/hour from Group B rate); Asphalt Pavers; Bobcat-type and/or skid steer loader with hoe attachment greater than 7000 lbs.; Bulldozers; CMI type Equipment; Concrete Saw, Vermeer-type; Endloaders; Hydro Milling Machine; Kolman-type Loaders (Dirt Loading); Lead Greasemen; Mucking Machines; Pettibone-Rail Equipment; Power Graders; Power Scoops; Power Scrapers; Push Cats;

Rotomills (all), grinders and planers of all types.

Group C - A-Frames; Air Compressors, Pressurizing Shafts or Tunnels; All Asphalt Rollers; Bobcat-type and/or Skid Steer Loader with or without attachments; Boilers (15 lbs. pressure and over); All Concrete Pumps (without booms with 5 inch system); Fork Lifts (except masonry); Highway Drills - all types (with integral power); Hoists (with one drum); House Elevators (except those automatic call button controlled), Buck Hoists, Transport Platforms, Construction Elevators; Hydro Vac/Excavator (when a second person is needed, the rate of pay will be "Class E"); Man Lifts; Material hoist/elevators; Mud Jacks; Pressure Grouting; Pump Operators (installing or operating Well Points or other types of Dewatering Systems); Pumps (4 inches and over discharge); Railroad Tie (Inserter/Remover); Rotovator (Lime-Soil Stabilizer); Submersible Pumps (4" and over discharge); Switch & Tie Tampers (without lifting and aligning device); Trench Machines (24" and under); Utility Operators.

Group D - Backfillers and Tampers; Ballast Re-locator; Batch Plant Operators; Bar and Joint Installing Machines; Bull Floats; Burlap and Curing Machines; Clefplanes; Compressors, on building construction; Concrete Mixers, more than one bag capacity; Concrete Mixers, one bag capacity (side loaders); All Concrete Pumps (without boom with 4" or smaller system); Concrete Spreader; Conveyors, used for handling building materials; Crushers; Deckhands; Drum Fireman (in asphalt plants); Farm type tractors pulling attachments; Finishing Machines; Form Trenchers; Generators; Guniting Machines; Hydro-seeders; Pavement Breakers (hydraulic or cable); Post Drivers; Post Hole Diggers; Pressure Pumps (over 1/2" discharge); Road Widening Trenchers; Rollers (except asphalt); Self-propelled sub-graders; Shotcrete Machines; Tire Repairmen; Tractors, pulling sheepsfoot post roller or grader; VAC/ALLS; Vibratory Compactors, with integral power; Welders.

Group E - Allen Screed Paver (concrete); Boilers (less than 15 lbs. pressure); Cranes-Compact, track or rubber (under 4,000 pounds capacity); Directional Drill "Locator"; Fueling and greasing +\$3.00; Inboard/outboard Motor Boat Launches; Light Plant Operators; Masonry Fork Lifts; Oilers/Helpers; Power Driven Heaters (oil fired); Power Scrubbers; Power Sweepers; Pumps (under 4 inch discharge); Signalperson, Submersible Pumps (under 4" discharge).

Master Mechanics - Master Mechanic

Cranes 150' - 180' - Boom & Jib 150 - 180 feet

Cranes 180' - 249' - Boom & Jib 180 - 249 feet

Cranes 250' and over - Boom & Jib 250-feet or over

1st year	50.00	\$22.07	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$38.67	\$49.71
2nd year	60.00	\$26.48	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$43.08	\$56.33
3rd year	70.00	\$30.90	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$47.50	\$62.95
4th year	80.00	\$35.31	\$9.26	\$6.25	\$0.90	\$0.00	\$0.00	\$0.09	\$0.00	\$0.10	\$51.91	\$69.57

Special Calculation Note : Other: Education & Safety Fund

Misc: National Training

Ratio :

For every (3) Operating Engineer Journeymen employed by the company, there may be employed (1) Registered Apprentice or Trainee Engineer through the referral when they are available. An Apprentice, while employed as part of a crew per Article VIII, paragraph 65 will not be subject to the apprenticeship ratios in this collective bargaining agreement

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, LUCAS, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

**Apprentices will receive a 10% increase on top of the percentages listed above provided they are operating mobile equipment. Mechanic Trainees will receive 10% increase if they are required to have CDL.

Class A - Air Compressors on Steel Erection; Asphalt Plant Engineers (Cleveland District Only); Barrier Moving Machine; Boiler Operators, Compressor Operators, or Generators, when mounted on a rig; Boom Trucks (all types); Cableways; Cherry Pickers; Combination- Concrete Mixers & Towers; Concrete Plants (over 4 yd capacity); Concrete Pumps; Cranes (all types); Compact Cranes track or rubber over 4,000 pounds capacity; Cranes self-erecting stationary, track or truck; Derricks (all types); Draglines; Dredges dipper, clam or suction; Elevating Graders or Euclid Loaders; Floating Equipment (all types); Gradalls; Helicopter Crew (Operator- hoist or winch); Hoes (all types); Hoisting Engines; Hoisting Engines, on shaft or tunnel work; Hydraulic Gantry (lifting system); Industrial-type Tractors; Jet Engine Dryer (D8 or D9) diesel Tractors; Locomotives (standard gauge); Maintenance Operators/Technicians (class A); Mixers, paving (single or double drum); Mucking Machines; Multiple Scrapers; Piledriving Machines (all types); Power Shovels, Prentice Loader; Quad 9 (double pusher); Rail Tamper (with automatic lifting and aligning device); Refrigerating Machines (freezer operation); Rotary Drills, on caisson work; Rough Terrain Fork Lift with winch/hoist; Side Booms; Slip Form Pavers; Survey Crew Party Chiefs; Tower Derricks; Tree Shredders; Trench Machines (over 24" wide); Truck Mounted Concrete Pumps; Tug Boats; Tunnel Machines and /or Mining Machines; Wheel Excavators.

Class B - Asphalt Pavers; Automatic Subgrade Machines, self-propelled (CMI-type); Bobcat-type and /or Skid Steer Loader with hoe attachment greater than 7000 lbs.; Boring Machine Operators (more than 48 inches); Bulldozers; Concrete Saws, Vermeer type; Endloaders; Horizontal Directional Drill (50,000 ft. lbs. thrust and

over); Hydro Milling Machine; Kolman-type Loaders (production type-dirt); Lead Greasemen; Lighting and Traffic Signal Installation Equipment includes all groups or classifications; Maintenance Operators/Technicians, Class B; Material Transfer Equipment (shuttle buggy) Asphalt; Pettibone-Rail Equipment; Power Graders; Power Scrapers; Push Cats; Rotomills (all), Grinders and Planners of all types, Groovers (excluding walk-behinds); Trench Machines (24 inch wide and under).

Class C - A-Frames; Air Compressors, on tunnel work (low Pressure); Articulating/straight bed end dumps if assigned (minus \$4.00 per hour); Asphalt Plant Engineers (Portage and Summit Counties only); Bobcat-type and/or skid steer loader with or without attachments; Drones; Highway Drills (all types); HydroVac/Excavator (when a second person is needed, the rate of pay will be "Class E"); Locomotives (narrow gauge); Material Hoist/Elevators; Mixers, concrete (more than one bag capacity); Mixers, one bag capacity (side loader); Power Boilers (over 15 lbs. pressure); Pump Operators (installing or operating well Points); Pumps (4 inch and over discharge); Railroad Tie Inserter/Remover; Rollers, Asphalt; Rotovator (lime-soil Stabilizer); Switch & Tie Tampers (without lifting and aligning device); Utilities Operators, (small equipment); Welding Machines and Generators.

Class D - Backfillers and Tampers; Ballast Re-locator; Bar and Joint Installing Machines; Batch Plant Operators; Boring Machine Operators (48 inch or less); Bull Floats; Burlap and Curing Machines; Concrete Plants (capacity 4 yds. and under); Concrete Saws (multiple); Conveyors (highway); Crushers; Deckhands; Farm type tractors, with attachments (highway); Finishing Machines; Firemen, Floating Equipment (all types); Fork Lifts (highway), except masonry; Form Trenchers; Hydro Hammers; Hydro Seeders; Pavement Breakers (hydraulic or cable); Plant Mixers; Post Drivers; Post Hole Diggers; Power Brush Burners; Power Form Handling Equipment; Road Widening Trenchers; Rollers (brick, grade, macadam); Self-Propelled Power Spreaders; Self-Propelled Sub-Graders; Steam Firemen; Survey Instrument men; Tractors, pulling sheepsfoot rollers or graders; Vibratory Compactors, with integral power.

Class E - Compressors (portable, Sewer, Heavy and Highway); Cranes-Compact, track or rubber under 4,000 pound capacity; Drum Firemen (asphalt plant); Fueling and greasing (Primary Operator with Specialized CDL Endorsement Add \$3.00/hr); Generators; Inboard-Outboard Motor Boat Launches; Masonry Fork Lifts; Oil Heaters (asphalt plant); Oilers/Helpers; Power Driven Heaters (oil fired); Power Scrubbers; Power Sweepers; Pumps (under 4 inch discharge); Signalperson; Survey Rodmen or Chairmen; Tire Repairmen; VAC/ALLS.

Master Mechanic - Master Mechanic

Cranes and Mobile Concrete Pumps 150' -179' - Boom & Jib 150 - 179 feet

Cranes and Mobile Concrete Pumps 180' - 249' - Boom & Jib 180 - 249 feet

Cranes and Mobile Concrete Pumps 250' and over - Boom & Jib 250 feet or over

Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Locals 123 & 238

Change # : LCN01-2024ibLoc123-238

Craft : Drywall Finisher Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Drywall Finisher	\$28.29	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.45
Tapers and Finishers	\$28.29	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.45
Apprentice	Percent										
1st Year	65.00	\$18.39	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$27.50	\$36.69
2nd Year	70.00	\$19.80	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$28.91	\$38.81
3rd Year	80.00	\$22.63	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$31.74	\$43.06
4th Yea	90.00	\$25.46	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$34.57	\$47.30

Special Calculation Note : Apprentices shall be paid the proper % of the classification above.

Ratio :

1 Journeyman to 1 Apprentice per job

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, CLINTON, HAMILTON, WARREN

Special Jurisdictional Note :

Details :

Industrial Work paid as commercial work above for each class which includes, Industrial Plants, repair garages, processing plants, storage tanks, warehouses, skeletons structures, bridges unless highest point of clearance is 60 feet or more whether new or old construction offices and office buildings in industrial sites are at industrial rates. Heavy & Highway Bridges-Guard Rails- Light Poles. A hazardous steeplejack rate shall apply on radio towers, stacks, light towers, water towers, steeples, skeleton steel, and exterior industrial conveyors over 25 feet, where such items require steeplejack methods and the rate of pay shall be a \$1.00 per hour above the industrial rate. Steeplejack rate to apply to bridges where highest point of clearance is 60 feet.

Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 123 & 238 Hvy Hwy

Change # : LCN01-2024ibLoc123

Craft : Painter Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Painter Bridge Class 1	\$38.68		\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$52.69	\$72.03
Bridge Painter, Rigger, Containment Builder, Spot Blaster Class 2	\$31.68		\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.69	\$61.53
Equipment Operator/Field Mechanic, Grit Reclamation, Paint Mixer, Traffic Control, Boat Person Class 3	\$31.68		\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.69	\$61.53
Concrete Sealing, Concrete Blasting/Power Washing, Etc. Class 4	\$31.68		\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.69	\$61.53
Quality Control/Quality Assurance, Traffic Safety, Competent Person Class 5	\$31.68		\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.69	\$61.53
Apprentice	Percent											
1st Year	65.00	\$25.14	\$2.30	\$6.50	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.25	\$46.82
2nd Year	70.00	\$27.08	\$2.30	\$6.50	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.19	\$49.72
3rd Year	80.00	\$30.94	\$2.30	\$6.50	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.05	\$55.53
4th Year	90.00	\$34.81	\$2.30	\$6.50	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.92	\$61.33

Special Calculation Note : Apprentices shall be paid proper % of the classification above..

Ratio :

Jurisdiction (* denotes special jurisdictional note) :

Special Jurisdictional Note :

Details :

Industrial Work paid as commercial work above for each class which includes, Industrial Plants, repair garages, processing plants, storage tanks, warehouses, skeletons structures, bridges unless highest point of clearance is 60 feet or more whether new or old construction offices and office buildings in industrial sites are at industrial rates. Heavy & Highway Bridges-Guard Rails- Light Poles. A hazardous steeplejack rate shall apply on radio towers, stacks, light towers, water towers, steeples, skeleton steel, and exterior industrial conveyors over 25 feet, where such items require steeplejack methods and the rate of pay shall be a \$1.00 per hour above the industrial rate. Steeplejack rate to apply to bridges where highest point of clearance is 60 feet.

Class 1 – Abrasive blasting of any kind.

Class 2 – Bridge painting, coating application of any kind. All steel surface preparation other than abrasive blasting. All necessary rigging and containment building. All remedial/ spot blasting.

Class 3 – Tend to all equipment including but not limited to abrasive blasting, power washing, spray painting, forklifts, hoists, trucks, etc. Load and unload trucks, handle materials, man safety boats, handle traffic control, clean up/ vacuum abrasive blast materials and related tasks.

Class 4 – All aspects of concrete coating/ sealing including but not limited to preparation, containment, etc.

Class 5 – Verify and record that all work is completed according to job specifications. Assure that all health and safety standards are adhered to. Assure all traffic is safely handled.

Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 639

Change # : LCNO1-2015fbLoc639

Craft : Painter Effective Date : 06/10/2015 Last Posted : 06/10/2015

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Metal Finisher/Helpers											
Top Helper Class A	\$19.09	\$3.65	\$0.00	\$0.00	\$0.66	\$0.00	\$0.00	\$0.00	\$0.00	\$23.40	\$32.94
Top Helper Class B	\$19.09	\$3.65	\$0.65	\$0.00	\$1.03	\$0.00	\$0.37	\$0.00	\$0.00	\$24.79	\$34.33
Top Helper Class C	\$19.09	\$3.65	\$1.00	\$0.00	\$1.76	\$0.00	\$0.37	\$0.00	\$0.00	\$25.87	\$35.41
Helper Class A	\$14.69	\$3.65	\$0.00	\$0.00	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$18.85	\$26.19
Helper Class B	\$14.69	\$3.65	\$0.65	\$0.00	\$0.79	\$0.00	\$0.28	\$0.00	\$0.00	\$20.06	\$27.40
Helper Class C	\$14.69	\$3.65	\$1.00	\$0.00	\$1.64	\$0.00	\$0.28	\$0.00	\$0.00	\$21.26	\$28.60
New Hire 90 Days	\$11.00	\$3.65	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$14.65	\$20.15

Special Calculation Note : Other is Sick and Personal Time

Ratio :

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY,

SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

Top Helper: Shall perform the responsibilities of a Helper and be responsible for the setup, break down, safety and quality of the company's product.

Helper : Shall be responsible for performing tasks in refinishing, compliance with safety procedures, setting up and breaking down job sites, scaffolding and swing stages and preparing surfaces for refinishing including but not limited to, masking and stripping and cleaning, oxidizing, polishing and scratch removal on various surfaces

Class A Workers: Less than 1 Year of Service.

Class B Workers: More than 1 and less than 8 Years of Service.

Class C Workers: More than 8 Years of Service.

Metal Polisher Scope of Work: Polishing, buffing, stripping, coloring, lacquering, spraying, cleaning and maintenance of ornamental and architectural metals, iron, bronze, nickel, aluminum and stainless steel and in mental specialty work, various stone finishes, stone specialty work and any other work pertaining to the finishing of metal, stones, woods, and any window washing/cleaning done in conjunction with this work, using chemicals, solvents, coatings and hand applied lacquer thinner, removing scratches from mirror finished metals, burnishing of bronze, statuary finishes on exterior and interior surfaces and the use of all tools required to perform such work, including but not limited to polishes, spray equipment and scaffolding.

Swing State Rate: All work on scaffold 4 sections or higher, including any boom lifts and swing stage scaffolds including the rigging and derigging of hanging/suspended swing stage systems and rappelling/bolson chair work, ADD \$1.50 per hour.

Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 639 Zone 2 Sign

Change # : LCN01-2023ibLoc639

Craft : Painter Effective Date : 03/22/2023 Last Posted : 03/22/2023

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Sign Journeyman Tech/Team Leader Class A	\$25.28	\$1.70	\$0.21	\$0.00	\$0.00	\$0.00	\$0.68	\$0.00	\$0.00	\$27.87	\$40.51
Painter Sign Journeyman Tech/Team Leader Class B	\$25.28	\$1.70	\$0.21	\$0.00	\$0.49	\$0.00	\$0.68	\$0.00	\$0.00	\$28.36	\$41.00
Painter Sign Journeyman Tech/Team Leader Class C	\$25.28	\$1.70	\$0.21	\$0.00	\$0.97	\$0.00	\$0.68	\$0.00	\$0.00	\$28.84	\$41.48
Painter Sign Journeyman Tech/Team Leader Class D	\$25.28	\$1.70	\$0.21	\$0.00	\$1.46	\$0.00	\$0.68	\$0.00	\$0.00	\$29.33	\$41.97
Sign Journeyman Class A	\$25.00	\$1.70	\$0.21	\$0.00	\$0.00	\$0.00	\$0.67	\$0.00	\$0.00	\$27.58	\$40.08
Sign Journeyman Class B	\$25.00	\$1.70	\$0.21	\$0.00	\$0.48	\$0.00	\$0.67	\$0.00	\$0.00	\$28.06	\$40.56
Sign Journeyman Class C	\$25.00	\$1.70	\$0.21	\$0.00	\$0.96	\$0.00	\$0.67	\$0.00	\$0.00	\$28.54	\$41.04
Sign Journeyman Class D	\$25.00	\$1.70	\$0.21	\$0.00	\$1.44	\$0.00	\$0.67	\$0.00	\$0.00	\$29.02	\$41.52
Tech Sign Fabrication/ Erector Class A	\$19.67	\$1.70	\$0.21	\$0.00	\$0.00	\$0.00	\$0.53	\$0.00	\$0.00	\$22.11	\$31.95

Tech Sign Fabrication/ Erector Class B	\$19.67	\$1.70	\$0.21	\$0.00	\$0.38	\$0.00	\$0.53	\$0.00	\$0.00	\$22.49	\$32.33
Tech Sign Fabrication/ Erector Class C	\$19.67	\$1.70	\$0.21	\$0.00	\$0.76	\$0.00	\$0.53	\$0.00	\$0.00	\$22.87	\$32.71
Tech Sign Fabrication/ Erector Class D	\$19.67	\$1.70	\$0.21	\$0.00	\$1.13	\$0.00	\$0.53	\$0.00	\$0.00	\$23.24	\$33.08

Special Calculation Note : Other is for paid holidays.

Ratio :

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, AUGLAIZE, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GREENE, HAMILTON, HANCOCK, HARDIN, HENRY, HIGHLAND, HOLMES, HURON, JACKSON, KNOX, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MERCER, MIAMI, MONTGOMERY, MORROW, MUSKINGUM, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, WARREN, WAYNE, WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

Class A: less that 1 year.

Class B: 1-3 years.

Class C; 3-10 years.

Class D: More than 10 years.

Prevailing Wage Rate Skilled Crafts

**Name of Union: Painter Locals 123 & 238
Commercial & Industrial**

Change # : LCN01-2024ibLoc123ComInd

Craft : Painter Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Brush Roll	\$28.29	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.45
Paper Hanger	\$28.29	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.45
Spray Painter	\$28.79	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.80	\$57.20
Sand Blaster Water Blaster	\$29.04	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.05	\$57.57
Elevated Tanks	\$29.29	\$6.50	\$7.20	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.30	\$57.95
Apprentice	Percent										
1st Year	65.00	\$18.39	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$27.50	\$36.69
2nd Year	70.00	\$19.80	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$28.91	\$38.81
3rd Year	80.00	\$22.63	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$31.74	\$43.06
4th Year	90.00	\$25.46	\$6.50	\$2.30	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$34.57	\$47.30

Special Calculation Note : Apprentices shall be paid the proper % of the classification above.

Ratio :

(1) Journeymen to (1) Apprentice per jobsite

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, CLINTON,
HAMILTON, WARREN

Special Jurisdictional Note :

Details :

Industrial Work paid as commercial work above for each class which includes, Industrial Plants, repair garages, processing plants, storage tanks, warehouses, skeletons structures, bridges unless highest point of clearance is 60 feet or more whether new or old construction offices and office buildings in industrial sites are at industrial rates. Heavy & Highway Bridges-Guard Rails- Light Poles. A hazardous steeplejack rate shall apply on radio towers, stacks, light towers, water towers, steeples, skeleton steel, and exterior industrial conveyors over 25 feet, where such items require steeplejack methods and the rate of pay shall be a \$1.00 per hour above the

industrial rate. Steeplejack rate to apply to bridges where highest point of clearance is 60 feet.

Prevailing Wage Rate Skilled Crafts

Name of Union: Plasterer Local 132 (Cincinnati)

Change # : LCN01-2024ibLoc132Cinci

Craft : Plasterer Effective Date : 07/01/2024 Last Posted : 06/26/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Plasterer	\$30.40		\$6.10	\$8.47	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$46.73	\$61.93
Apprentice	Percent											
1st 900 hours	70.00	\$21.28	\$6.10	\$0.00	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$29.14	\$39.78
2nd 900 hours	74.00	\$22.50	\$6.10	\$0.00	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$30.36	\$41.60
3rd 900 hours	78.00	\$23.71	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$39.31	\$51.17
4th 900 hours	82.00	\$24.93	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$40.53	\$52.99
5th 900 hours	86.00	\$26.14	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$41.74	\$54.82
6th 900 hours	90.00	\$27.36	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$42.96	\$56.64
7th 900 hours	94.00	\$28.58	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$44.18	\$58.46
8th 900 hours	98.00	\$29.79	\$6.10	\$7.74	\$0.70	\$0.00	\$1.00	\$0.06	\$0.00	\$0.00	\$45.39	\$60.29

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

*Other is International Training

Ratio :

- 1 Journeyman to 1 Apprentice
- 4 Journeyman to 2 Apprentice
- 7 Journeyman to 3 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

- BROWN, BUTLER, CLERMONT, HAMILTON, HIGHLAND, WARREN

Special Jurisdictional Note :

Details :

Apprentice and Shop Hand Pension are \$1.00 less than Journeyman.

Prevailing Wage Rate Skilled Crafts

Name of Union: Plumber Pipefitter Local 392

Change # : LCN01-2024ibLoc392

Craft : Plumber/Pipefitter Effective Date : 06/01/2024 Last Posted : 05/29/2024

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Plumber Pipefitter	\$40.70	\$11.08	\$14.15	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$0.00	\$67.45	\$87.80
Plumber Helper	\$26.46	\$10.98	\$7.40	\$0.89	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.73	\$58.96
Apprentice	Percent										
1st Year	52.00	\$21.16	\$10.88	\$1.15	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$34.71	\$45.30
2nd Year	55.00	\$22.39	\$10.88	\$1.15	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$35.94	\$47.13
3rd Year	58.00	\$23.61	\$10.88	\$7.90	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$43.91	\$55.71
4th Year	62.00	\$25.23	\$10.88	\$7.90	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$45.53	\$58.15
5th Year	75.00	\$30.53	\$10.88	\$14.15	\$0.89	\$0.00	\$0.00	\$0.63	\$0.00	\$57.08	\$72.34

Special Calculation Note : OTHER IS: SUPPLEMENTAL UNEMPLOYMENT BENEFITS.

Ratio :

- 1 Journeymen to 1 Apprentice
- 2 Journeymen to 4 Apprentices
- 3 Journeymen to 6 Apprentices

Jurisdiction (* denotes special jurisdictional note) :

BROWN, BUTLER, CLERMONT, HAMILTON, WARREN

When more than Sixteen (16) Journeymen are employed additional apprentices may be acquired at a ratio of one (1) apprentice to four (4) journeymen.

Special Jurisdictional Note :

Details :

Helpers shall be permitted to work on ONLY , Exterior Sewers, Concrete, Vitrified Clay or PVC Pipe and Digging and Backfilling for Piping Work. The ratio shall not exceed 2 helpers to 1 Journeymen when performing the scope of work listed above

Prevailing Wage Rate Skilled Crafts

Name of Union: Roofer Local 42

Change # : OCR01-2025ibLoc42

Craft : Roofer Effective Date : 01/29/2025 Last Posted : 01/29/2025

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Roofer	\$33.18		\$8.40	\$8.78	\$0.50	\$0.00	\$1.68	\$0.21	\$0.00	\$0.00	\$52.75	\$69.34
Tradesmen	\$26.54		\$8.40	\$7.02	\$0.00	\$0.00	\$1.68	\$0.06	\$0.00	\$0.00	\$43.70	\$56.97
Apprentice	Percent											
1st Period	65.00	\$21.57	\$8.40	\$5.71	\$0.00	\$0.00	\$1.68	\$0.00	\$0.00	\$0.00	\$37.36	\$48.14
2nd Period	70.00	\$23.23	\$8.40	\$6.15	\$0.00	\$0.00	\$1.68	\$0.00	\$0.00	\$0.00	\$39.46	\$51.07
3rd Period	80.00	\$26.54	\$8.40	\$7.02	\$0.00	\$0.00	\$1.68	\$0.00	\$0.00	\$0.00	\$43.64	\$56.92

Special Calculation Note : Other is for Training Fund

Ratio :

2 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, BROWN, BUTLER, CLERMONT,
HAMILTON, HIGHLAND, PIKE, WARREN

Special Jurisdictional Note :

Details :

Any Tradesman Worker completing 2,000 hours in (2) years may move to Journeyman status by utilizing the Training Yard to improve their skills. Tradesman Workers will be tested at these yards to determine their competency for Journeyman status. Tradesman Workers must schedule and successfully complete the industry test battery in order to gain journeyman status.

Prevailing Wage Rate Skilled Crafts

Name of Union: Sheet Metal Local 24 (Dayton)

Change # : LCN01-2024ibLoc24(Dayton)

Craft : Sheet Metal Worker Effective Date : 09/18/2024 Last Posted : 09/18/2024

	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification												
Sheet Metal Worker	\$33.76		\$9.86	\$15.30	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$60.02	\$76.90
Apprentice												
	Percent											
1st Year (Probationary Period)	60.00	\$20.26	\$9.20	\$5.45	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.01	\$46.13
2nd Year	65.00	\$21.94	\$9.28	\$6.69	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.01	\$49.99
3rd Year	75.00	\$25.32	\$9.45	\$9.15	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.02	\$57.68
4th Year	85.00	\$28.70	\$9.62	\$11.60	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$51.02	\$65.36

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

1 Journeyman to 1 Apprentice then,
1 Apprentice for every 2 Journeymen thereafter

Jurisdiction (* denotes special jurisdictional note) :

ALLEN, AUGLAIZE, BUTLER, CHAMPAIGN,
CLARK, CLINTON, DARKE, GREENE, HARDIN,
LOGAN, MERCER, MIAMI, MONTGOMERY,
PREBLE, SHELBY, VAN WERT, WARREN,
WYANDOT

Special Jurisdictional Note :

Details :

Prevailing Wage Rate Skilled Crafts

Name of Union: Sprinkler Fitter Local 669

Change # : LCN01-2024ibLoc669

Craft : Sprinkler Fitter Effective Date : 01/01/2025 Last Posted : 12/31/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Sprinkler Fitter	\$47.73		\$12.40	\$7.40	\$0.54	\$0.00	\$7.74	\$0.00	\$0.00	\$0.00	\$75.81	\$99.68
Apprentice	Percent											
CLASS 1	45.00	\$21.48	\$9.03	\$0.00	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$31.05	\$41.79
CLASS 2	50.02	\$23.87	\$9.03	\$0.00	\$0.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.44	\$45.38
CLASS 3	54.47	\$26.00	\$12.40	\$7.40	\$0.54	\$0.00	\$1.15	\$0.00	\$0.00	\$0.00	\$47.49	\$60.49
CLASS 4	59.48	\$28.39	\$12.40	\$7.40	\$0.54	\$0.00	\$1.15	\$0.00	\$0.00	\$0.00	\$49.88	\$64.07
CLASS 5	64.46	\$30.77	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$52.51	\$67.89
CLASS 6	69.47	\$33.16	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$54.90	\$71.48
CLASS 7	74.48	\$35.55	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$57.29	\$75.06
CLASS 8	79.46	\$37.93	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$59.67	\$78.63
CLASS 9	84.47	\$40.32	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$62.06	\$82.22
CLASS 10	89.49	\$42.71	\$12.40	\$7.40	\$0.54	\$0.00	\$1.40	\$0.00	\$0.00	\$0.00	\$64.45	\$85.81

Special Calculation Note :

Ratio :

1 Journeyman to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,

PUTNAM, RICHLAND, ROSS, SANDUSKY,
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

Sprinkler Fitter work shall consist of the installation, dismantling, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems including the unloading, handling by hand, power equipment and installation of all piping or tubing, appurtenances and equipment pertaining thereto, including both overhead and underground water mains, fire hydrants and hydrant mains, standpipes and hose connections to sprinkler systems used in connection with sprinkler and alarm systems. Also all tanks and pumps connected thereto, also included shall be CO-2 and Cardox Systems, Dry Chemical Systems, Foam Systems and all other fire protection systems.

Prevailing Wage Rate Skilled Crafts

Name of Union: Truck Driver Bldg & HevHwy Class 1
Locals 20,40,92,92b,100,175,284,438,377,637,908,957

Change # : LCN01-2024ibBldgHevHwy

Craft : Truck Driver Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Truck Driver CLASS 1 4 wheel service, dump, and batch trucks; drivers on tandems; truck sweepers (not to include power sweepers & scrubbers)	\$31.84		\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$49.84	\$65.76
Apprentice	Percent											
First 6 months	80.00	\$25.47	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.47	\$56.21
7-12 months	85.00	\$27.06	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.06	\$58.60
13-18 months	90.00	\$28.66	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.66	\$60.98
19-24 months	95.00	\$30.25	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$48.25	\$63.37
25-30 months	100.00	\$31.84	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$49.84	\$65.76

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

3 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK,

CLERMONT, CLINTON, COLUMBIANA,
COSHOCOTON, CRAWFORD, DARKE, DEFIANCE,
DELAWARE, ERIE, FAIRFIELD, FAYETTE,
FRANKLIN, FULTON, GALLIA, GREENE,
GUERNSEY, HAMILTON, HANCOCK, HARDIN,
HARRISON, HENRY, HIGHLAND, HOCKING,
HOLMES, HURON, JACKSON, JEFFERSON,
KNOX, LAWRENCE, LICKING, LOGAN, LORAIN,
LUCAS, MADISON, MAHONING, MARION,
MEDINA, MEIGS, MERCER, MIAMI, MONROE,
MONTGOMERY, MORGAN, MORROW,
MUSKINGUM, NOBLE, OTTAWA, PAULDING,
PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,
PUTNAM, RICHLAND, ROSS, SANDUSKY,
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

Prevailing Wage Rate

Skilled Crafts

Name of Union: Truck Driver Bldg & Hwy Class 2
Locals 20,40,92,92b,100,175,284,438,377,637,908,957

Change # : LCN01-2024ibBldgHwy

Craft : Truck Driver **Effective Date :** 05/01/2024 **Last Posted :** 05/01/2024

Classification	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Truck Driver CLASS 2 Tractor Trailer-Semi Tractor Trucks; Pole Trailers; Ready Mix Trucks; Fuel Trucks; 5 Axle & Over; Belly Dumps; Low boys - Heavy duty Equipment(irrespective of load carried) when used exclusively for transportation; Truck Mechanics (when needed)	\$32.26		\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.26	\$66.39
Apprentice	Percent											
First 6 months	80.00	\$25.81	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.81	\$56.71
7-12 months	85.00	\$27.42	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.42	\$59.13
13-18 months	90.00	\$29.03	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.03	\$61.55
19-24 months	95.00	\$30.65	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$48.65	\$63.97
25-30 months	100.00	\$32.26	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.26	\$66.39

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

3 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON,

KNOX, LAWRENCE, LICKING, LOGAN, LORAIN,
LUCAS, MADISON, MAHONING, MARION,
MEDINA, MEIGS, MERCER, MIAMI, MONROE,
MONTGOMERY, MORGAN, MORROW,
MUSKINGUM, NOBLE, OTTAWA, PAULDING,
PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,
PUTNAM, RICHLAND, ROSS, SANDUSKY,
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

Prevailing Wage Rate

Skilled Crafts

Name of Union: Truck Driver Bldg & HevHwy Class 3
Locals 20,40,92,92b,100,175,284,438,377,637,908,957

Change # : LCN01-2024ibBldgHevHwy3

Craft : Truck Driver Effective Date : 05/01/2024 Last Posted : 05/01/2024

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Truck Driver CLASS 3 Articulated Dump Trucks; Ridge-Frame Rock Trucks; Distributor Trucks)	\$33.26		\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$51.26	\$67.89
Apprentice	Percent											
First 6 months	80.00	\$26.61	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$44.61	\$57.91
7-12 months	85.00	\$28.27	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.27	\$60.41
13-18 months	90.00	\$29.93	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.93	\$62.90
19-24 months	94.96	\$31.58	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$49.58	\$65.38
25-30 months	100.00	\$33.26	\$8.00	\$9.60	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$51.26	\$67.89

Special Calculation Note : No special calculations for this skilled craft wage rate are required at this time.

Ratio :

3 Journeymen to 1 Apprentice

Jurisdiction (* denotes special jurisdictional note) :

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE,

GUERNSEY, HAMILTON, HANCOCK, HARDIN,
HARRISON, HENRY, HIGHLAND, HOCKING,
HOLMES, HURON, JACKSON, JEFFERSON,
KNOX, LAWRENCE, LICKING, LOGAN, LORAIN,
LUCAS, MADISON, MAHONING, MARION,
MEDINA, MEIGS, MERCER, MIAMI, MONROE,
MONTGOMERY, MORGAN, MORROW,
MUSKINGUM, NOBLE, OTTAWA, PAULDING,
PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,
PUTNAM, RICHLAND, ROSS, SANDUSKY,
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,
VINTON, WARREN, WASHINGTON, WAYNE,
WILLIAMS, WOOD, WYANDOT

Special Jurisdictional Note :

Details :

SECTION 00 70 20
PERMITS

Contractor shall keep a copy of all permits at the project site throughout the duration of the work.

FLOOD HAZARD AREA DEVELOPMENT PERMIT

Permit Number: F-25-03

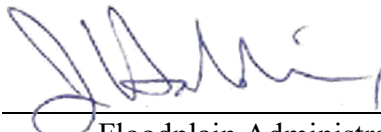
Issued to: Warren County Commissioners
Contact: Chris Brausch, County Sanitary Engineer
406 Justice Drive
Lebanon, OH 45036
(513) 695-1193

Property Address: 1699 Mason-Morrow-Millgrove Rd., Lebanon, OH 45036

Description of Use: Construction of well structures

Zoning Classification: RFP - Residential Floodplain District

Date: May 19, 2025



Floodplain Administrator



City of South Lebanon
10 N. High Street, South Lebanon, Ohio 45065
513-494-2296 fax: 513-494-1656
www.southlebanonohio.org



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
502 EIGHTH STREET
HUNTINGTON, WEST VIRGINIA 25701-2070

March 28, 2025

Regulatory Division
North Branch
LRH-2024-00908-LMR-Little Miami River

NATIONWIDE PERMIT NO. 57 VERIFICATION

Chris Brausch
Warren County Water & Sewer
P. O. Box 530
Lebanon, Ohio 45036

Dear Chris Brausch:

I refer to your pre-construction notification (PCN) received in this office on November 15, 2024, concerning the Middletown Junction Wellfield Electrical Utility Service Project. The project site is located under a section of the Little Miami River, located along the southwest side of the City of Lebanon Countryside Trail Bike Path at the Little Miami River and approximately 300 feet downstream of the bridge near 1770 West Mason-Morrow-Millgrove Road in Lebanon, Warren County, Ohio, at approximately 39.3654663 latitude and -84.24077 longitude. On-site waters include a section of the Little Miami River, a navigable water of the United States. We have assigned the following file number to your PCN: LRH-2024-00908-LMR. Please reference this number on all future correspondence related to this permit authorization request.

The United States Army Corps of Engineers' (Corps) authority to regulate waters of the United States is based on the definitions and limits of jurisdiction contained in 33 CFR 328 and 33 CFR 329. Section 404 of the Clean Water Act (Section 404) requires a Department of the Army (DA) permit be obtained prior to discharging dredged and/or fill material into waters of the United States, including wetlands. Section 10 of the Rivers and Harbors Act of 1899 (Section 10) requires a DA permit be obtained for any work in, on, over or under a navigable water.

The proposed project, as described in the submitted information, has been reviewed in accordance with Section 404 and Section 10. Based on your description of the proposed work, it has been determined that this project would not require any discharge of dredged and/or fill material into waters of the United States but would involve work under a Section 10 navigable water of the United States, Little Miami River, a navigable water of the United States, and is subject to the requirements of Section 10.

In the submitted PCN materials, you have requested a DA authorization to extend electrical power under approximately 400 linear feet of the Little Miami River to the new wellfield. Specifically, horizontal directional drilling (HDD) will be used to install two (2) four (4)-inch high density polyethylene (HDPE) or polyvinyl chloride (PVC) electrical conduits. The HDD

drilling rig will be positioned in uplands in the riparian area of the river at River Creek Lofts development site and will exit within a wooded area on the opposite side of the river at the Warren County wellfield site. Equipment involved with the work under the Little Miami River will be staged in uplands and existing paths and areas will be utilized to gain access to the work areas on both side of the river. The proposal will not require any discharge of dredged and/or fill material into waters of the United States. All work in waters of the United States will occur during low flow conditions and conducted in accordance with the drawings submitted with the PCN.

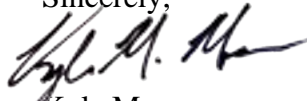
Based on your description of the proposed work, and other information available to us, it has been determined the proposed discharge of dredged and/or fill material into waters of the United States in conjunction with the proposed project meets the criteria for Nationwide Permit (NWP) No. 57 (enclosed) under the January 13, 2021 Federal Register, Reissuance and Modification of NWPs (86 FR 2744) provided you comply with all terms and conditions of the enclosed material and the enclosed special conditions. A copy of NWP 57 is enclosed.

This verification is valid until the expiration date of the NWPs, unless the NWP authorization is modified, suspended, or revoked. The verification will remain valid if the NWP authorization is reissued without modification, or the activity complies with any subsequent modification of the NWP authorization. The 2021 NWPs published January 13, 2021, in the Federal Register (86 FR 2744), are scheduled to be modified, reissued, or revoked on March 14, 2026. Prior to this date, it is not necessary to contact this office for re-verification of your project unless the plans for the proposed activity are modified. Furthermore, if you commence or under contract to commence this activity before March 14, 2026, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this NWP.

Please be aware this NWP verification does not obviate the requirement to obtain any other federal, state, or local assent required by law for the activities. In addition, this letter does not grant any property rights or exclusive privileges or authorize any injury to the property or rights of others.

A copy of the NWP and this verification letter must be kept at the site during construction. Upon completion of the activities authorized by this NWP verification, the enclosed certification must be signed and returned to this office. If you have any questions concerning the above, please contact Laurie Moore of the North Branch at 937-271-9942, by mail at the above address, or by email at laurie.a.moore@usace.army.mil.

Sincerely,



Kyle Moore
Regulatory Project Manager
North Branch

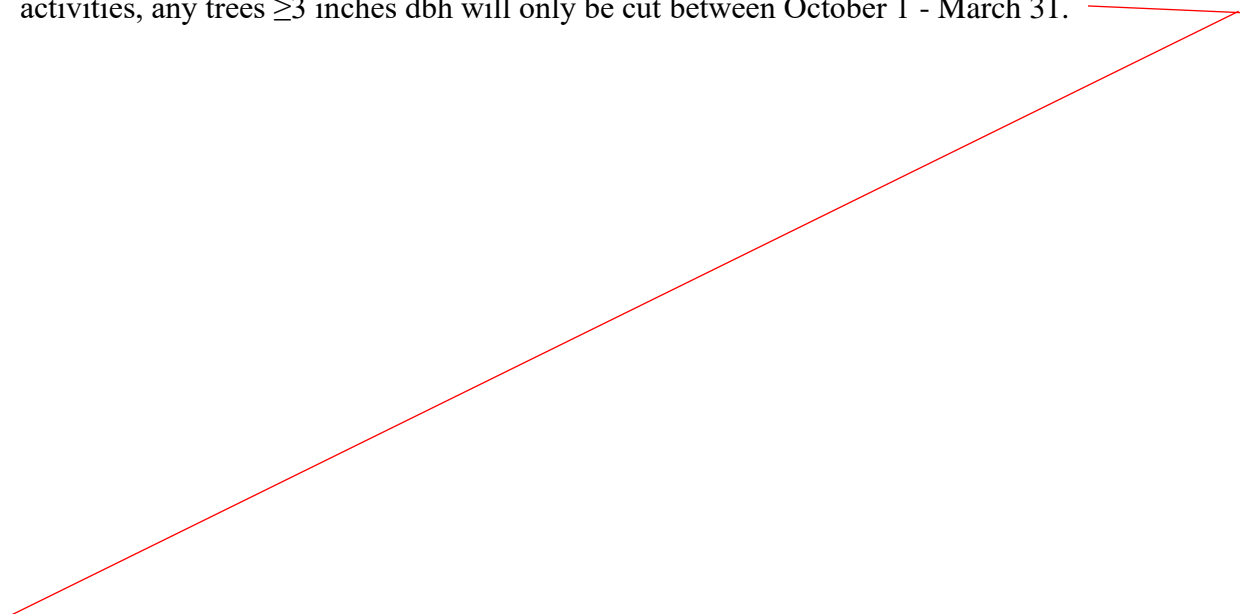
Enclosures

**SPECIAL CONDITIONS FOR NATIONWIDE PERMIT 57 VERIFICATION
MIDDLETOWN JUNCTION WELLFIELD ELECTRICAL UTILITY PROJECT
LEBANON, WARREN COUNTY, OHIO
LRH-2024-00908-LMR-LITTLE MIAMI RIVER
PAGE 1 OF 2**

1. All work will be conducted in accordance with the submitted pre-construction notification for the Middletown Junction Wellfield Electrical Utility Service Project.
2. Enclosed is a copy of Nationwide Permit 57, which will be kept at the site during construction. A copy of the nationwide permit verification, special conditions, and the submitted construction plans must be kept at the site during construction. The permittee will supply a copy of these documents to their project engineer responsible for construction activities.
3. Construction activities will be performed during low flow conditions to the greatest extent practicable. Additionally, appropriate site-specific best management practices for sediment and erosion control will be fully implemented during construction activities at the site.
4. Upon completion of the activity authorized by this Nationwide Permit verification, the enclosed certification must be signed and returned to this office along with as-built drawings showing the location and configuration, as well as all pertinent dimensions and elevations of the activity authorized under this Nationwide Permit verification.
5. No area for which grading has been completed will be unseeded or unmulched for longer than 14 days. All disturbed areas will be seeded and/or revegetated with native species and approved seed mixes (where practicable) after completion of construction activities for stabilization and to help preclude the establishment of non-native invasive species.
6. Should new information regarding the scope and/or impacts of the project become available that was not submitted to this office during our review of the proposal, the permittee will submit written information concerning proposed modification(s) to this office for review and evaluation, as soon as practicable.
7. In the event any previously unknown historic or archaeological sites or human remains are uncovered while accomplishing the activity authorized by this nationwide permit authorization, the permittee must cease all work in waters of the United States immediately and contact local, state and county law enforcement offices (only contact law enforcement on findings of human remains), the Corps at 304-399-5210 and Ohio State Historic Preservation Office at 614-298-2000. The Corps will initiate the Federal, state and tribal coordination required to comply with the National Historic Preservation Act and applicable state and local laws and regulations. Federally recognized tribes are afforded a government-to-government status as sovereign nations and consultation is required under Executive Order 13175 and 36 CFR Part 800.

**SPECIAL CONDITIONS FOR NATIONWIDE PERMIT 57 VERIFICATION
MIDDLETOWN JUNCTION WELLFIELD ELECTRICAL UTILITY PROJECT
LEBANON, WARREN COUNTY, OHIO
LRH-2024-00908-LMR-LITTLE MIAMI RIVER
PAGE 2 OF 2**

8. Section 7 obligations under Endangered Species Act must be reconsidered if new information reveals impacts of the project that may affect federally listed species or critical habitat in a manner not previously considered, the proposed project is subsequently modified to include activities which were not considered during Section 7 consultation with the United States Fish and Wildlife Service, or new species are listed or critical habitat designated that might be affected by the subject project.

 9. The project site lies within the range of the Indiana bat (*Myotis sodalis*), a federally-listed endangered species, and the tricolored bat (*Perimyotis subflavus*), a proposed federally-listed endangered species. Several factors have contributed to the two (2) species decline, including habitat loss, fragmentation of habitat and the disease White Nose Syndrome. During winter, the two (2) bat species hibernate in caves and abandoned mines. Suitable summer habitat for the Indiana bats and tricolored bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches diameter at breast height (dbh) that have any exfoliating bark, cracks, crevices, hollows and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. The permittee will preserve wooded/forested habitats exhibiting any of the characteristics listed above wherever possible. Should suitable habitat be present that cannot be saved during construction activities, any trees ≥ 3 inches dbh will only be cut between October 1 - March 31.
- 

Permit Number: LRH-2024-00908-LMR

Name of Permittee: Warren County Water & Sewer

Date of Issuance: 28 March 2025

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Huntington District
U. S. Army Corps of Engineers
502 8th Street
Huntington, West Virginia 25701-2070
Attn: RDN

Please note that your permitted activity is subject to a compliance inspection by an U. S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

PM: Laurie Moore

NATIONWIDE PERMITS FOR THE STATE OF OHIO

U.S. ARMY CORPS OF ENGINEERS (CORPS) REGULATORY PROGRAM REISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS WITH OHIO DEPARTMENT OF NATURAL RESOURCES CONSISTENCY DETERMINATION UNDER THE COASTAL ZONE MANAGEMENT ACT AND WAIVED OHIO EPA 401 WATER QUALITY CERTIFICATION

Final rule published in the *Federal Register* (86 FR 2744) on January 13, 2021

NWP 57

Expires: March 14, 2026

NWP 57. *Electric Utility Line and Telecommunications Activities.* Activities required for the construction, maintenance, repair, and removal of electric utility lines, telecommunication lines, and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.

Electric utility lines and telecommunication lines: This NWP authorizes discharges of dredged or fill material into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of electric utility lines and telecommunication lines. There must be no change in preconstruction contours of waters of the United States. An “electric utility line and telecommunication line” is defined as any cable, line, fiber optic line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and internet, radio, and television communication.

Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the electric utility line or telecommunication line crossing of each waterbody.

Electric utility line and telecommunications substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with an electric utility line or telecommunication line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges of dredged or fill material into

non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for overhead electric utility line or telecommunication line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead electric utility line or telecommunication line towers, poles, and anchors in all waters of the United States, provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of electric utility lines or telecommunication lines, including overhead lines and substations, in nontidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges of dredged or fill material into non-tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

This NWP may authorize electric utility lines or telecommunication lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (see 33 CFR part 322). Electric utility lines or telecommunication lines constructed over section 10 waters and electric utility lines or telecommunication lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit.

This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing electric utility lines or telecommunication lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing electric utility lines or telecommunication lines.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the electric utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to

the maximum extent practicable, when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) A section 10 permit is required; or (2) the discharge will result in the loss of greater than 1/10-acre of waters of the United States. (See general condition 32.) (Authorities: Sections 10 and 404)

Note 1: Where the electric utility line is constructed, installed, or maintained in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, a copy of the NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the electric utility line to protect navigation.

Note 2: For electric utility line or telecommunications activities crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Electric utility line and telecommunications activities must comply with 33 CFR 330.6(d).

Note 3: Electric utility lines or telecommunication lines consisting of aerial electric power transmission lines crossing navigable waters of the United States (which are defined at 33 CFR part 329) must comply with the applicable minimum clearances specified in 33 CFR 322.5(i).

Note 4: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP.

Access roads used solely for construction of the electric utility line or telecommunication line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 5: This NWP authorizes electric utility line and telecommunication line maintenance and repair activities that do not qualify for the Clean Water Act section 404(f) exemption for maintenance of currently serviceable fills or fill structures.

Note 6: For overhead electric utility lines and telecommunication lines authorized by this NWP, a copy of the PCN and NWP verification will be provided by the Corps to the Department of Defense Siting Clearinghouse, which will evaluate potential effects on military activities.

Note 7: For activities that require preconstruction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require preconstruction notification (see paragraph (b)(4) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, “District Engineer’s Decision.” The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

Corps NWP 57 Specific Regional Conditions:

- PCN in accordance with NWP General Condition 32 and Regional General Condition 6 is required for all permanent conversion of scrub/shrub and forested wetlands of greater than 1/10 of an acre per each single and complete project. Use of conversion in this regional condition relates to the change of a scrub/shrub and forested wetlands to a herbaceous state, but it would not result in a loss of waters of the United States as the wetland would continue to exist in the landscape.
- This NWP does not authorize the placement of manholes in wetlands.

Ohio Department of Natural Resources CZMA Federal Consistency Determination Condition:

- For all activities located within or along the shore of Ohio's portion of Lake Erie, including Maumee Bay and Sandusky Bay, all applicable authorizations under the Ohio Coastal Management Program must be obtained.

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation.

- a. No activity may cause more than a minimal adverse effect on navigation.
- b. Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.
- c. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below.

The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. Removal of Temporary Structures and Fills. Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers.

- a. No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study
- b. river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.
- c. If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.
- d. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: <http://www.rivers.gov/>.

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species.

- a. No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a
- b. species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which “may affect” a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of “effects of the action” for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding “activities that are reasonably certain to occur” and “consequences caused by the proposed action.”

- c. Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.
- d. Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity “may affect” or will have “no effect” to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps’ determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have “no effect” on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.
- e. As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWP.
- f. Authorization of an activity by an NWP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a

Biological Opinion with “incidental take” provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take” means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

- g. If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP
- h. activity or whether additional ESA section 7 consultation is required.
- i. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.nmfs.noaa.gov/pr/species/esa/> respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether “incidental take” permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties.

- a. No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register

- of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.
- b. Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If preconstruction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.
 - c. Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: No historic properties affected, no adverse effect, or adverse effect.
 - d. Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to

cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

- e. Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

- (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50,

51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWP's 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWP's only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

- a. The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).
- b. Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.
- c. Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require preconstruction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.
- d. Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100-acre and require preconstruction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100-acre or less that require preconstruction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult to-replace resources (see 33 CFR 332.3(e)(3)).

- e. Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.
- f. Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.
 - 1. The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the
 - 2. district engineer may approve the use of permittee-responsible mitigation.
 - 3. The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)
 - 4. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option
 - 5. considered for permittee-responsible mitigation.
 - 6. If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A

conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

7. If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).
 8. Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).
- g. Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.
- h. (h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

- i. Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality.

- a. Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401, a CWA section 401 water quality certification for the proposed discharge must be obtained or waived (see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.
- b. If the NWP activity requires preconstruction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.
- c. The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may

require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

- a. If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.
- b. If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2-acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

“When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.”

(Transferee)

(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

- a. A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;
- b. A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and
- c. The signature of the permittee certifying the completion of the activity and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States. If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification.

- a. **Timing.** Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the

prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

1. He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or
 2. 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).
- b. **Contents of Pre-Construction Notification:** The PCN must be in writing and include the following information:
1. Name, address and telephone numbers of the prospective permittee;
 2. Location of the proposed activity;
 3. Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;
 4.
 - i. A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s)

- used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures.
- ii. For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs.
 - iii. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);
 - iv. The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;
5. If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

7. For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;
 8. For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;
 9. For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the “study river” (see general condition 16); and
 10. For an NWP activity that requires permission from, or review by, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from, or review by, the Corps office having jurisdiction over that USACE project.
- c. **Form of Pre-Construction Notification:** The nationwide permit pre-construction notification form (Form ENG 6082) should be used for NWP PCNs. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.
- d. **Agency Coordination:**
1. The district engineer will consider any comments from Federal and state agencies concerning the proposed activity’s compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity’s adverse environmental effects so that they are no more than minimal.
 2. Agency coordination is required for:

- i. All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States;
 - ii. NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and
 - iii. NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.
3. When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the preconstruction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.
4. In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.
5. Applicants are encouraged to provide the Corps with either electronic files or multiple copies of preconstruction notifications to expedite agency coordination.

District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the single and complete crossings of waters of the United States that require PCNs to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings of waters of the United States authorized by an NWP. If an applicant requests a waiver of an applicable limit, as provided for in NWPs 13, 36, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects.
2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by an NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.
3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters. The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included

in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure that the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) That the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

Nationwide Permit Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural. Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term “discharge” means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the

use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Nontidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of “open waters” include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has surface water flowing continuously year-round during a typical year.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Preconstruction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where preconstruction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Reestablishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: Reestablishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and

distant locations. The term “single and complete project” is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of “independent utility”). Single and complete non-linear projects may not be “piecemealed” to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream’s course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized jurisdictional stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of

the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or individual; or (2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWP, a waterbody is a “water of the United States.” If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

Nationwide Permits Regional General Conditions For the State of Ohio

1. NWPs shall not authorize any regulated activity which negatively impacts bogs and/or fens.
2. NWPs shall not authorize any regulated activity in Lake Erie which would result in diversion of water from the Great Lakes.

3. NWP's shall not authorize any regulated activity which has an adverse impact on littoral transport within Lake Erie.

4. In-Water Work Exclusion Dates: Any work associated with a regulated activity under a nationwide permit cannot take place during the restricted period of the following Ohio Department of Natural Resources (ODNR), Division of Wildlife (DOW) In-Water Work Restrictions, unless the applicant receives advanced written approval from the DOW, notifies the District Engineer in accordance with Nationwide Permit General Condition 32 and Regional General Condition 6, and receives written approval from the Corps:

Statewide In-Water Work Restriction Periods and Locations

1. Salmonid Locations Restriction Period: September 15 – June 30

Arcola Creek (entire reach)
Ashtabula Harbor
Ashtabula River (Hadlock Rd. to mouth)
Aurora Branch (Chagrin River (RM 0.38 to mouth))
Big Creek (Grand River (Girdled Road to mouth))
Black River (entire reach)
Chagrin River (Chagrin Falls to mouth)
Cold Creek (entire reach)
Conneaut Creek (entire reach)
Conneaut Harbor
Corporation Creek (Chagrin River (entire reach))
Cowles Creek (entire reach)
Ellison Creek (Grand River (entire reach))
Euclid Creek (entire reach)
Fairport Harbor
Grand River (Dam at Harpersfield Covered Bridge Park to mouth)
Gulley Brook (Chagrin River (entire reach))
Huron River (East Branch-West Branch confluence to mouth)
Indian Creek (entire reach)
Kellogg Creek (Grand River (entire reach))
Mill Creek (Grand River (entire reach))
Paine Creek (Grand River (Paine Falls to mouth))
Rocky River (East Branch-West Branch confluence to mouth)
Smokey Run (Conneaut Creek (entire reach))
Turkey Creek (entire reach)
Vermilion River (dam at Wakeman upstream of the US 20/SR 60 bridge to mouth)
Ward Creek (Chagrin River (entire reach))
Wheeler Creek (entire reach)
Whitman Creek (entire reach)

2. Other Locations Restriction Period: March 15 – June 30

All other perennial streams not listed above as salmonid.
Also includes Lake Erie and bays not listed above as salmonid.

Note: This condition does not apply to Ohio Department of Transportation projects that are covered under the “Memorandum of Agreement Between The Ohio Department of Transportation, The Ohio Department of Natural Resources, and The United States Fish and Wildlife Service For Interagency Coordination For Projects Which Require Consultation Under the Endangered Species Act, Impact State Listed Species, and/or Modify Jurisdictional Waters 2016 Agreement Number: 19394” or subsequent amendments to this Ohio Department of Transportation memorandum of agreement.

5. Waters of Special Concern: PCN in accordance with NWP General Condition 32 and Regional General Condition 6 is required for regulated activities in the following resources:

- a. **Threatened and Endangered Species:** Due to the potential presence of federally threatened or endangered species or their habitats, PCN in accordance with NWP General Conditions 18 and 32 and Regional General Condition 6 is required for any regulated activity under the NWPs in Ohio that includes:
 - i. The removal of trees \geq three (3) inches diameter at breast height. These trees may provide suitable roosting, foraging, or traveling habitat for the federally listed endangered Indiana bat and the federally-listed threatened northern long-eared bat; and/or
 - ii. Regulated activities that impact a sand, gravel, and/or cobble beach (landform between the low and high water marks affected by waves) and/or mud flat (areas affected by natural seiche effect) on the Lake Erie shoreline; and/or
 - iii. Regulated activities in the waterway or township of the corresponding counties listed in Appendix 1.

Note 1: Applicants must ensure they are referencing the latest version of Appendix 1 by contacting their nearest U.S. Army Corps of Engineers district office and visiting the online resources identified in General Condition 18(f) of these NWPs, since federally listed species are continuously listed, proposed for listing, and/or de-listed.

Note 2: As mentioned in General Condition 18, federal applicants should follow their own procedures for complying with the requirements of the Endangered Species Act (ESA). Federal applicants, including applicants that have received federal funding, must provide the District Engineer with the appropriate documentation to demonstrate compliance with ESA requirements.

- b. **Critical Resource Waters:**

- i. In Ohio, two (2) areas have been designated critical habitat for the piping plover (*Charadrius melodus*) and are defined as lands 0.62 mile inland from normal high water line. Unit OH-1 extends from the mouth of Sawmill Creek to the western property boundary of Sheldon Marsh State Natural Area, Erie County, encompassing approximately two (2) miles. Unit OH-2 extends from the eastern boundary line of Headland Dunes Nature Preserve to the western boundary of the Nature Preserve and Headland Dunes State Park, Lake County, encompassing approximately 0.5 mile.
 - ii. In Ohio three (3) areas have been designated critical habitat for the rabbitsfoot mussel (*Quadrula cylindrica cylindrica*). Unit RF26 includes 17.5 river kilometers (rkm) (10.9 river miles [rimi]) of the Walhonding River from the convergence of the Kokosing and Mohican Rivers downstream to Ohio Highway 60 near Warsaw, Coshocton County, Ohio. Unit RF27 includes 33.3 rkm (20.7 rmi) of Little Darby Creek from Ohio Highway 161 near Chuckery, Union County, Ohio, downstream to U.S. Highway 40 near West Jefferson, Madison County, Ohio. Unit RF29 includes 7.7 rkm (4.8 rmi) of Fish Creek from the Indiana and Ohio State line northwest of Edgerton, Ohio, downstream to its confluence with the St. Joseph's River north of Edgerton, Williams County, Ohio.
 - iii. Old Woman Creek National Estuarine Research Preserve.
- c. **Oak Openings:** Wetland activities conducted in the Oak Openings Region of Northwest Ohio located in Lucas, Henry and Fulton Counties. For a map of the Oak Openings Region, visit <https://www.google.com/maps/d/viewer?mid=1JADupaZXJzO6AUDvnUaV18GVjG7yfBim&usp=sharing>
- d. **Category 3 Wetlands:** As determined through use of the latest approved version of the Ohio Environmental Protection Agency's Ohio Rapid Assessment Method wetland evaluation form.
- e. **Ohio Stream Designations:** Exceptional Warmwater Habitat, Cold Water Habitat, Seasonal Salmonid, or any equivalent designation; or water bodies with an antidegradation category of Superior High Quality Water, Outstanding National Resource Water, or Outstanding State Waters as determined by the Ohio Environmental Protection Agency except for NWP 1, 2, 3, 9, 10, 11, 27, 28, 32, and 35 or maintenance activities covered under NWPs 7 and 12. The current list of these rivers and tributaries can be found on the Ohio Environmental Protection Agency web-site at: http://www.epa.ohio.gov/dsw/rules/3745_1.aspx. These designations can be found under the aquatic life use of the rivers and tributaries within its basin and under the "Anti-deg Rule #05."
6. **PCN Submittals:** In addition to the information required under NWP General Condition 32, the following information must be provided with the PCN:

- a. **Threatened and Endangered Species:** Section 7(a)(2) of the Endangered Species Act (ESA) states that each federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Section 7 of the ESA, called "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the continued existence of any federally or proposed federally listed species. Consistent with NWP General Condition 18, information for federally threatened and endangered species must be provided in the PCN to determine the proposed activity's compliance with NWP General Condition 18 and to facilitate project-specific coordination with the USFWS. All relevant information obtained from the USFWS must be submitted with the PCN.
- b. **Cultural Resources:** Under the National Historic Preservation Act (NHPA), the Corps must ensure no federal undertaking, including a Corps permit action, which may affect historic resources, is commenced before the impacts of such action are considered and the Advisory Council on Historic Preservation and the State Historic Preservation Office (SHPO) are provided an opportunity to comment as required by the NHPA, 36 CFR 800, and 33 CFR 325, Appendix C. Consistent with NWP General Condition 20, historic properties information must be provided in the PCN if the proposed undertaking might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. All relevant information obtained from the SHPO must be submitted with the PCN.
- c. **National Wild and Scenic Rivers:** The following waterways are components of the National Wild and Scenic River System and require PCN to the Corps:

Big and Little Darby Creeks

- Big Darby Creek from Champaign-Union County line downstream to the Conrail railroad trestle and from the confluence with the Little Darby Creek downstream to the Scioto River;
- Little Darby Creek from the Lafayette-Plain City Road bridge downstream to within 0.8 mile from the confluence with Big Darby Creek; and
- Total designation is approximately 82 miles.

Little Beaver Creek

- Little Beaver Creek main stem, from the confluence of West Fork with Middle Fork near Williamsport to mouth;
- North Fork from confluence of Brush Run and North Fork to confluence of North Fork with main stem at Fredericktown;

- Middle Fork from vicinity of Co. Rd. 901 (Elkton Road) bridge crossing to confluence of Middle Fork with West Fork near Williamsport;
- West Fork from vicinity of Co. Rd. 914 (Y-Camp Road) bridge crossing east to confluence of West Fork with Middle Fork near Williamsport; and
- Total designation is 33 miles.

Little Miami River

- Little Miami River - St. Rt. 72 at Clifton to the Ohio River;
- Caesar Creek - lower two (2) miles of Caesars Creek; and
- Total designation is 94 miles.

d. **Temporary Fills or Structures:** When a PCN is required for temporary fills or structures, the PCN must specify how long the temporary fills or structures will remain and include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-construction contours and elevations. Native, non-invasive vegetation must be used unless otherwise authorized by a Corps NWP verification.

7. **Invasive Species:** No area for which grading has been completed will be unseeded or unmulched for longer than 14 days. All disturbed areas will be seeded and/or revegetated with native species and approved seed mixes (where practicable) after completion of construction activities for stabilization and to help preclude the establishment of non-native invasive species.

APPENDIX 1 TO REGIONAL GENERAL CONDITION 5 (a)		
County	Waterway	Township
Adams	Ohio River, Scioto Brush Creek, South Fork Scioto Brush Creek	
Ashtabula	Grand River, Pymatuning Creek	Andover, Austinburg, Cherry Valley, Colebrook, Dorset, Hartsgrove, Harpersfield, Morgan, New Lyme, Orwell, Richmond, Rome, Trumbull, Wayne, Williamsfield, Windsor
Athens	Ohio River	
Brown	East Fork Little Miami River, Ohio River	
Butler	Great Miami River	Lemon, Liberty
Champaign		Mad River, Union, Urbana
Clark	Little Miami River	Bethel, Moorfield, Pleasant, Springfield
Clermont	East Fork Little Miami River, Little Miami River,	

APPENDIX 1 TO REGIONAL GENERAL CONDITION 5 (a)

County	Waterway	Township
	Ohio River	
Clinton		Chester, Richland, Wayne
Columbiana		Butler, Fairfield, Hanover, Knox, Unity
Coshocton	Killbuck Creek, Muskingum River, Walhonding River	
Crawford		Auburn, Bucyrus, Cranberry, Dallas, Holmes, Whetstone
Darke	Stillwater River	
Defiance	St. Joseph River	Milford
Delaware	Mill Creek, Olentangy River	
Erie		Margaretta
Fairfield		Walnut
Fayette		Concord, Green, Jasper, Union
Franklin	Big Darby Creek, Little Darby Creek, Scioto River	
Fulton	Swan Creek	
Gallia	Ohio River	
Greene	Little Miami River	Bath, Beaver Creek, Spring Valley, Sugar Creek
Hamilton	Great Miami River, Little Miami River, Ohio River	
Hancock	Blanchard River	
Hardin	Blanchard River	Blanchard, Dudley, Hale, Jackson, McDonald, Roundhead
Hocking		Benton, Laurel
Holmes		All townships
Huron		New Haven, Richmond
Lake	Grand River	Madison
Lawrence	Ohio River	
Licking		Licking, Union
Logan	Great Miami River	Perry, Richland, Stokes, Washington, Zane
Lucas	Swan Creek	All townships
Madison	Big Darby Creek, Little Darby Creek	
Mahoning		Beaver, Boardman, Canfield, Green, Poland, Springfield
Marion	Tymochtee Creek	Big Island, Bowling Green, Grand, Green Camp, Montgomery, Salt Rock

APPENDIX 1 TO REGIONAL GENERAL CONDITION 5 (a)

County	Waterway	Township
Meigs	Ohio River	
Miami	Great Miami River, Stillwater River	
Montgomery	Great Miami River, Stillwater River	Mad River, Wayne
Morgan	Muskingum River	
Muskingum	Muskingum River	
Ottawa		All townships
Perry		Thorn
Pickaway	Big Darby Creek, Scioto River	
Pike	Scioto River	
Portage		Aurora, Atwater, Charlestown, Deerfield, Edinburg, Franklin, Freedom, Mantua, Nelson, Palmyra, Paris, Randolph, Ravenna, Rootstown, Streetsboro
Preble		Dixon, Gasper, Israel, Jackson, Lanier, Monroe, Somers, Twin, Washington
Richland		Plymouth
Ross	Salt Creek, Scioto River	
Sandusky		All townships
Scioto	Ohio River, Scioto Brush Creek, Scioto River, South Fork Scioto Brush Creek	Nile, Rush, Union
Shelby	Great Miami River	
Stark		Lexington, Marlboro
Summit		Hudson, Tallmadge, Twinsburg
Trumbull	Pymatuning Creek	All townships
Union	Big Darby Creek, Little Darby Creek, Mill Creek, Treacle Creek	Allen, Darby, Washington
Warren	Great Miami River, Little Miami River	Clear Creek, Deerfield, Massie, Turtle Creek, Union, Washington, Wayne
Washington	Muskingum River, Ohio River	
Wayne		All townships
Williams	Fish Creek, St. Joseph River	Bridgewater, Center, Florence, Jefferson, Madison, Northwest, St. Joseph, Superior
Wyandot	Tymochtee Creek	Antrim, Marseilles, Mifflin, Pitt

HELPFUL INFORMATION FOR COMPLIANCE WITH THE NWP GENERAL CONDITIONS:

DISCLAIMER: The below information is intended to provide helpful contact information and other submittal recommendations. Contact the appropriate local, state, or federal agency for the most updated links to ensure compliance with the NWP General Conditions.

General Condition 1 (Navigation)

List of Section 10 Navigable Waters of the U.S.:

Buffalo District –

https://www.lrb.usace.army.mil/Portals/45/docs/regulatory/DistrictInfo/waterway_oh.pdf

Huntington District – <https://www.lrh.usace.army.mil/Missions/Regulatory/Section-10-Streams/>

Louisville District –

<https://www.lrl.usace.army.mil/Portals/64/docs/Regulatory/Public%20Notices/Limits%20of%20Jurisdiction%20Public%20Notice-revised.pdf?ver=2013-02-13-120705-203>

Pittsburgh District –

<https://www.lrp.usace.army.mil/Portals/72/docs/regulatory/RegulatoryBoundaries/PN12-2.pdf>

Navigation Charts:

Buffalo District – <https://www.lrb.usace.army.mil/Library/Maps-and-Charts/>

Huntington District – <https://www.lrh.usace.army.mil/Missions/Regulatory/Section-10-Streams/>

Louisville District –

<https://www.lrl.usace.army.mil/Portals/64/docs/Ops/Navigation/Charts/Ohio/OhioRiverCharts102-122.pdf>

Pittsburgh District – <https://www.lrp.usace.army.mil/Missions/Navigation/Navigation-Charts/>

Locks and Dams:

Buffalo District – <https://www.lrb.usace.army.mil/Library/Maps-and-Charts/>

Huntington District – <https://www.lrh.usace.army.mil/Missions/Civil-Works/Locks-and->

Dams/

Louisville District – <https://www.lrl.usae.army.mil/Missions/Civil-Works/Navigation/Locks-and-Dams/>

Pittsburgh District –
<https://www.lrp.usace.army.mil/Missions/Navigation/Locks-and-Dams/#:~:text=Locks%20and%20Dams%20%20%20Allegheny%20River%20,Locks%20%26%20Dam%20%205%20more%20rows%20>

Notice to Navigation Interests Request Sheets:

Huntington District –
<https://www.lrh.usace.army.mil/Portals/38/docs/navigation/Notice%20Info%20sheet.pdf>

Louisville –
<https://www.lrl.usace.army.mil/Portals/64/docs/Regulatory/Forms/Notice%20to%20Navigation%20Interests%20Data%20Form%202019.pdf?ver=2019-07-22-101251-297>

Pittsburgh District –
<https://www.lrp.usace.army.mil/Portals/72/docs/regulatory/NavNoticeRequestForm.pdf>

General Condition 5 (Shellfish Beds)

Shellfish beds in Ohio include concentrations of freshwater mussels. All native mussels are protected in the State of Ohio (Section 1533.324 of the Ohio Revised Code). In addition, 10 federally listed species occur in the state and are protected by the ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). All rivers and tributaries that contain mussels or potential mussel habitat must be surveyed prior to any proposed streambed disturbance. Currently accepted protocol and supporting materials can be found on the Ohio Department of Natural Resources' website:

<https://ohiodnr.gov/wps/portal/gov/odnr/buy-and-apply/special-use-permits/collecting-research/ohio-mussel-surveyor>

General Condition 7 (Water Supply Intakes)

Locations of drinking water source protection areas associated with public water supply intakes, including the name of the public water supply, can be found at the following link:

<https://oepa.maps.arcgis.com/apps/webappviewer/index.html?id=3b39e11ba7fc43c3b41801e3580e6d21>

Contact information for public water suppliers can be obtained from Ohio EPA by contacting the Division of Drinking and Ground Waters at whp@epa.ohio.gov or 614-644-2752.

General Condition 10 (Fills Within 100-year Floodplains)

The following website provides a statewide listing of Floodplain Managers in Ohio:
<https://ohiodnr.gov/wps/portal/gov/odnr/discover-and-learn/safety-conservation/about-ODNR/water-resources/floodplains/>

General Condition 16 (Wild and Scenic Rivers)

Prior to submitting a PCN for work in a National Wild and Scenic River System, it is recommended that the applicant contact the National Park Service Regional Wild and Scenic Rivers Specialist, at the Midwest Regional Office, 601 Riverfront Drive, Omaha, Nebraska 68102, for assistance in complying with NWP General Condition 16. Any determination provided by the National Park Service should be submitted with the PCN. The following website provides information on National Wild and Scenic Rivers within Ohio:

<https://www.rivers.gov/ohio.php>

General Condition 18 (Endangered Species)

To obtain the most up to date information on federally threatened and endangered species applicants are encouraged to utilize the USFWS's Information for Planning and Consultation System (IPaC) found at <https://ecos.fws.gov/ipac/>

Prior to the submittal of a PCN, applicants may also contact the USFWS, Ohio Ecological Services Field Office at:

Address: 4625 Morse Road, Suite 104
Columbus, Ohio 43230

Email: ohio@fws.gov

Phone: (614) 416-8993

The Ohio Mussel Survey Protocol may be found at the following link:

<https://ohiodnr.gov/wps/portal/gov/odnr/buy-and-apply/special-use-permits/collecting-research/ohio-mussel-surveyor>

General Condition 4 (Migratory Bird Breeding Areas) and General Condition 19 (Migratory Birds and Bald and Golden Eagles)

Prior to the submittal of a PCN, information to assist in complying with NWP General Conditions 4 and 19 may be obtained from the USFWS, Ohio Ecological Services Field Office at:

Address: 4625 Morse Road, Suite 104
Columbus, Ohio 43230

Email: ohio@fws.gov

Phone: (614) 416-8993

The Ohio Division of Natural Resources Division of Wildlife may be contacted at (800) 945-3543.

General Condition 20 (Historic Properties)

The Ohio National Register of Historic Places can be found at the following link:
<https://www.ohiohistory.org/preserve/state-historic-preservation-office/nationalregister>

When reviewing a PCN, the Corps will scope appropriate historic property identification efforts and, if applicable, work with the applicant to take into account the effect of the proposed activity on historic properties. In these instances, information and coordination may include:

- Requesting comments directly from the Ohio History Connection SHPO on the effect the proposed regulated activity may have on historic properties. The Ohio History Connection SHPO may be contacted at:

Address: Ohio History Center
800 E. 17th Ave., Columbus, Ohio 43211
Phone: (614) 297-2300
Email: info@ohiohistory.org

- To identify potential historic properties that may be affected by a proposed project, the following information may be reviewed and/or provided with the PCN when applicable:
 - A detailed description of the project site in its current condition (i.e. prior to construction activities) including information on the terrain and topography of the site, the acreage of the site, the proximity of the site to major waterways, and any known disturbances within the site.
 - A detailed description of past land uses in the project site.
 - Photographs and mapping showing the site conditions and all buildings or structures within the project site and on adjacent parcels are useful. Photographs and maps supporting past land uses should be provided as available.
 - Information regarding any past cultural resource studies or coordination pertinent to the project area, if available.
 - U.S. Geological Survey (USGS) 7.5' series topographic maps;
 - Ohio History Connection SHPO files including:

- Ohio Archaeological Inventory (OAI) files;
 - Ohio Historic Inventory files (OHI);
 - Ohio SHPO Cultural Resources Management (CRM)/contract archaeology files;
 - NRHP files including Historic Districts; and
 - County atlases, histories and historic USGS 15' series topographic map(s).
- When needed to evaluate effects to historic properties, the applicant is encouraged to consult with professionals meeting the Professional Qualification Standards as set forth in the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716) during this data gathering process. These professionals can assist with compiling the project information discussed above and should provide recommendations as to whether the proposal has the potential to affect historic properties and if further effort is needed to identify or assess potential effects to historic properties. These professionals can also compile preliminary review information to submit to the District Engineer as part of the PCN.

General Condition 23 (Mitigation)

Information pertaining to mitigation can be found at the following link:
<https://www.lrh.usace.army.mil/Missions/Regulatory/Mitigation.aspx>

General Condition 25 (Water Quality)

The Ohio Environmental Protection Agency may be contacted at:

Address: Lazarus Government Center
50 W Town St. Suite 700
Columbus, Ohio 43215

Phone: (614) 644-2001

Information pertaining to the Ohio Environmental Protection Agency water quality certification (WQC) program, including the Section 401 Clean Water Act WQC application form, can be obtained at the following link:
<https://www.epa.state.oh.us/dsw/#113292723-programs>

General Condition 32 (Pre-Construction Notification)

The nationwide permit pre-construction notification form (Form ENG 6082) may be obtained at the following link:

https://www.publications.usace.army.mil/Portals/76/Eng_Form_6082_2019Oct.pdf?ver=2019-10-22-081550-710/

A checklist of information that must be provided in a pre-construction notification can be obtained at the following link:

<https://www.lrh.usace.army.mil/Missions/Regulatory/How-to-Apply-for-a-Permit/Nationwide-Permits/>

Electronic Submittal:

- PCNs should be saved as a PDF document, and then submitted as an attachment in an email to the appropriate Regulatory Office:

Buffalo District – LRB.Ohio.RegActions@usace.army.mil

Huntington District – LRH.permits@usace.army.mil

Louisville District – CELRL.Door.To.The.Corps@usace.army.mil

Pittsburgh District – Regulatory.Permits@usace.army.mil

- Electronic documents must have sufficient resolution to show project details. The PCN and supporting documents submitted electronically must not exceed 10 megabytes (10MB) per email. Multiple emails may be required to transmit documents to ensure the 10MB limit is not exceeded. Alternatively, use of the Department of Defense Secure Access File Exchange (DoD SAFE) service to transfer large files may be requested in your email.
- For tracking and processing purposes, the email should include the following:
 - **Email Subject Line:** include the name of the applicant, type of PCN request, and location (County and State). Example: RE: Doe, John, PCN and Section 401 WQC Request, Summit County, Ohio;
 - **Email Body:** 1) Brief description of the proposed project, 2) contact information (phone number, mailing address, and email address) for the applicant and/or their agent, and 3) the project location: Address and Latitude/Longitude in decimal degrees (e.g. 42.92788° N, 88.36257° W).
- If you do not have internet access, information may be submitted through the U.S. Postal Service to the appropriate Regulatory Office:

U.S. Army Corps of Engineers, Buffalo District

ATTN: Regulatory Branch

1776 Niagara Street

Buffalo, New York 14207

Phone: (716) 879-4330

Fax: (716) 879-4310

U.S. Army Corps of Engineers, Huntington District
ATTN: Regulatory Division
502 Eighth Street
Huntington, West Virginia 25701-2070
Phone: (304) 399-5210
Fax: (304) 399-5805

U.S. Army Corps of Engineers, Pittsburgh District
ATTN: Regulatory Division
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186
Phone: (412) 395-7155
Fax: (412) 644-4211

U.S. Army Corps of Engineers, Louisville District
ATTN: CELRL-RD, Room 752
600 Dr. Martin Luther King Jr. Place
Louisville, Kentucky 40202-0059
Phone: (502) 315-6733
Fax: (502) 315-6677

SECTION 00 70 30
STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

The Warren County Water and Sewer Department has adopted the Standard General Conditions of the Construction Contract prepared by the Engineers Joint Contract Documents Committee and issued and published by the American Consulting Engineers Council, the National Society of Professional Engineers, and the American Society of Civil Engineers. This document, contained herein, shall be made part of the Contract and shall be used during the performance of the work, except as modified by the following SECTION 00 80 10 Supplemental Conditions.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

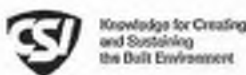
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AMERICAN SOCIETY OF CIVIL ENGINEERS

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The Associated General Contractors of America



Construction Specifications Institute

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National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314

American Council of Engineering Companies
1015 15th Street, N.W., Washington, DC 20005

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor Nos. C-520 or C-525 (2002 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC Construction Documents, General and Instructions (No. C-001) (2002 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. C-800) (2002 Edition).

TABLE OF CONTENTS

	<u>Page</u>
ARTICLE 1 - DEFINITIONS AND TERMINOLOGY	6
1.01 <i>Defined Terms</i>	6
1.02 <i>Terminology</i>	8
ARTICLE 2 - PRELIMINARY MATTERS	9
2.01 <i>Delivery of Bonds and Evidence of Insurance</i>	9
2.02 <i>Copies of Documents</i>	9
2.03 <i>Commencement of Contract Times; Notice to Proceed</i>	9
2.04 <i>Starting the Work</i>	9
2.05 <i>Before Starting Construction</i>	9
2.06 <i>Preconstruction Conference</i>	9
2.07 <i>Initial Acceptance of Schedules</i>	9
ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE	10
3.01 <i>Intent</i>	10
3.02 <i>Reference Standards</i>	10
3.03 <i>Reporting and Resolving Discrepancies</i>	10
3.04 <i>Amending and Supplementing Contract Documents</i>	11
3.05 <i>Reuse of Documents</i>	11
3.06 <i>Electronic Data</i>	11
ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS	11
4.01 <i>Availability of Lands</i>	11
4.02 <i>Subsurface and Physical Conditions</i>	12
4.03 <i>Differing Subsurface or Physical Conditions</i>	12
4.04 <i>Underground Facilities</i>	13
4.05 <i>Reference Points</i>	13
4.06 <i>Hazardous Environmental Condition at Site</i>	13
ARTICLE 5 - BONDS AND INSURANCE	14
5.01 <i>Performance, Payment, and Other Bonds</i>	14
5.02 <i>Licensed Sureties and Insurers</i>	15
5.03 <i>Certificates of Insurance</i>	15
5.04 <i>Contractor's Liability Insurance</i>	15
5.05 <i>Owner's Liability Insurance</i>	16
5.06 <i>Property Insurance</i>	16
5.07 <i>Waiver of Rights</i>	17
5.08 <i>Receipt and Application of Insurance Proceeds</i>	17
5.09 <i>Acceptance of Bonds and Insurance; Option to Replace</i>	17
5.10 <i>Partial Utilization, Acknowledgment of Property Insurer</i>	18
ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES	18
6.01 <i>Supervision and Superintendence</i>	18
6.02 <i>Labor; Working Hours</i>	18
6.03 <i>Services, Materials, and Equipment</i>	18
6.04 <i>Progress Schedule</i>	18
6.05 <i>Substitutes and "Or-Equals"</i>	19
6.06 <i>Concerning Subcontractors, Suppliers, and Others</i>	20
6.07 <i>Patent Fees and Royalties</i>	21
6.08 <i>Permits</i>	21
6.09 <i>Laws and Regulations</i>	21
6.10 <i>Taxes</i>	22
6.11 <i>Use of Site and Other Areas</i>	22
6.12 <i>Record Documents</i>	22
6.13 <i>Safety and Protection</i>	22
6.14 <i>Safety Representative</i>	23
6.15 <i>Hazard Communication Programs</i>	23

6.16	<i>Emergencies</i>	23
6.17	<i>Shop Drawings and Samples</i>	23
6.18	<i>Continuing the Work</i>	24
6.19	<i>Contractor's General Warranty and Guarantee</i>	24
6.20	<i>Indemnification</i>	24
6.21	<i>Delegation of Professional Design Services</i>	25
ARTICLE 7 - OTHER WORK AT THE SITE		25
7.01	<i>Related Work at Site</i>	25
7.02	<i>Coordination</i>	26
7.03	<i>Legal Relationships</i>	26
ARTICLE 8 - OWNER'S RESPONSIBILITIES		26
8.01	<i>Communications to Contractor</i>	26
8.02	<i>Replacement of Engineer</i>	26
8.03	<i>Furnish Data</i>	26
8.04	<i>Pay When Due</i>	26
8.05	<i>Lands and Easements; Reports and Tests</i>	26
8.06	<i>Insurance</i>	26
8.07	<i>Change Orders</i>	26
8.08	<i>Inspections, Tests, and Approvals</i>	26
8.09	<i>Limitations on Owner's Responsibilities</i>	27
8.10	<i>Undisclosed Hazardous Environmental Condition</i>	27
8.11	<i>Evidence of Financial Arrangements</i>	27
ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION		27
9.01	<i>Owner's Representative</i>	27
9.02	<i>Visits to Site</i>	27
9.03	<i>Project Representative</i>	27
9.04	<i>Authorized Variations in Work</i>	27
9.05	<i>Rejecting Defective Work</i>	27
9.06	<i>Shop Drawings, Change Orders and Payments</i>	28
9.07	<i>Determinations for Unit Price Work</i>	28
9.08	<i>Decisions on Requirements of Contract Documents and Acceptability of Work</i>	28
9.09	<i>Limitations on Engineer's Authority and Responsibilities</i>	28
ARTICLE 10 - CHANGES IN THE WORK; CLAIMS		28
10.01	<i>Authorized Changes in the Work</i>	28
10.02	<i>Unauthorized Changes in the Work</i>	29
10.03	<i>Execution of Change Orders</i>	29
10.04	<i>Notification to Surety</i>	29
10.05	<i>Claims</i>	29
ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK		30
11.01	<i>Cost of the Work</i>	30
11.02	<i>Allowances</i>	31
11.03	<i>Unit Price Work</i>	31
ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES		32
12.01	<i>Change of Contract Price</i>	32
12.02	<i>Change of Contract Times</i>	33
12.03	<i>Delays</i>	33
ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK		33
13.01	<i>Notice of Defects</i>	33
13.02	<i>Access to Work</i>	33
13.03	<i>Tests and Inspections</i>	33
13.04	<i>Uncovering Work</i>	34
13.05	<i>Owner May Stop the Work</i>	34
13.06	<i>Correction or Removal of Defective Work</i>	34
13.07	<i>Correction Period</i>	34
13.08	<i>Acceptance of Defective Work</i>	35
13.09	<i>Owner May Correct Defective Work</i>	35
ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION		36
14.01	<i>Schedule of Values</i>	36
14.02	<i>Progress Payments</i>	36
14.03	<i>Contractor's Warranty of Title</i>	37
14.04	<i>Substantial Completion</i>	37

14.05	<i>Partial Utilization</i>	38
14.06	<i>Final Inspection</i>	38
14.07	<i>Final Payment</i>	38
14.08	<i>Final Completion Delayed</i>	39
14.09	<i>Waiver of Claims</i>	39
ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION.....		39
15.01	<i>Owner May Suspend Work</i>	39
15.02	<i>Owner May Terminate for Cause</i>	39
15.03	<i>Owner May Terminate For Convenience</i>	40
15.04	<i>Contractor May Stop Work or Terminate</i>	40
ARTICLE 16 - DISPUTE RESOLUTION.....		41
16.01	<i>Methods and Procedures</i>	41
ARTICLE 17 - MISCELLANEOUS.....		41
17.01	<i>Giving Notice</i>	41
17.02	<i>Computation of Times</i>	41
17.03	<i>Cumulative Remedies</i>	41
17.04	<i>Survival of Obligations</i>	41
17.05	<i>Controlling Law</i>	41
17.06	<i>Headings</i>	41

GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*--The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*--The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*--A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*--The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*--The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*--See Paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*--The individual or entity named as such in the Agreement.

20. *Field Order*--A written order issued by Engineer which requires minor changes in the Work but which does

not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*--The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*--Polychlorinated biphenyls.

31. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*--A schedule, prepared and maintained by Contractor, describing the sequence and

duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

37. *Resident Project Representative*--The authorized representative of Engineer who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

44. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

45. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

46. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

47. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

48. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*—Work to be paid for on the basis of unit prices.

51. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by

Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

- a. does not conform to the Contract Documents, or
- b. does not meet the requirements of any applicable inspection, reference standard, test, or

approval referred to in the Contract Documents, or

c. has been damaged prior to Engineer's - recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which

Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other

submittals, processing Applications for Payment, and maintaining required records.

2.07 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor

may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, 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.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
- b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Hazardous Environmental Condition at Site

A. Reports and Drawings: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
2. other data, interpretations, 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.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice:

(i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, 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 a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence

of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclu-

sion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include completed operations insurance;
4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, (other than caused by flood) and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;
3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
5. allow for partial utilization of the Work by Owner;
6. include testing and startup; and
7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and

any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and,

in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make

settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques,

sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 Substitutes and "Or-Equals"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute

item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties 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 for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use 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 Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, 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 any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, 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 such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on

entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 Taxes

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, 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 any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the

Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or

indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 Safety Representative

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 Hazard Communication Programs

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 Shop Drawings and Samples

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples*: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the

requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to

revisions other than the corrections called for by Engineer on previous submittals.

6.18 Continuing the Work

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor's General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, 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 performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures.

Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 Related Work at Site

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and
2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 Legal Relationships

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and

disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 Communications to Contractor

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 Replacement of Engineer

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 Furnish Data

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 Pay When Due

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 Lands and Easements; Reports and Tests

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 Insurance

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 Change Orders

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to

check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the

Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,
2. approve the Claim, or
3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

B. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All

cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone

directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect any other item of Work; and
3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier

Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.c, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections,

tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 Uncovering Work

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, 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 such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 Owner May Stop the Work

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 Correction or Removal of Defective Work

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, 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 such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 Correction Period

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, 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 such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, 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) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, 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) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to

an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 Progress Payments

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment,

including final payment, will impose responsibility on Engineer:

- a. to supervise, direct, or control the Work, or
- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
- d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
- e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

- a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
- b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
- c. there are other items entitling Owner to a set-off against the amount recommended; or
- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue

a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

- a. all documentation called for in the Contract Documents, including but not limited to the

evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and, will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),
2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
3. all claims, 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) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment

within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or
2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will 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 or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

**SECTION 00 80 10
SUPPLEMENTAL CONDITIONS**

PART 1 GENERAL

1.1 GENERAL

- A. These Supplementary Conditions shall modify and supplement the Standard General Conditions of the Construction Contract (Section 00 70 30, EJCDC C-700), and shall govern whenever they conflict. All provisions which are not so amended or supplemented remain in full force and effect.

1.2 MODIFICATIONS TO ARTICLES OF THE GENERAL CONDITIONS

A. ARTICLE 1 – DEFINITIONS

1. Paragraph 1.01.A.19 is supplemented with the following: Where the term “Engineer” is used in the Specification for the approval of materials or work, it shall be understood to mean Warren County Water & Sewer. Contractor acknowledges that Engineer is a full-time employee appointed by Owner, and Engineer is not an independent third party, rather is a department of the governmental entity of Owner (Warren County Board of Commissioners) a political subdivision of Ohio.
2. Paragraph 1.01.A.29 is supplemented with the following: Whenever the term “Owner” is used in the Contract Documents, it shall refer to Warren County Board of Commissioners on behalf of Warren County Water & Sewer, or its authorized representative.

B. ARTICLE 2 – PRELIMINARY MATTERS

1. Paragraph 2.03 – Commencement of Contract Time: Notice to Proceed is amended as follows: Delete the last sentence.

C. ARTICLE 4 – AVAILABILITY OF LANDS; SURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

1. Paragraph 4.06(G) shall be deleted.

D. ARTICLE 5 – BONDS AND INSURANCE

1. Paragraph 5.01.A – Amend the second sentence to read: “ ...These bonds shall remain in effect not less than one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents”
2. Paragraph 5.01.D – Add the following paragraph:

“D. If the Contractor provided a certified or cashier’s check or letter of credit as Bid Security, he shall furnish a Performance Bond in an amount at least equal to 100% of the Contract Price as security for the faithful performance of this agreement.”

3. Paragraph 5.04.C – Add the following new paragraph immediately after 5.04.B:

“C. The Contractor shall, at his own expense, purchase and maintain the following minimum coverage:

1. Workers Compensation, for claims for bodily injury, sickness, disease or death as follows:
 - a. Coverage A Statutory Benefits as described by the applicable law.
 - b. Coverage B Employer’s Liability
 - i. \$500,000 Bodily Injury by Accident – each employee
 - ii. \$500,000 Bodily Injury by disease – each employee
 - iii. \$500,000 Bodily Injury by disease – policy limit

The Contractor shall provide a copy of a certificate of premium payment from the Industrial Commission and Bureau of Workers Compensation, State of Ohio, for the period of time specified during which construction commences and copies of renewal certificates for subsequent periods, so long as the project continues.

2. Comprehensive General Liability Coverage for Bodily Injury and Property Damage – occurrence form.

General Aggregate	\$2,000,000	Each occurrence, combined single limit for Bodily Injury and Property Damager
Products – Completed Operations	\$1,000,000	Each occurrence
Aggregate	\$2,000,000	
Personal and Advertising Liability per Occurrence	\$1,000,000	Combined Single Limit for Bodily Injury and Property Damager

Coverage shall be extended to include the following:

- a. Per project and per location aggregate.
- b. Premises and operations coverage.
- c. Coverage for liability and independent contractors.
- d. Products and completed operations.
- e. Coverage for explosion, collapse and underground hazards.

- f. Stop-Gap Liability: All monopolistic states - \$1,000,000.
- g. Owner as additional insureds.
- h. Waiver of Subrogation against Owner
- i. 60-Day Notice of Cancellation or material change.

3. Comprehensive Automobile Liability Insurance – Occurrence Form

Any Automobile	\$1,000,000	Bodily Injury and Property Damage, Combined Single Limit
----------------	-------------	--

Borrowed, Non-Owned	\$1,000,000	Bodily Injury and Hired Automobile Property Damage, Combined Single Limit
---------------------	-------------	---

Coverage shall be extended to include:

- a. Contractual liability for assumed liability.
- b. Owner as additional insureds.
- c. Waiver of Subrogation against Owner
- d. 60 Day Notice of Cancellation or material change.
- e. Motor Carrier Act Endorsement MCS-90
- f. Extra Wide/Extra Heavy Hauling Permit Endorsement

4. Any Umbrella Liability or Excess Liability Policy over primary comprehensive General and Automobile Liability shall be carried in a minimum amount of:

\$5,000,000 Each Occurrence
 \$5,000,000 Aggregate

The Umbrella or Excess Policy shall be following the form of:

- a. Any Additional Insured under primary policy.
- b. Per project and per location aggregates.
- c. Explosion, Collapse, or Underground Hazards
- d. Stop-Gap Liability
- e. Waiver of Subrogation against Owner.
- f. Watercraft (when employed to perform the work).
- g. Aircraft (when employed to perform the work).
- h. 60-Day Notice of Cancellation or material change.

4. Paragraph 5.06 – *Property Insurance* – shall be DELETED in its entirety.

D. ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

1. Paragraph 6.01.A – After the first sentence add: “Contractor’s Work shall be performed according to the standards of care normally exercised by construction organizations within Ohio that are engaged in performing comparable services devoting such attention thereto and applying such skills as may be necessary to perform the work in accordance with the Contract Documents.”
2. Paragraph 6.02.C – Add a new paragraph as follows:
 - “C. If the Contractor does not perform the work in accordance with the Contractor’s construction schedule and the project construction schedule, and it becomes apparent that the work may not be completed within the contract times, the Contractor shall, at no additional cost to the Owner, as necessary to improve the Contractor’s progress: (a) increase the number of employees in such crafts as will regain lost scheduled progress; and (b) increase the number of working hours per shift, shifts per work day, working days per week, the amount of equipment, or any combination of the foregoing measures to regain lost scheduled progress. Contractor shall furnish such employees, materials, facilities, and equipment, and shall work such hours, including extra shifts, overtime operations, and Sundays and holidays, as may be necessary to insure the prosecution and completion of the work in accordance with the Contractor’s construction schedule and the project construction schedule.”
3. Paragraph 6.02.D – Add a new paragraph as follows:
 - “D. Contractor shall at all times maintain good discipline and order at the site. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. If the Owner deems any employee of the Contractor or a subcontractor unsatisfactory, the Contractor must transfer or require its subcontractor to transfer such employee from the project immediately.”
4. Paragraph 6.05(E) - shall be deleted.
5. Paragraph 6.08 – Replace this Paragraph with the following:
 - “A. Permit requirements are specified in Section 0020 00 – INSTRUCTIONS TO BIDDERS, and 00 70 20 – PERMITS.
6. Paragraph 6.10 – Taxes, is amended as follows:
 - “A. OWNER, being a public body, is exempt from taxes on material incorporated into the work. CONTRACTOR, therefore, is not

required to pay such materials taxes. The OWNER will provide the tax exemption forms. These forms are to contain all necessary information required by the State. CONTRACTOR shall be responsible for payment of any applicable commercial activity tax.

- B. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated to the Work.
- C. Contractor is specifically required to abide by all local tax requirements, if any, including income tax requirements to withhold at source. Contractor acknowledges that the Contract work may take place in various cities and taxing districts, and further acknowledges different tax burdens may be imposed by each. Contractor shall indemnify, defend, and hold Owner harmless for any federal, state, or local tax liabilities incurred as a result of Contractor performing the Work."

- 6. Paragraphs 6.13 and 6.14 – Safety and Protection, are supplemented with the following: "All construction work under this Agreement is subject to Chapter XVII of Title 29, Code of Federal Regulations (CFR) Part 1926 (formerly Chapter XVII of Title 29, Part 1518) titled, "Safety and Health Regulations for Construction" and subsequent amendments."

E. ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

- 1. Paragraph 9.01 – Add the following sentence: The parties acknowledge and agree that ENGINEER is a full-time employee of OWNER and is not an independent third party, however, ENGINEER shall perform any duties under this agreement in good faith and adhere to a standard of professional care and skill ordinarily used by members of the subject profession practicing under similar circumstances at the same time and in the same locality.

F. ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

- 1. Paragraph 10.03.A.4 – Add the following paragraph:
 - "4. In no event is the Contractor entitled to reserve any rights or take other similar action with respect to a change order if the effect or intent of such reservation or action would be to accommodate a further adjustment in the contract times, contract price, or both, after the Contractor executes the change order. By executing a change order, the Contractor irrevocably certifies that the elements of the change order described are completely satisfied and waives all rights to seek further adjustment of the contract times, contract price, or both, at a later date with respect to the associated change in the work."

E. ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

1. Paragraph 11.01(A)(3) – Amend the Second Sentence as follows: DELETE the phrase “If required by Owner”. Add Sentence OWNER requires CONTRACTOR to competitively bid work from subcontractors.

2. Paragraph 11.01(D) Add the following Sentence: This agreement shall be subject to open book pricing, CONTRACTOR shall make any all bids, invoices, receipts, any and all documentation for expenses and costs available for inspection by OWNER immediately upon request.

Paragraph 11.01.B.1 – Add project manager and project executive to the list of excluded compensation and payroll costs.

E. ARTICLE 12 – CHANGE OF CONTRACT PRICE, CHANGE OF CONTRACT TIMES

1. Paragraph 12.01.C.2.e – Add the following to the end of paragraph 12.01.C.2.e: “Any change that results in a net decrease in cost shall include the appropriate overhead and profit added thereto calculated as set forth in ARTICLE 12 of the General Conditions.”

2. Paragraph 12.01.D – Insert new paragraph as follows: “D. In no event shall Contractor be entitled to any increase in the Contract Price on account of any adverse weather.”

3. Paragraph 12.02.B – Replace Paragraph 12.02.B with the following:

“B. If the Contractor wishes to make a claim for an increase in contract times, prompt written notice as provided herein shall be given. The Contractor’s claim shall include an estimate of cost and of probable effect of delay on progress of the work, a detailed schedule which identifies the critical portions of the work impacted by the delaying event and the dates of such impact, and a statement from Contractor that the increase requested is the entire increase in the contract time associated with the claim. The failure to provide such information and statement within the time period established in Paragraph 10.05.B shall constitute an irrevocable waiver of the claim. In the case of a continuing delay occurring on consecutive days, only one claim is necessary, provided, however, that within ten (10) days of the cessation of the cause of the continuing delay, the Contractor shall notify the Owner in writing that the cause of the delay has ceased. The failure to give notice of the cessation of the cause of the continuing delay shall constitute an irrevocable waiver of any claim based upon the continuing delay.”

4. Add the following paragraph as Paragraph 12.02.C:

“In addition to the requirements of Paragraph 12.02.B, if adverse weather conditions are the basis for a claim for additional time, the contractor shall

support such claim with data acceptable to the Owner and Engineer that substantiates that weather conditions were significantly abnormal for the period of time and could not have reasonably been anticipated and that weather conditions had an adverse effect on a critical element of the scheduled construction. Notwithstanding any other provisions of the Contract Documents to the contrary, the project times will not be adjusted on account of the impact of a normal adverse weather or any of the work or on account of the impact of any abnormal adverse weather on non-critical elements of the work. The support for the evaluation of all adverse-weather claims resulting in lost workdays shall be based upon criteria as provided for in the State of Ohio Department of Transportation (ODOT) Construction and Material Specifications dated January 1, 2013. ODOT Specification 108.06.C lists the number of days that the Contractor may expect to be lost due to weather as follows:

Month	Number of Days Lost Due to Weather
January	8
February	8
March	7
April	6
May	5
June	5
July	4
August	4
September	5
October	6
November	6
December	6

5. Paragraph 12.03.F – Add new paragraph as follows:

“F. Any proposed time extensions for delays requested because of abnormal weather conditions shall be subject to Paragraph 12.02.C.”

6. Paragraph 12.03.G. – Add new paragraph as follows:

“G. Delays beyond the substantial completion date attributable to and within the control of the Contractor, their Subcontractor, or Supplier shall be subject to liquidated damages in the amounts specified in SECTION 00 60 10 – CONTRACT.”

F. ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

1. Paragraph 15.01.A. – Delete the sentence that states: “Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

REPLACE the above sentence with the following: Contractor shall be granted an extension of the Contract Times directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

2. Paragraph 15.03.A(3) – shall be DELETED in its entirety.

G. ARTICLE 14 – PAYMENT TO CONTRACTOR AND COMPLETION

1. Add new Paragraph 14.02.A.4 as follows:

“4. In accordance with ORC Section 153.12 partial payments to the Contractor for labor performed under either a unit or lump sum price contract shall be made at the rate of ninety-two per cent of the estimates prepared by the Contractor and approved by the Engineer. All labor performed after the job is fifty percent completed shall be paid for at the rate of one hundred per cent of the estimates submitted by the Contractor and approved by the Engineer. A Contract shall be considered 50 percent complete when the Contractor has been paid an amount equal to 50 percent of the total cost of the labor of the Contract and 50 percent of the total cost of the material of the Contract.

All materials furnished and delivered but not actually included in the construction and approved by the Owner, after the work under this contract is 50 percent complete, shall be paid for at the rate of 92 percent of the invoiced value of the materials. The balance of such estimates shall be paid when the material is incorporated into and becomes a part of the building construction.

When the major portion of the project is substantially completed and occupied, or in use, or otherwise accepted, and there exists no other reason to withhold retainage, the retained percentages held in connection with such portion shall be released and paid to the contractor, withholding only that amount necessary to assure completion.

All retained payments shall be deposited into an escrow account at the 1st National Bank, 1160 E. Main Street, Lebanon Ohio (513) 932-3221, Contact: Gail Haines. The Contractor may waive their right to deposit the payments in an escrow account by written request to the Owner. Retained payments not deposited into an escrow account will be held by the Owner for future payment to the Contractor.”

2. Amend Paragraph 14.02.C to read: “Thirty days after presentation”

G. ARTICLE 16 – DISPUTE RESOLUTION

1. Delete Paragraphs 16.01.A, 16.01.B, and 16.01.C and replace with the following:

“1. This Contract shall be construed under the laws of the State of Ohio, and the parties hereby stipulate to the venue for any and all claims, disputes, interpretations, litigation of any kind arising out of this Contract being exclusively in the Warren County, Ohio Court of Common Pleas (unless both parties mutually agree in writing to alternate dispute resolution), as well as waiving any right to bring or remove such matters in or to any other state or federal court.”

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PROJECT MANUAL

FOR

**MIDDLETOWN JUNCTION WELLFIELD
DEVELOPMENT**

FOR THE

BOARD OF COUNTY COMMISSIONERS
WARREN COUNTY, OHIO

WESSLER ENGINEERING, INC.
80 STATE ROUTE 103, SUITE C
BLUFFTON, OHIO 45817

MAY 2025

PROJECT MANUAL
FOR
MIDDLETOWN JUNCTION WELLFIELD DEVELOPMENT
FOR THE
BOARD OF COUNTY COMMISSIONERS
WARREN COUNTY, OHIO

WESSLER ENGINEERING, INC.
BLUFFTON, OHIO

Certified By:



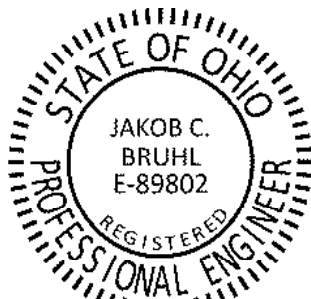
05/16/2025

Ryan K. Brauen
Professional Engineer No. E-79180



05/19/2025

Wayne C. Moore
Covering Electrical
Professional Engineer No. E-70068



05/16/2025

Jakob C. Bruhl, Ph.D.
Covering Structural
Professional Engineer No. E-89802

MAY 2025

TABLE OF CONTENTS

A. CONTRACTUAL-LEGAL REQUIREMENTS

General Documents

OH 00101 – Title Sheet	1 Page
OH 00110 – Table of Contents	2 Page

B. TECHNICAL SECTIONS OF THE SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

Section 01010 – Summary of Work	3 Pages
Section 01050 – Construction Engineering	2 Pages
Section 01090 – Reference Standards	3 Pages
Section 01200 – Project Meetings	2 Pages
Section 01300 – Submittals	6 Pages
Section 01400 – Quality Assurance and Quality Control	5 Pages
Section 01500 – Construction Facilities and Temporary Controls	5 Pages
Section 01600 – Material and Equipment	2 Pages
Section 01650 – Starting of Systems	4 Pages
Section 01710 – Cleaning	3 Pages
Section 01720 – Project Record Documents	3 Pages
Section 01990 – Schedule of Values	4 Pages

DIVISION 2 – SITE WORK

Section 02101 – Stormwater Pollution Prevention and Erosion Control	14 Pages
Section 02102 – Material Handling and Spill Prevention	8 Pages
Section 02110 – Site Clearing	3 Pages
Section 02111 – Recording of Construction Areas	4 Pages
Section 02200 – Earthwork	9 Pages
Section 02226 – Trenchless Excavation – Directional Drilling	5 Pages
Section 02660 – Water Mains	11 Pages
Section 02670 – Water Well Pumps and Motors	11 Pages
Section 02675 – Disinfection	5 Pages

DIVISION 3 – CONCRETE

Section 03100 – Concrete Formwork	5 Pages
Section 03200 – Concrete Reinforcement	6 Pages
Section 03300 – Cast-in-Place Concrete	19 Pages

DIVISION 5 – METALS

Section 05120 – Structural Steel	10 Pages
Section 05520 – Miscellaneous Metals	9 Pages

DIVISION 8 – DOORS AND WINDOWS

Section 08310 – Aluminum Floor Access Hatches 4 Pages

DIVISION 9 – FINISHES

Section 09900 – Protective Coatings 16 Pages

DIVISION 13 – SPECIAL CONSTRUCTION

Section 13400 – Measurement and Control Instrumentation 12 Pages
Section 13420 – Field-Mounted Instruments 14 Pages
Section 13431 – Control Panel Design and Construction 12 Pages
Section 13441 – Miscellaneous Control Panel Components 8 Pages
Section 13450 – Modular Programmable Logic Controllers 6 Pages
Section 13455 – SCADA Local Area Network (LAN) Equipment 8 Pages
Section 13456 – Uninterruptable Power Supply (UPS) 4 Pages
Section 13482 – SCADA and Control Systems - IO List 5 Pages
Section 13491 – SCADA System – Configuration Services 8 Pages
Section 13492 – SCADA System - Testing and Commissioning 5 Pages
Section 13494 – SCADA System – Training 2 Pages

DIVISION 16 – ELECTRICAL

Section 16000 – Basic Electrical Requirements 12 Pages
Section 16111 – Conduit 9 Pages
Section 16118 – Underground Ducts and Handholes 4 Pages
Section 16123 – Building Wire and Cable 10 Pages
Section 16130 – Outlet and Junction Boxes 4 Pages
Section 16141 – Wiring Devices 5 Pages
Section 16170 – Grounding and Bonding 4 Pages
Section 16190 – Supporting Devices 3 Pages
Section 16195 – Electrical Identification 3 Pages
Section 16440 – Disconnect Switches 3 Pages
Section 16461 – Dry Type Distribution Transformers 5 Pages
Section 16470 – Panelboards 7 Pages
Section 16495 – Variable Frequency Drives 15 Pages
Section 16496 – Automatic Transfer Switch 9 Pages
Section 16500 – Lighting 7 Pages
Section 16780 – Video Surveillance Systems 4 Pages

C. APPENDICES

Appendix A

Test Well TW-2 Evaluation, Middletown-Junction Property 82 Pages

-END-

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 Summary

A. The Base Bid Lump Sum Work includes:

1. Well improvements: Installation of three submersible well pumps, motors, piping, pitless adapters, new elevated steel service platforms, site fencing, meter valve vault, security cameras, relocate existing generator, and supporting electrical and instrumentation improvements for the development of a three million gallon per day wellfield (3 MGD).

B. The Base Bid Unit Price Work includes:

1. Installation of approximately 75 linear feet of 8-inch ductile iron water main, 600 linear feet of 10-inch ductile iron water main, and 1,210 linear feet of 12-inch ductile iron water main by open cut installation, including all related valves, fittings, restraints, services hydrants, sample stations, appurtenances, and other incidental work necessary for complete installation.

1.02 Contract

A. Work shall be constructed under a unit Price and Lump Sum Contract.

- ###### **B. The Contractor shall not be allowed extra compensation by reason of any matter or thing concerning which the Contractor might have fully informed himself prior to the bidding. No verbal agreement, understandings, or conversations with a representative or employee of the Owner or Engineer, either before or after the execution of this Contract, shall affect or modify the terms of obligations herein contained.**

1.03 Completion

- ###### **A. Commence Work required by the Contract Documents within 10 days after the date of the Notice to Proceed, and fully complete the Work within the Contract Times stated in the Bid Attachment and Agreement unless the Contract Times are extended otherwise by the Contract Documents.**

- ###### **B. The Project will not be ready for substantial completion review until test and performance evaluations are completed, all Work is complete and ready for service and the site is clear of construction rubbish and debris.**

- 1.04 Work by Others
- A. The Owner reserves the right to let other Contracts in connection with other portions of the project.
- 1.05 Items to be Provided by Owner
- A. Those items shown on the Drawings and/or specified herein.
- 1.06 Coordination
- A. Select order of Work and establish schedule or working hours for construction, subject to approval of Engineer which will assure orderly and expeditious progress of Work.
- B. Maintain existing service affected by Contractors' operations under the contract. Schedule construction to minimize interruptions to existing services, and inconveniences to others.
- 1.07 Rights of Access
- A. The Contractor agrees that representatives of the Engineer, Owner and regulatory agencies will have access to the Work wherever it is in preparation or progress and that the Contractor will provide facilities for such access and inspection.
- 1.08 Safety and Health Regulations for Construction
- A. Obligations prescribed as employer obligations under Chapter XVII of Title 29, Code of Federal Regulations, Part 1926, otherwise known as "Safety and Health Regulations for Construction and CFR Part 1910.46 Permit Required for Confined Space" are the sole responsibility of the Contractor. Provide Engineer the name of the Contractor's Safety Officer, plus the on-site Safety Representative, if other than the Superintendent, as indicated under Article 6.21 of the General Conditions of the Construction Contract.
- 1.09 Discovery of Hazardous Material
- A. If, during the course of this Work, the existence of hazardous material, including asbestos containing material, is observed in the Work area, immediately notify the Engineer in writing. Do not perform any Work pertinent to the hazardous material prior to receipt of special instructions from the Engineer.
- 1.10 Easements
- A. The Owner will obtain right-of-way easements over and through certain lands for construction. The width or limits of such easements will be defined by the Owner before the Work begins. If the methods of construction employed by the Contractor require the use of land beyond these limits, make agreements with the property owners affected for the use of such additional land. Such additional agreements will not include any liability for the Owner or Engineer and shall have no direct effect on the completion of the project, project cost, or the time of completion.

- B. The concrete monuments do not align with the property line as recorded at the County Recorder's Office and with the property pins for the occupancy survey. The GIS property lines were used. ODNR did not provide verification for the location of the concrete monuments and did not express concern with using the GIS property line.
- C. Place backfill to the grade of the existing ground level or as otherwise shown on the Drawings.
- D. Include the cost of all restoration of property in the Contractor's bid. No additional payment will be allowed for restoration Work.

1.11 Operations Within Right-of-Way

- A. If the methods of the construction employed are such as to require the use of land beyond the public right-of-way limits, make arrangements with the property owners affected for the use of such additional land. Such additional agreements will not include any liability for the Owner or Engineer and shall have no direct effect on the completion of the project, project cost, or the time of completion.

1.12 Permits

- A. The Owner will obtain permits related to the design and construction of the completed facilities, including but not limited to, permits from the following:
 - 1. Ohio Environmental Protection Agency (OEPA) – Plan Review
 - 2. Warren County Floodplain Building Application
 - 3. Army Corps of Engineers 404
- B. Obtain copies of the permits listed above from the Owner and abide by all terms and conditions of the permits.
- C. Obtain permits related to construction activities as specified in the General Conditions.
 - 1. All necessary permits or licenses from the city, state or county in connection with construction procedures will be obtained by the Contractor. The construction shall be performed in full accordance with all requirements of the State of Ohio as well as county and local requirements.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

SECTION 01050 - CONSTRUCTION ENGINEERING

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Providing all equipment, personnel and materials necessary for performing Construction Engineering, including layout and verification of existing conditions and infrastructure, to complete the Work as described in these Specifications.

1.02 Project/Site Conditions

A. Field Measurements

1. Make all measurements and check all dimensions and elevations necessary for the proper construction of the Work called for by the Drawings and Specifications.
2. Make all necessary measurements to prevent misfitting in said Work, and be responsible for the accuracy of the layout, staking and construction of the Work.

PART 2 - MATERIALS

Not Used.

PART 3 - EXECUTION

3.01 Examination

A. Verification of Conditions

1. Check and verify elevations and locations of existing infrastructure and conditions shown on the Drawings, or otherwise present at the site, that may affect the Work. Allow adequate time for modifications to be made to the Work to account for conditions which may differ from those shown on the Drawings.
2. Verify conditions and accessible existing infrastructure prior to the preparation of shop drawings associated with, or that may be impacted by, existing conditions and infrastructure.
3. Obtain and verify elevations of inaccessible infrastructure immediately after exposure by excavation.
4. No additional compensation will be made to the Contractor for failure to obtain this information in a timely manner which would have permitted modifications to the Work that would have avoided additional work, delays, and cost.

3.02 Preparation

- A. Perform all necessary Construction Engineering, including layout and staking, to ensure that the Work conforms to the lines, grades, and elevations shown on the Drawings or otherwise specified or required.
 - 1. Establish all necessary lines, points, and corners with references for recovery of said items during construction.
 - 2. Conduct a level circuit to establish additional benchmarks for use during construction.
 - 3. Set stakes for structures.
 - 4. Set any other reference points as required for control lines and grades.
- B. When staking utilities, perform the necessary checking to establish location and grade to best fit the conditions.

-END-

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. General reference standards, rules and regulations that govern construction work, alterations, repairs, mechanical installations and appliances connected therewith
2. Abbreviations used in these Specifications

1.02 Quality Assurance

A. Regulatory Requirements: Work shall comply with the following:

1. Occupational Safety and Health Act
2. Ohio Department of Transportation
3. State Building rules and regulations of The Ohio Revised Building Code
4. Ohio State Fire Marshal
5. Ohio Environmental Protection Agency
6. Ohio Department of Natural Resources
7. Army Corps of Engineers
8. National Electric Code
9. National Electric Safety Code
10. Uniform Building Code
11. Uniform Mechanical Code
12. Life Safety Code
13. Utility regulations
14. Local ordinances, state, and federal rules and regulations pertaining to the Work

B. Such rules, regulations and ordinances are to be considered part of these Specifications.

C. Fees for licenses shall be paid by the Contractor.

1.03 Reference Abbreviations

A. Reference to a technical society, trade association or standards setting organization may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAR	Association of American Railroads
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute

ADC	Air Diffusion Council
AFBMA	Anti-Friction Bearing Manufacturers Association
A-E	Architect/Engineer
AGA	American Gas Association
AHAM	Association of Home Appliance Manufacturers
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	The Engineered Wood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
FS	Federal Specifications
FHWA	Federal Highway Administration, Department of Transportation
FM	Associated Factory Mutual Laboratories
GANA	Glass Association of North America
HPVA	Hardwood Plywood and Veneer Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
IGCC	Insulating Glass Certification Council
IPCEA	Insulated Power Cable Engineers Association
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NAIMA	North American Insulation Manufacturers Association
NAVFAC	U.S. Naval Facilities Engineering Command
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association

NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
OPC	Ohio Plumbing Code
OSHA	Occupational Safety and Health Administration
PCI	Precast Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PFI	Pipe Fabricators Institute
SAE	Society of Automotive Engineers
SPECS	Specifications
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPI	Society of the Plastics Industry
SSPC	The Society for Protective Coatings
STI	Steel Tank Institute
TCNA	Tile Council of North America
UL	Underwriter's Laboratories, Inc.
USBR	US Bureau of Reclamation
WWPA	Western Wood Products Association

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 Preconstruction Conference

- A. A Preconstruction Conference will be scheduled within 30 days after delivery of the Owner-executed Agreement to the Contractor, but before starting the Work. The Engineer will make arrangements for the meeting at the site or other location and notify participants in advance of the meeting date, time and location. Required attendees include the Engineer, Contractor, Subcontractors, and the Owner or his representative. Significant proceedings of this meeting will be recorded by the Engineer and copies distributed to the participants.
- B. At the meeting, submit a preliminary Construction Progress Schedule, Schedule of Submittals (including name, type and specification section), Schedule of Values (per Section 01990) and a list of subcontractors and suppliers if a list was not previously submitted with the Contractor's bid, or if subcontractors and suppliers have changed.

1.02 Monthly Progress Meetings

- A. A monthly Progress Meeting will be conducted on a specific day of every month at the job site. A supervisory representative, able to make management decisions, from the Contractor shall attend the meeting. The date, time and location of said meeting will be determined at the Preconstruction Conference.
- B. Present a written status report, neatly prepared, at each meeting. The status report shall include at least the following information: Construction progress, update of schedule, delays, changes, status of RFIs, RFPs, problems, differing conditions, anticipated payment requests, personnel changes, and regulatory compliance updates. The status report shall cover all subcontractors.
- C. Require the attendance of subcontractors' supervisory personnel, as necessary, to assist in the presentation of the status report.
- D. Prepare 5 copies of the status report for distribution to the Engineer's representatives.
- E. If the Contractor fails to have a supervisory representative attend the Progress Meeting or if the Contractor fails to distribute a written status report as specified above, approval of a Partial Payment Application may be withheld until such time as the Progress Meeting can be rescheduled.
- F. Significant proceedings of this meeting will be recorded by the Engineer and copies distributed to the participants.

1.03 Special Meetings

- A. Special Meetings may be called by the Engineer or Contractor as progress of the Work dictates.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

SECTION 01300 – SUBMITTALS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Administrative and procedural requirements for submittals and construction documentation, including Construction Progress Schedules, Shop Drawings, Product Data, requests for information (RFIs), field transmittal memos (FTMs), samples, tests, O&M manuals, and Partial Pay Claims.

1.02 Electronic Document Management

- A. All submittals, including Shop Drawings, RFIs, Field Orders, Change Orders, Change Order Requests, FTMs, Partial Pay Claims, record drawings, and other documents and communications between Contractor and Engineer for the Project shall be submitted and processed through the email.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Construction Schedules

- A. Submit Progress Schedules (Bar Charts or CPM/PERT Charts) at the monthly Progress Meetings during the contract period.
 1. Provide complete sequence of construction by activity showing dates for beginning and completion of each element of construction.
 2. Identify Work in separate phases, or other logically grouped activity.
 3. Identify first work day of each week on a horizontal time scale. Sheet size shall be 24" x 36" maximum and 8 ½" x 11" minimum, but of sufficient size to allow space for updating.
- B. Engineer will review Progress Schedules for conformance to the contract completion dates. If required, resubmit within 7 days after return of reviewed copy addressing Engineer's review comments.
- C. Show all changes occurring since previous submission of updated schedule. Indicate progress of each activity and show completion dates. Include major changes in scope, activities modified since previous updating, revised projections due to changes and other identifiable changes.

- D. If the Progress Schedule reflects completion date(s) different than the Contract Times, the Contract Times are not thereby voided, nullified, or affected. The Contract Times govern. Where the Progress Schedule reflects completion date(s) that are earlier than the Contract Times, the Engineer may accept such Progress Schedule with the Contractor to specifically understand that no Change Request or Claim for additional Contract Time or Contract Price shall be brought resulting from the Contractor's inability to complete the Work by the earlier date(s) indicated on the accepted Progress Schedule.
- E. Distribute copies of monthly progress schedule to Engineer, the job site file, subcontractors, and other concerned parties.
- F. Instruct recipients to report any inability to comply, and provide detailed explanation, with suggested remedies.

3.02 Alternate or "or equal" items

- A. A Specification followed by one or more manufacturers and "or approved equal" is open to equal products or materials as determined to be "equal" solely by the Engineer. The Engineer's decision shall be final in this regard.
- B. Where specific manufacturers and/or model numbers for products or materials are listed in the detailed Specifications, these items have served as the basis for the design of the improvements in this project. Products and materials submitted as an alternate or "or equal" item must be certified by the Contractor as:
 - 1. Meeting or exceeding the requirements of the detailed Specifications,
 - 2. Being of equal or better quality, and
 - 3. Being of equal function to the specific manufacturer and/or model listed.
- C. If the submitted alternate or "or equal" item requires any modification or deviation from the Drawings, prepare and submit detailed drawings to the Engineer showing all modifications in structures, piping, or other Work required to adapt the Work to the submitted alternate or "or equal" item. The Engineer will review the submitted detailed drawings of the modifications and indicate whether changes are necessary to comply with the project requirements. Detailed drawings which do not comply with the project requirements shall be revised and resubmitted.
- D. The Contractor's listed "add" or "deduct" associated with alternate products and materials shall be based upon an "installed price" and shall take into consideration and include any cost of the design or construction changes that may be required as a result of an alternate or "or equal" product or material.
- E. Voluntary alternate and/or "or equal" products or materials that is installed by Contractor but fails to meet the specified requirements as determined by the Engineer shall be replaced with the specified item at the Contractor's expense.

3.03 Shop Drawings

A. General

1. References to Shop Drawings in this Section 01300 shall by definition include Product Data and other descriptive data.
2. Submit Shop Drawings to the Engineer within 30 days after Notice-to-Proceed.
3. The Engineer shall have 21 calendar days from the date of receipt of a complete submittal to review and return the submittal. The Contractor shall not be allowed any claims for Shop Drawing review that is completed within the 21-day review period.
 - a. The Engineer may agree to expedite his Shop Drawing review on an item by item basis, but it is imperative that all Shop Drawing submittals be complete and properly marked as indicated in this Section 01300.
 - b. Completion of the project within the contracted time is critical. Engineer cannot review incomplete or poor quality Shop Drawings and will not accept responsibility for any delays caused by incomplete or poor quality Shop Drawing submittals.
 - c. It is the Contractor's responsibility to submit legible Shop Drawings. Faxed copies of the Shop Drawings are unacceptable and will be returned without review.
4. Contractor agrees that Shop Drawing submittals processed by the Engineer are not Change Orders; that the purpose of Shop Drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which products and materials he intends to furnish and install, and by detailing the fabrication and installation methods he intends to use.
5. Review of Shop Drawings does not relieve Contractor of responsibility for correct ordering of products and materials. Contractor's review should ensure that products will fit in available space.
6. Contractor further agrees that if deviations, discrepancies or conflicts between Shop Drawings and Specifications are discovered either prior to or after Shop Drawing submittals are processed by the Engineer, the design Drawings and Specifications shall control and shall be followed.

B. Contractor Submittal Procedure

1. Submit Shop Drawings to the Engineer for every product and all components to be used in the Work in accordance with the General Conditions, individual Sections, and this Section 01300.
2. Shop Drawings shall be submitted and processed electronically. Submit all electronic submittals through email to both Owner and Engineer.
 - a. The Engineer reserves the right to request up to two (2) hard copies of all submittals.
 - b. Full-size drawings may be requested by the Engineer for review.
3. Provide a letter of transmittal to the Engineer for each submittal. The letter of transmittal shall contain the name of the project, workmanship and materials Section number, the name of the Contractor, the list of drawings submitted including numbers and titles, and any other pertinent information for the items being submitted.

4. If any part of a Shop Drawing lists data or information which is in conflict or differs from the Specification or Drawings, clearly note the difference or conflict on the submittal and include in the cover letter a description of the differences entitled "Exceptions to the Specifications and/or Drawings".
 - a. Information on submittals which contain differences or discrepancies which are not clearly noted shall be considered "not reviewed" with any of the Shop Drawing action codes and may be rejected.
5. Coordinate and submit complete sets of Shop Drawings in brochure form and include all related items in one brochure.
6. Do not markup Shop Drawings in red font. Engineer will make all his review comments in red font.
7. Submit Shop Drawings to the Engineer for review before products are ordered or sent to the project.
8. Complete submittals shall include all significant data and a response to each requirement listed in the Specifications. Submittals which do not comply with these requirements may be returned as incomplete and without review.
9. Shop Drawings shall be of sufficient detail to assure the items comply with the Specifications, and shall provide the necessary data for installation, operation, and maintenance.
10. Submittals shall be applicable to this project and not a "cover-all", "general", or "typical" drawing or catalog cut-sheet unless it is made to indicate the products being provided specifically for this project using the following methods:
 - a. Include project name, product name, and other items or identifiers and descriptions on the drawings and cut sheets.
 - b. All sizes, special features, options, modifications, etc., that are provided specific to this project are noted in some fashion.
 - c. All options or features not provided specific to this project or pertinent to this Work are deleted, crossed out, or otherwise removed from consideration.
11. Information to Include
 - a. Manufacturer's model number
 - b. Indication of all performance data, construction materials, finishes and modifications to manufacturer's standard design called for in the Specifications
 - c. Location of connections for all piping
12. Affix Contractor's company name and date in form of a stamp, to all Shop Drawings submittals before submitting. The signature of Contractor's Representative is required.
13. Contractor's Certification: Material data and Shop Drawings shall be submitted by the Contractor with a cover letter, and the Contractor's stamp of approval, indicating that he has reviewed, checked, and approved the data submitted; that submittal is in compliance with the requirements of the project and with the provisions of the Contract Documents; that any exceptions to the Specifications or Drawings are specifically noted or pointed out as such; and that he has verified all field measurements and construction criteria, materials, catalog numbers, and similar data.
14. Failure to provide required information and certification with or on the submittals shall be cause for the return of Shop Drawings without review or other action.

C. Engineer's Review

1. Engineer's action codes shall have the following meanings:
 - a. If a Shop Drawing is stamped "No Exceptions Taken" or "Make Corrections Noted", then no further submittals by the Contractor will be required and a letter of transmittal will be returned to the Contractor.
 - b. If a Shop Drawing is stamped "Make Corrections Noted", make the corrections indicated and proceed as noted.
 - c. If a Shop Drawing is stamped "Rejected-Resubmit" or "Revise and Resubmit", the Contractor will receive marked copies with a letter of transmittal noting the Engineer's review comments.
2. If the first Shop Drawing submittal is rejected by the Engineer, and the second Shop Drawing submittal for the same item is also rejected by the Engineer, then the review fees and expenses that the Engineer incurs in conjunction with the review of the third and subsequent Shop Drawing submittals shall be charged to the Contractor, and the Contractor shall reimburse the Owner.
 - a. Engineer's review fees and expenses shall be based upon the current "Hourly Rate and Reimbursable Expense Schedule" of the Engineer and this compensation shall be paid within 30 days of being invoiced. As an option, Engineer's review fees and expenses may be withheld from payment to Contractor.
3. Resubmitted Shop Drawings
 - a. Make the necessary corrections and resubmit the documents. The letter transmitting corrected Shop Drawings shall note that the documents comprise a resubmittal.
 - b. All information, which is correct on the original submittal, will not be changed in any way on the resubmitted Shop Drawings.
 - 1) If information on a Shop Drawing must be changed due to a Change Order, cloud all the changes on the resubmitted Shop Drawing and state such changes in the resubmittal transmittal letter.
 - 2) If any corrections to the original Shop Drawing, other than those noted by the Engineer, are made on a resubmittal due to discovery by Contractor that original information was incorrect, cloud all the changes on the resubmitted Shop Drawing and state such changes in the resubmittal transmittal letter.
 - c. Revise and resubmit the Shop Drawings as required, until the submittal is marked "No Exceptions Taken" or "Make Corrections Noted".

3.04 Partial Payment Claims

- A. These claims are described in the General Conditions. One (1) pdf copy of the fully executed claims shall be submitted to the Engineer monthly as determined at the Preconstruction Conference.
- B. Submit purchase orders, invoices and delivery tickets to the Engineer for products claimed as stored materials. Prices must be shown on the invoices or delivery tickets if the Contractor is claiming reimbursement for materials stored onsite, in the possession of the Owner. Amounts claimed for stored materials cannot exceed

the amounts indicated in the invoice for the applicable items or the value of that pay item as listed on the Bid Attachment.

-END-

SECTION 01400 – QUALITY ASSURANCE AND QUALITY CONTROL

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Documents.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Documents.
 - 3. Requirements for Contractor to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 Definitions

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratories shall mean the same as testing agency.

1.03 Delegated Design

- A. Where professional design services or certifications by a design professional are specifically required of the Contractor by the Contract Documents, provide these services and certifications in compliance with specific performance and design criteria indicated. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Submit a statement, signed and sealed by the responsible design professional, for each product or system specifically assigned to Contractor to be designed or certified by a design professional, indicating the products or systems comply with

performance and design criteria indicated. Include list of codes, loads, and other design factors used in performing these services.

1.04 Tests and Inspections

- A. All materials and each part or detail of the Work shall be subject to inspection by the Engineer at all times. Allow access to all parts of the Work and furnish such information and assistance required to make a complete and detailed inspection.
- B. Shop inspections may be required including observations of the preparation, manufacture and coating of materials and products at the plant.
- C. The inspection of the Work shall not relieve the Contractor of any obligation to fulfill his contract as prescribed. Defective Work shall be made good and unsuitable materials shall be rejected, notwithstanding that such defective Work and materials have been previously overlooked and accepted on estimates for payments.
- D. All Work shall be tested to the satisfaction of the Engineer before acceptance. The cost of all tests is to be borne by the Contractor.
- E. Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents within 30 days of Notice to Proceed. Include the following information in the schedule:
 - 1. Specification Section number and title
 - 2. Description of test and inspection
 - 3. Identification of applicable standards
 - 4. Identification of test and inspection methods
 - 5. Number of tests and inspections required
 - 6. Time schedule or time span for tests and inspections
 - 7. Entity responsible for performing tests and inspections
 - 8. Requirements for obtaining samples
 - 9. Unique characteristics of each quality-control service
- F. Distribute schedule to Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- G. Prepare and submit certified written reports that include the following:
 - 1. Date of issue
 - 2. Project title and number
 - 3. Name, address, and telephone number of testing agency
 - 4. Dates and locations of samples and tests or inspections
 - 5. Names of individuals making tests and inspections
 - 6. Chain of Custody Record (where applicable)
 - 7. Description of the Work and test and inspection method
 - 8. Identification of product and Specification Section
 - 9. Complete test or inspection data
 - 10. Test and inspection results and an interpretation of test results

11. Ambient conditions at time of sample taking and testing and inspection
12. Comments or professional opinion on whether tested or inspected Work complies with the Contract Documents requirements
13. Name and signature of laboratory inspector
14. Recommendations on retesting and reinspection

1.05 Submittals

- A. Submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 Quality Assurance

- A. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Testing Agency Qualifications: An agency specializing in, and with proven experience and capability in, conducting the types of tests and inspections to be performed. Provide proof of agency's capabilities and experience upon Owner's request.

1.07 Quality Control

- A. Contractor Responsibilities: Provide quality-control services specified in the Contract Documents and required by authorities having jurisdiction.
 1. Engage a qualified testing agency to perform quality-control services.
 2. Do not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing and inspection agencies in ample time before performing Work that requires testing or inspection. Abide by notification requirements of authority having jurisdiction.
 4. Submit a certified written report of each quality-control service performed to Owner, Engineer, and authority having jurisdiction.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation. Report results in writing.
- C. Retesting/Reinspection: Regardless of whether original tests or inspections were Contractor's responsibility, provide retesting and reinspection for construction that

revised or replaced Work that failed to comply with requirements of the Contract Documents.

- D. Testing Agency Responsibilities: Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of services.
 - 2. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - 3. Submit a certified written report, in duplicate, of each test and inspection service through Contractor.
 - 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.

- E. Associated Services: Cooperate with agencies performing tests and inspections, and provide reasonable auxiliary services requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field-curing of test samples
 - 5. Delivery of samples to testing agencies
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency
 - 7. Security and protection for samples and for testing and inspection equipment at Project site

- F. Schedule time for tests, inspections, obtaining samples, and similar activities. Coordinate sequence of activities to accommodate quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Repair and Protection

- A. On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

- B. Protect construction exposed by or for quality-control service activities.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

-END-

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Providing and coordinating temporary facilities, utilities and controls.
- B. Related Sections
 - 1. Section 01010 – Summary of Work
 - 2. Section 01090 – Reference Standards

1.02 References

- A. Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) and Ohio Supplement, latest editions

1.03 Submittals

- A. Quality Assurance/Control Submittals
 - 1. Before beginning Work adjacent to any street, provide the Engineer with a proposed signing schedule, which shall include location, size, and messages at all signs to be used.

1.04 Quality Assurance

- A. Regulatory Requirements
 - 1. Obtain permits as specified in Section 01010.
 - 2. Comply with the latest applicable Federal, State, and local codes, including but not limited to, the agencies and codes specified in Section 01090.
 - 3. Maintain lights and barricades on all obstructions and hazards during contract period in conformance with federal, state and local laws and codes.

PART 2 - PRODUCTS

2.01 Temporary Facilities, Utilities and Services

- A. Storage Sheds and Enclosures
 - 1. Storage sheds or trailers shall be provided by each Subcontractor as required. Coordinate location and removal with General Contractor.
 - 2. Provide temporary weather-tight enclosures for all exterior openings.
 - 3. Equip exterior doors with locks and closers.

B. Sanitary Facilities

1. Provide sanitary facilities for use of all construction personnel including personnel of other contractors for the duration of the project as follows:
 - a. Chemical units complete with weather-tight enclosure adequately ventilated and equipped with latching door.
 - b. Maintain chemical units weekly or at lesser periods if determined necessary. Chemical units shall be in accordance with the rules and regulations of the locality of the project (State, county, or city).
 - c. Furnish toilet paper and hand sanitizer for the chemical units and replenish supply as needed.

C. Water and Electric Service

1. Install and maintain all extensions from the service sources to Work areas as required providing adequate water supply and electric power for all aspects of the Work and in accordance with all relevant codes and regulations.

D. Heat and Ventilation

1. Provide heat and ventilation as required to maintain specified conditions for construction operations, to provide for a safe working environment in accordance with health regulations, and to protect materials and finishes from damage due to temperature or humidity. Follow requirements set forth elsewhere in these Specifications.
2. Whenever fixtures, water services or items subject to damage from cold have been installed, maintain the temperature above 50 degrees Fahrenheit.
3. Prior to operation of permanent facilities for temporary purposes, verify that installation is approved for operation, and that filters are in place. Provide and pay for operation, maintenance, and utilities and fully service all equipment, including cleaning filters, until the time the Work is turned over to the Owner.
4. Provide ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases.
5. No open fires will be permitted.

E. Trash Containers

1. Provide a trash container for the disposal of packaging materials, pieces of broken pipe, rubbish, trash, and all other debris. Empty trash containers weekly or as container is filled.

F. Fire Extinguishers

1. Provide multipurpose dry chemical fire extinguishers as required. Mount units in protective red enclosures plainly marked and readily accessible.

G. Bulletin Board

1. Provide a bulletin board or display area to post required notices in an appropriate weather-protected manner.

H. Construction Signs and Equipment

1. Provide and erect construction signs, lights, channelizing devices, and other traffic control equipment in accordance with the MUTCD and the Ohio Supplement requirements.

PART 3 - EXECUTION

3.01 Installation

- A. Locate temporary facilities herein specified, and facilities required by the Contractor and his Subcontractors for storage or other purposes in the performance of their contracts, to avoid interference with Work. Relocate as required and/or directed by Engineer.
- B. Construct temporary structures on stable foundation with code approved service connections.
- C. Install temporary electrical service and distribution overhead. Do not run branch circuits on floor.

3.02 Protection

- A. Piping Rough-ins: Keep foreign materials out of piping by capping or other protection. Trades responsible for stoppage will be charged for cleaning.
- B. Safety: Maintain signs, lights, and barricades on all obstructions and hazards during construction period in conformance with local, state, and federal laws and codes.

3.03 Access Roads and Parking Areas

- A. Provide and maintain vehicular access to the site and within the site for use by persons and equipment involved in the construction of the project. Maintain access roads and driveways with sufficient compacted aggregate to provide a suitable support for vehicular traffic and anticipated loads.
- B. Provide and maintain temporary parking facilities for use by construction personnel, the Owner, and the Engineer. Maintain parking facilities free of construction materials, mud, snow, ice, and debris.
- C. Restore areas to original or to specified conditions shown on the Drawings at completion of the Work.

3.04 Maintenance of Traffic

A. General

1. Comply with the requirements of the State, City or County Highway and Street Departments for all traffic maintenance.

2. Maintain all construction signs, lights, channelizing devices, and other traffic control equipment in proper working order.
3. During construction, maintain and protect the pedestrian and vehicular traffic at all times on all streets involved and provide access to all residential and commercial establishments adjacent to the construction area.

B. Notification Requirements

1. Before closing any thoroughfare, notify and, if necessary, obtain a permit or permits from the duly constituted public authority having jurisdiction (state, county, or city).
2. Notify the Engineer of intended road or drive closures 72 hours in advance of the proposed closing. Place all proper detour signs and barricades prior to the actual street closing.
3. Notify each resident or property owner of Work which will impact access to his property a minimum of 2 business days in advance of restricting access to the property.

C. Pavement Restoration

1. Streets in which excavation has occurred shall be temporarily restored to receive traffic as soon as possible. Permission to close additional streets shall be denied the Contractor if, in the opinion of the Owner or Engineer, the restoration on streets where excavation has occurred has not progressed satisfactorily.
2. Maintain the road surfaces during the construction, take precautions to prevent unnecessary damage to partially completed surfaces, and repair any portions which do become damaged. Bear all costs involved in such maintenance, precautions, and repairs, including the cost of all necessary materials.

3.05 Barricades, Warning Lights and Arrow Boards

- A. Provide, erect, and maintain all necessary barricades, suitable and sufficient danger signals, and signs. Take all necessary precautions for the protection and safety of the public, workmen, structures, and equipment. Roads closed to traffic shall be protected by effective barricades. Obstructions shall be illuminated during hours of darkness.
- B. Erect warning signs in advance of any location on the project where operations may interfere with the use of the road by traffic and at all intermediate points where the new Work crosses or coincides with an existing road.
- C. Place sufficient warning lights and arrow boards on or near the Work and keep them illuminated during periods of construction and reduced visibility (from twilight in the evening until sunrise). The Contractor is responsible for all damages that Owner or any other party may sustain in consequences of neglecting the necessary precautions in prosecuting this Work.

3.06 Removal and Clean-Up

- A. Remove all temporary facilities, utilities, services and materials upon completion of construction. Remove debris and clean area. Repair all damage and restore area to finish condition.

-END-

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 Delivery, Storage and Handling

- A. The delivery, receipt, storage and handling of all fixtures, equipment, materials, components and appurtenances (collectively "products") shall be the responsibility of the Contractor.
- B. Load and unload all products by lifting with hoists and skidding to avoid shock or damage. Under no circumstances shall products be dropped.
- C. Do not skid or roll products on or against other products. Use padded slings, hooks, pipe tongs, etc, to handle all products in a manner to prevent damage.
- D. Pack, transport and store all equipment components and motors in protective enclosures such that they are not subjected to forces or elements that may result in damage. Promptly remove damaged products from the job site and replace with undamaged products.
- E. Do not stack equipment components or motors. Adequately support equipment during transport and storage to prevent undue stress.
- F. Obtain storage space for all products used on this project. The Owner will not receive, store or house products being delivered to the site for Contractor or his Subcontractor.
- G. Store products to prevent dirt and debris from entering and accumulating. Protect products from heat, cold, sunlight, contamination and other adverse conditions.
- H. Deliver, store, protect, and handle products in accordance with the manufacturer's instructions. Products not properly stored or protected may be subject to rejection as determined by the Engineer.

1.02 Local Labor and Materials

- A. Whenever possible, the Contractor, his subcontractors, material men, or others who employ labor, shall employ labor locally.
- B. Purchase materials such as sand, cement, gravel, pipe, steel, and lumber from local dealers when such local dealers' prices meet competition's and where such materials meet the Specifications.

1.03 Domestic Product Requirements

- A. All steel and foundry products provided for public works projects, including ferrous and non-ferrous metals, piping, fittings, and piping-related products, shall be manufactured in the United States. Public agency contract provisions; rules for determining reasonable pricing.

- B. All iron and steel products provided for the project shall meet the requirements of the Consolidated Appropriations Act of 2017 Section 746 Division A of Title VII: Required Contract Provisions Related to American Iron and Steel.

1.04 Unavailability of Materials and Equipment

- A. Bids must be based on use of the products specified, subject to the provisions of any addenda issued. If the Contractor is unable to furnish or use any of the products specified because of any order by a governmental agency limiting the manufacture or use, or because of the lack of availability in the market for such products, the Contractor shall offer substitutes suitable for the purpose, considering the factors of quality, serviceability, appearance, and maintenance. No substitute shall be used until it has been approved by the Engineer.
- B. No consideration will be given to the use of substitutes on account of market conditions unless the Contractor demonstrates that, for the item in question, he placed his order and submitted shop drawings without delay, that he has shown due diligence in attempting to locate the item as specified, and that the unavailability is due to market conditions in general throughout the particular industry.
- C. If substitutes are used in the Work, the compensation to be paid to the Contractor shall be subject to review and adjustment. The basis upon which the amount of price and adjustments will be founded shall be the cost of the appropriate items at the time the bids were opened.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

SECTION 01650 – STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Starting of equipment and systems
2. Demonstration, training and instructions
3. Acceptance of Equipment

1.02 Submittals

- A. Submit O&M Manuals to the Engineer for review prior to system start up for each respective system or piece of equipment in accordance with Section 01300.
- B. Provide an abstract or outline of the start-up, testing and training procedures to the Engineer at least five (5) days prior to the scheduled start-up.
- C. Following start-up, a typed, bound Start-Up Certification Report covering the manufacturer's representative's findings shall be submitted to the Engineer for review and approval. The report shall certify that the equipment is properly installed and functioning for the purpose intended. The report shall include the following:
 1. Type of inspections performed
 2. A description of the start-up procedures taken
 3. Detailed description of any deficiencies observed along with the corrective measures taken
 4. The results of all field tests, including necessary graphs, charts, tables, etc., specified in the detailed Specification or required by the referenced standards

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Examination

A. Verification of Conditions

1. Verify that each piece of equipment for system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
2. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

3. Verify that wiring and support components for equipment are complete and tested.

3.02 Preparation

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer seven days prior to start-up of each item. Coordinate system or equipment start-up with Plant Superintendent and Engineer.

3.03 Field Quality Control

A. Manufacturers Field Service

1. Execute start-up under supervision of applicable manufacturer's representative and Contractor's personnel and in accordance with manufacturer's instructions. When indicated in individual Specification sections, require manufacturer to provide an authorized representative to be present at the site.
2. Manufacturer's services shall be furnished at the Contractor's expense.
3. The services provided shall be by a qualified representative for the specified period of time and for the specified number of trips. A working day is defined as a normal 8-hour working day on the job and does not include travel time.
4. Manufacturer's services shall include:
 - a. Inspect the complete installation of the equipment.
 - b. Place the equipment in operation and make any necessary adjustments.
 - c. Perform tests specified in the detailed Specification and as recommended by the equipment manufacturer.
 - d. Instruct Owner's personnel in the proper operation and maintenance of the equipment (training) as described in Article 3.04.
5. The purpose of these services is to demonstrate to the Owner and Engineer's complete satisfaction that the equipment has been properly installed and will satisfactorily perform the functions for which it is intended.

- B. If equipment or systems are not completed for proper start-up and training procedures, the representative shall schedule another visit at no additional cost to the Owner. The Contractor shall bear all expenses associated with the start-up, testing and training procedures, and required reporting, including labor, transportation, lodging and material costs.

3.04 Demonstration, Training and Instructions

- A. Training will not be permitted without prior start-up and operation of the equipment. Training shall be performed separate and distinct from start-up and testing tasks. Manufacturer's O&M Manuals and materials shall be incorporated in the training procedures, with emphasis on items or materials of greatest importance.
- B. Demonstrate project equipment and instruct in a classroom environment located at the plant site. Instruction shall be by a manufacturer's representative who is knowledgeable about the equipment and its application to the project.

- C. Utilize O&M Manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustments, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at equipment location.
- E. Prepare and insert additional data in O&M Manuals when need for additional data becomes apparent during instruction.
- F. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
- G. Provide demonstration such that the Owner may video the training if so desired.

3.05 Acceptance of Equipment

- A. Acceptance of equipment shall be defined as that point in time when the following requirements have been fulfilled and the equipment is placed in operation:
 - 1. All required submittals and documentation have been submitted and are acceptable to the Engineer.
 - 2. All start-up and training procedures have been satisfactorily performed and the Start-Up Certification Report has been submitted, and is acceptable, to the Engineer.
 - 3. All equipment O&M Manuals and materials have been submitted and are acceptable to the Engineer.
 - 4. All spare parts have been provided to the Owner.
- B. The date of formal acceptance by the Owner for a particular item of equipment, or Date of Acceptance, shall be the date of Substantial Completion as described in the General Conditions, unless specifically approved otherwise by the Engineer.
- C. Equipment which is absolutely necessary to be placed into operation prior to Substantial Completion may be accepted by the Owner as described in the General Conditions, provided that all the above requirements have been met. Once the Start-Up Certification Report has been submitted and is acceptable to the Engineer, an Acceptance Agreement for Partial Work Completed may be issued, which indicates the Date of Acceptance. The Contractor shall maintain ownership and have total responsibility for the equipment until the Date of Acceptance Agreement for Partial Work Completed is agreed to by all parties. The Owner shall provide regular operation and maintenance of the equipment after acceptance. Only equipment which must be placed into operation prior to Substantial Completion in order to maintain adequate treatment through the facility will be considered for acceptance prior to Substantial Completion, as determined by the Engineer.

- D. The manufacturer's and Contractor's warranty for each item of equipment shall not begin until the equipment is placed into permanent operation, as determined by the Date of Acceptance established for each piece of equipment.

-END-

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Intermediate Cleaning During Construction
2. Final Cleaning
3. Final Inspection

1.02 Quality Assurance

A. Requirements of Regulatory Agencies

1. Maintain project in accordance with Occupational Safety and Health Act of 1970 as amended, in terms of cleanup.

1.03 Project/Site Conditions

A. Environmental Requirements

1. Conduct cleaning and disposal operations in accordance with local ordinances, state and federal regulations and anti-pollution laws.
2. Do not burn or bury rubbish and waste materials on project site. Do not dispose of volatile wastes such as, mineral spirits, oil or paint thinner in storm or sanitary drains.

PART 2 - PRODUCTS

2.01 Cleaning Materials

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 General

- A. All cleaning shall be the responsibility of the Contractor unless specifically noted otherwise. If rubbish and debris are not removed from the Work areas as specified, or cleaning of the buildings, structures and site are not completed as specified, the Owner reserves the right to have the cleaning done at the expense of the Contractor.

- B. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly painted surfaces.
- C. Provide on-site containers for collection of waste materials, debris and rubbish.

3.02 Intermediate Cleaning During Construction

- A. Execute cleaning to ensure that all structures and buildings, grounds, roadways and property are maintained free from accumulations of waste materials, debris and rubbish caused by construction activities. Remove all surplus materials from the job site on a daily basis.
- B. Prior to placing equipment and Work areas into service, perform intermediate cleaning as follows:
 - 1. Remove and dispose of all temporary structures and debris, including dirt, sand, gravel, rubbish, and waste material from the tanks, filters, and Work areas.
 - 2. Thoroughly clean, sweep, and wash down all tanks, filters, and Work areas.
 - 3. Thoroughly clean, and when so directed, disinfect all materials and equipment being modified, rehabilitated, and or replaced.
 - 4. Direct all Subcontractors to similarly clean all tanks, filters, and areas in which they have worked, and to thoroughly clean all materials and equipment provided under their contracts.

3.03 Final Cleaning

- A. General: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's cleaning instructions.
- B. At the completion of Work and immediately prior to final inspection, clean the entire Project as follows:
 - 1. Clean the project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of waste materials, debris, rubbish and foreign substances.
 - 2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 3. Remove tools, construction equipment, machinery, and surplus material from the site.
 - 4. Thoroughly clean, sweep, wash, and polish all Work and equipment under the Contract, including finishes.
 - 5. Remove all dirt, sand, gravel, and other material.
 - 6. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
 - 7. Remove labels that are not permanent labels.

8. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.
 9. Remove snow and ice from access to all buildings and structures, new or existing, affected by the Work.
 10. Replace air-handling filters, new and existing, if units were operated during construction.
 11. Clean new and existing ducts, blowers, and coils, if air-handling units were operated without filters during construction.
 12. Vacuum clean all interior spaces, including inside cabinets.
 13. Clean transparent materials, including mirrors and glass in doors and windows.
 14. Clean interior of all panels, cabinets, pull boxes, and other equipment enclosures.
 15. Wash and wipe clean all lighting fixtures, lamps, and other electrical equipment which may have become soiled during construction.
 16. Perform touch-up painting.
- C. Leave the structures and site in a complete and finished condition to the satisfaction of the Engineer.
- D. At completion of Work, remove tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy or operation as applicable.

3.04 Final Inspection

- A. In preparation for substantial completion or occupancy, conduct inspection of sight-exposed interior and exterior finished surfaces, and of concealed spaces.
- B. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the Owner and Engineer.

-END-

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Administrative and procedural requirements for Project Record Documents.
- B. Project Record Documents required include the following as applicable:
 - 1. Marked-up copies of Contract Drawings
 - 2. Marked-up copies of Shop Drawings
 - 3. Newly prepared drawings
 - 4. Marked-up copies of Addenda, and Change Orders
 - 5. Marked-up Product Data submittals
 - 6. Field Orders
 - 7. Record Samples
 - 8. Field records for variable and concealed conditions
 - 9. Record information on Work that is recorded only schematically
 - 10. Field Test Reports
- C. Related Sections
 - 1. Section 01300 – Submittals

1.02 Maintenance of Documents

- A. Make documents available at all times for the Engineer's observations.
- B. Store record documents apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition.

1.03 Submittals

- A. Record Drawings
 - 1. For substantial completion to be established, deliver one (1) set of "Contractor's Record Drawings" to Engineer. The Engineer will review the Record Drawings prior to acceptance.
 - 2. Organize into sets and bind and label sets for the Owner's continued use.
 - 3. If the Engineer determines the Record Drawings are not in conformance with the specifications, the Engineer will return the Record Drawings to the Contractor. Revise the Record Drawings and resubmit to the Engineer prior to final completion. The Engineer will review the revised Record Drawings for conformance to specifications. If the revised Record Drawings are not in conformance with the specifications the Engineer or a third party as determined by the Owner will then perform all necessary field survey and measurements,

- field excavations and locations, engineering calculations, and drafting to complete the Record Drawings in conformance with the specifications.
4. The Contractor shall be responsible for payment to the Owner for Work to make the corrections and revisions to the incomplete Record Drawings submitted by the Contractor.
 5. The Engineer will not recommend Final Completion until Record Drawings are submitted and approved.

B. Markup Procedures

1. During construction, maintain one (1) set of Contract Drawings and Shop Drawings for Project Record Document purposes. Label each drawing "Contractor's Record Drawing" in 2-inch high printed letters. Keep Record Drawings current. Do not permanently conceal any Work until required information has been recorded.
 - a. Legibly and accurately mark these Drawings in an understandable drawing technique to show the actual installations where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Items required to be marked include as applicable, but are not limited to, the following:
 - 1) Dimensional changes to the Drawings
 - 2) Revisions to details shown on the Drawings
 - 3) Locations and depths of underground utilities
 - a) All valves (gate, plug, air release, combination sewage, etc.) shall be located and referenced to three (3) permanent surface improvements.
 - b) All fittings (tees, wyes, bends, crosses, plugs, caps, etc.) shall be located and referenced to three (3) permanent surface improvements.
 - c) All force mains shall be located and referenced to the centerline of the road or street at 500-foot minimum intervals.
 - d) All structures (manholes, vaults, etc.) shall be located and referenced to three (3) permanent surface improvements.
 - e) All sewer laterals shall be located and referenced to the downstream manhole (stationing in feet) and depth of lateral at property line.
 - 4) Revisions to routing of piping and conduits
 - 5) Changes made by Change Order or Field Transmittal Memo
 - 6) Details not on original Contract Drawings
 - c. Mark record prints of Contract Drawings with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - d. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - e. Note Field Transmittal Memo numbers, alternate numbers, Change Order numbers, and similar identification.
2. Responsibility for Markup: Contractor shall be solely responsible for the measurement and recording of the Record Drawings. The presence of the

Engineer or Owner shall not relieve the Contractor in any way of his/her obligation in this regard.

C. Miscellaneous Records

1. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities and products.
2. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Engineer for the Owner's records.
3. Miscellaneous records include, but are not limited to, the following categories as applicable:
 - a. Field records on excavations, underground construction and similar Work
 - b. Survey showing locations and elevations of underground lines
 - c. Invert elevations of drainage piping
 - d. Authorized measurements utilizing unit prices or allowances
 - e. Records of landscaping and plant treatments
 - f. Certification received in lieu of labels on bulk products
 - g. Batch mixing and bulk delivery records
 - h. Documented qualification of installation firms
 - i. Inspections and certifications by governing authorities
 - j. Leakage and water-penetration tests
 - k. Final inspection and correction procedures

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Recording

- A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.
- B. Have Documents readily available for review at the monthly progress meetings. Partial pay claims may be withheld if record documents are not kept updated in a satisfactory manner.

-END-

SECTION 01990 – SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Measurement and payment for:

1. Lump Sum Work
2. Unit Price Work

1.02 Lump Sum Work

A. Submit a Schedule of Values for the various items of Work to be completed on the project for review by the Engineer. The Schedule shall include prices which when added together equal the Contract Price. The Schedule will be used in processing Monthly Partial Pay Claims. The following is a minimum list of items to be included in the Schedule.

B. General Conditions

1. Mob/Demob/Bonds/Ins
2. Field Superintendent
3. Field Office and Utilities

C. Wells

1. Pump, Motor, & Piping
2. Meter Vault Valve
3. Coatings
4. Instrumentation
5. Electrical
6. Steel Platform and Stairs with gravel pad
7. Fence
8. Access Gates
9. Site Work
10. Crushed Stone Access Drive
11. Start-Up

D. Generator

1. Disconnect at Revis Wellfield
2. Relocation to MJ Wellfield Well 2 Platform
3. Electrical Components and Connections at MJ Wellfield
4. Restoration of Revis Site Electrical and Structural Components

1.03 Mob/Demob/Bonds/Ins scheduled value shall not exceed 5% of the total Contract Price. 60% of this value can be claimed upon both mobilization of Contractor to the project site and start of construction. Mobilization shall include set up of the Engineer's job site trailer and the Contractor's equipment being on site and operating. The

remaining 40% will be paid after the project has reached final completion and all equipment and materials have been demobilized.

1.04 Field Superintendent and Field Office and Utilities scheduled values, as approved by the Engineer, will be paid based on the percentage of Work completed on the project in the opinion of the Engineer.

1.05 Incidental Work

A. The following Incidental Work shall be included in the unit price of each applicable pay item in this Section. No extra payment will be made for Incidental Work, which shall include the furnishing of all labor, material, and equipment necessary to complete the Work, including:

1. construction engineering; utility locating; supporting and protecting utility poles, conduits, and lines;
2. excavating; sheeting; shoring; dewatering, including treatment and disposal; bypass piping and pumping;
3. hauling; placing; spreading; compacting; testing of materials; and placing, maintaining, removing, and disposing of any temporary materials;
4. pipe bedding; installation; jointing; haunching; initial backfilling; trench and final backfilling;
5. core drilling; connecting piping to existing and new structures or pipes; locating, extending, providing fittings, and connecting existing pipes into the system; grouting and sealing pipe penetrations; installing tops and castings; abandoning existing structures and pipes;
6. repairing/replacing existing sewers, laterals, drainage structures, water mains, service lines, irrigation system components, curbs and gutters, sidewalks, pavement, field tiles, and other items damaged or affected by the Work;
7. flushing and cleaning pipes, appurtenances, and structures; pipe and structure testing;
8. testing of pipes and structures, including but not limited to, hydrostatic testing; leakage testing; etc. as specified;
9. removing and disposing of excess and demolished structures, piping, material, and debris;
10. preparing concrete and asphalt surfaces; sawcutting; formwork; forming; reinforcing; doweling; placing materials; finishing, tooling, and jointing; curing; protecting; slump tests; compression tests; other specified testing; pavement markings;
11. permitting; safety;
12. installing erosion control measures prior to and during construction; providing on-going maintenance of erosion control measures until seeding and paving are established; bank restoration at stream crossings;
13. initial clean-up and restoration;
14. installing and removing temporary structures, signs, and fencing; removing and replacing signs, mailboxes, fencing, landscaping, and other items; and
15. other Incidental Work necessary to complete the Work as specified and as indicated on the Drawings.

1.06 Base Bid – Unit Price Pay Items

If included in the Contract, the unit prices stated in the Contract for Base Bid to be paid for the respective items shall be payment in full for the completion of all Work specified and described to be included in the respective items, complete and ready for use and operation, including verification and testing, as shown on the Drawings and as specified. Payment will be made under each item only for such Work as is not specifically included under other items.

Item 1 12" Ductile Iron Water Main (LF)

Payment for 12" Ductile Iron Water Main will be made at the applicable contract unit price per linear foot (LF) as listed in the itemized proposal, which price shall include length of pipe, sleeves, fittings, including bends, plugs, reducers, etc.; pipe and joint restraints; polyethylene encasement material; chlorination of pipe and appurtenances; gate valve; and all Incidental Work necessary for a complete installation as specified and as indicated on the Drawings. The 12" Ductile Iron Water Main shall be installed by open cut method.

Item 2 10" Ductile Iron Water Main (LF)

Payment for 10" Ductile Iron Water Main will be made at the applicable contract unit price per linear foot (LF) as listed in the itemized proposal, which price shall include length of pipe, sleeves, fittings, including bends, plugs, reducers, etc.; pipe and joint restraints; polyethylene encasement material; chlorination of pipe and appurtenances; gate valve; and all Incidental Work necessary for a complete installation as specified and as indicated on the Drawings. The 10" Ductile Iron Water Main shall be installed by open cut method.

Item 3 8" Ductile Iron Water Main (LF)

Payment for 8" Ductile Iron Water Main will be made at the applicable contract unit price per linear foot (LF) as listed in the itemized proposal, which price shall include length of pipe, sleeves, fittings, including bends, plugs, reducers, etc.; pipe and joint restraints; polyethylene encasement material; chlorination of pipe and appurtenances; gate valve; and all Incidental Work necessary for a complete installation as specified and as indicated on the Drawings. The 8" Ductile Iron Water Main shall be installed by open cut method.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used.

-END-

DIVISION 2 – SITE WORK

SECTION 02101 - STORMWATER POLLUTION PREVENTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Temporary and permanent control measures used during the life of the contract to control water pollution, soil erosion, and siltation using berms, dams, dikes, gravel, mulches, grasses, and other erosion control devices or methods.
2. Temporary erosion control may include Work outside the construction limits such as borrow pit operations, equipment and material storage sites, and waste areas.

B. Related Sections

1. Section 02102 - Material Handling and Spill Prevention Plan
2. Section 02110 - Site Clearing
3. Section 02200 – Earthwork

1.02 References

- A. Ohio EPA Permit No.: OHC0000005 (OEPA General Permit)
- B. Ohio's Standards for Stormwater Management, Land Development and Urban Stream Protection
- C. ODOT Standard Specifications, latest edition

1.03 Submittals

- A. Prior to the start of construction, submit erosion control schedules for temporary and permanent erosion control Work as applicable for clearing and grubbing, grading, construction, and paving.
- B. Submit a plan for erosion and dust control on haul roads.
- C. Submit a plan for disposal of waste materials. Refer to Section 02102 for practices for solid waste management.
- D. Submit soil testing results to Engineer per Paragraph 1.06.
- E. Provide inspection reports per Part III of this Section.

- F. Provide notification to the Owner when land disturbing activities have been completed, the entire site has been stabilized (permanent vegetation established at 70% density of coverage), and all temporary erosion control measures have been removed.
 - 1. Once the notification has been received, Owner shall submit a Notice of Termination (NOT) letter to OEPA, to close out the OEPA General Permit.

1.04 Quality Assurance

A. Regulatory Requirements

- 1. Comply with OEPA General Permit requirements and conditions and site Stormwater Pollution Prevention Plan (SWPPP) until an NOT is submitted to close out the permit.
 - 2. Provide grass seed containers bearing a seed label tag in accordance with the requirements of the Ohio Agricultural Seed Law.
 - 3. Provide fertilizer conforming to federal and state regulations and to the standards of the Association of Official Agricultural Chemists.
 - 4. Comply with all federal, state, and local erosion control and pollution prevention laws
- B. Copies of the SWPPP, NOI, and letter granting permit coverage under the OEPA General Permit shall be made available immediately upon request of an inspecting authority during working hours.
- C. Authority of Owner: The Owner has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, and areas of water impoundment.

1.05 Delivery, Storage and Handling

- A. Deliver grass seed in new and unopened containers or bags.

1.06 Project Site Conditions

A. Field Measurements

- 1. Test the soil to determine the need for fertilizer, lime, or other soil amendments. Coordinate soil testing services and implement the resulting recommendations. In lieu of a soil test, fertilizer can be broadcast and worked into the top inch of soil at the rate of 6 pounds per 1,000 square feet or 250 pounds per acre of 12-12-12 analysis fertilizer.

PART 2 - PRODUCTS

2.01 Materials

A. General: Provide materials in accordance with the requirements specified herein.

B. Temporary Grass Seed

1. Quick-growing species such as ryegrass, Italian ryegrass, or cereal grasses suitable to the area
2. Use grass species that will not compete with the grasses sown later for permanent cover
3. Application: apply temporary seeding to all disturbed areas to be left idle for 14 days or more during the growing season unless other erosion control measures are indicated on the Drawings.

C. Permanent Grass Seed

1. Type, mixture, and quantity to meet the application rate, as shown on the Drawings
2. Contains no more than 5 percent inert matter
3. Contains no objectionable weeds

D. Sod

1. Type shown on the Drawings
2. Free of weeds
3. Use within 1 week of its cutting - do not allow to dry out
4. Strongly rooted sod, a minimum of 2 years old
5. Capable of growth upon planting

E. Mulch

1. Hay, straw, fiber mats, netting, bark, or wood fiber
2. Straw mulch shall consist of threshed straw of cereal grain such as oats, wheat, barley, rye, and rice.
3. Free of objectionable weeds, seeds, or other material that may be detrimental to the planting being established.
4. Application: Apply mulch to all areas that have been seeded and to disturbed areas to be left idle for 14 days or more outside of the growing season unless other measures are indicated on the Drawings.
5. Application rates:
 - a. Straw/hay mulch: 92 pounds per 1,000 square feet (2 ton/acre)
 - b. Wood cellulose fiber: 17 pounds per 1,000 square feet (750pounds/acre)
 - c. Wood chips: 230 pounds per 1,000 square feet (10 ton/acre)

F. Fertilizer

1. Contains the minimum percentage of available nutrients (Nitrogen, Phosphorus, and Potash) based on soil content, seed mix and local conditions.

2. If local conditions do not indicate otherwise and soil testing is not required, provide 12-12-12 analysis fertilizer.
3. Application rate: as specified by the supplier

G. Lime

1. When soil testing results require pH levels to be increased, apply agricultural lime to the soils. Produce a slightly acid soil (pH 6.5).
2. Other available forms of liming materials may be applied depending on their potential to neutralize soil acidity. Provide agricultural lime from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio Department of Agriculture.
3. Changes to the lime requirements will be determined by the pH test, as indicated on soil analysis results. If local conditions do not indicate otherwise and soil testing is not required, provide 100 pounds per 1,000 square feet or 2 tons per acre.

H. Topsoil

1. Provide topsoil meeting the requirements specified in Section 02200.
2. Topsoil
 - a. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth
 - b. Of uniform composition throughout without admixture of subsoil
 - c. Free of stones, lumps, clods, sticks larger than one inch, sod, live plants and roots, and other extraneous matter

I. Erosion Control Blanket: Provide North American Green SC150 or approved equal.

J. Fiber Filtration Tubes

1. Natural or man-made fiber filter media encased within cylindrical tubes composed of a photodegradable mesh.
2. Performance: slowing and filtering of suspended particles in stormwater runoff. The tubes shall allow water to flow freely while providing filtration of suspended particles.

K. Geotextile Fabric for Use Under Riprap, Crushed Stone or Aggregate

1. Provide non-woven needle punched or heat bonded geotextile fabric consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other. The geotextile plastic yarn or fibers shall consist of at least 85 percent by weight of polyolefins, polyesters, or polyamides and resist deterioration from ultraviolet and heat exposure.

2. Provide geotextile meeting or exceeding ODOT Section 712.09 requirements or as follows:

<u>TEST</u>	<u>METHOD</u>	<u>REQUIREMENTS</u>
Grab Strength	ASTM D4632	80 lb (355.8 N)
Seam Strength	ASTM D4632	70 lb (311.4 N)
Puncture Strength	ASTM D6241	25 lb (111.2 N)
Trapezoid Tear	ASTM D4533	25 lb (111.2 N)
Apparent Opening Size	ASTM D4751	Sieve No. 50 max.
Permeability	ASTM D4491	0.1 mm/sec
Ultraviolet Degradation	ASTM D4355	70% strength retained

- L. Silt Fence: Use materials specified on the Drawings
- M. Other: All other materials shall meet commercial grade standards and be approved by the Engineer before being incorporated into the project.

PART 3 - EXECUTION

3.01 Examination

- A. Site Verification of Conditions
1. Coordinate soil testing services
 2. Implement resulting recommendations

3.02 Preparation

- A. Do not start Work until the erosion and sediment control schedules and methods of operations for the applicable construction activities have been accepted by the Engineer.
- B. Coordinate temporary erosion and sediment control measures contained herein with the permanent erosion control measures and soil stabilization methods as specified as part of this contract to assure economical, effective, and continuous erosion and sediment control throughout the construction and warranty period.

3.03 Protection

- A. Establish vegetation in accordance with the Seasonal Soil Protection Chart on the Drawings.

- B. Temporarily or permanently stabilize unvegetated areas that are scheduled or likely to be left inactive for 14 days or more with measures appropriate for the season to minimize erosion potential.
- C. For construction projects on agricultural land, final stabilization is accomplished by returning land to its preconstruction use.
- D. Do not discharge pollutants such as sediments, fuels, lubricants, bitumen, raw sewage, or wash water from concrete mixing operations (concrete washout), water from trench or pit dewatering, and other harmful materials into or near stormwater conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto.
- E. Do not apply pesticides when working in or adjacent to a floodway, river, stream, ditch, or other stormwater conveyance.
- F. Properly dispose of all waste materials.

3.04 Installation - General

- A. Incorporate all permanent erosion control features into the project at the earliest practical time. Except where future construction operations will damage slopes, perform the permanent seeding, mulching and other slope protection Work in stages as soon as substantial areas of exposed slopes can be made available.
- B. Use temporary erosion and pollution control measures to correct conditions that develop during construction, that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that develops during normal construction practices.
- C. Schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, install temporary erosion control measures between successive construction stages.
- D. Limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with progress in completing the finish grading, seeding, mulching and other such permanent control measures in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, install temporary erosion control measures.
- E. In the event temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the Work as scheduled or as ordered by the Engineer, perform such Work at Contractor's expense.
- F. Maintain all erosion and sediment control practices during the construction period.

3.05 Installation - Erosion and Sediment Control Measures

A. Temporary Construction Entrance

1. Install a temporary construction entrance as specified in the Drawings.
2. Construct temporary construction entrances where needed and in location shown on the Drawings to prevent tracking of soil or mud onto publicly or privately owned paved surfaces.
3. Place temporary construction entrances at locations where construction vehicles will repeatedly access a disturbed or unpaved area from a paved roadway.
4. Not all locations of construction entrances may be shown on the Drawings. The contractor is responsible for locating and placing construction entrances to prevent tracking and to avoid disturbance to existing waterways.
5. Should tracking of soil occur, clear accumulated sediment from public and private driveways on a daily basis at a minimum and more frequently as sediment is tracked onto roadways.
6. Redistribute or properly dispose of collected sediments in a manner that is in accordance with all applicable statutes and regulations.
7. Do not rinse tracked material with water unless water is collected and disposed of properly.

B. Silt Fence

1. Install silt fence as shown on the Drawings to provide sediment control at the top of slopes, at the down-gradient project limits, as periodic filter breaks on down slopes, at project limits and other locations indicated.
2. Provide additional silt fence where the extents of land disturbance extend beyond the lengths of silt fence shown on the Drawings.
3. Install silt fence across a utility route in accordance with the following:
 - a. At locations where the utility route runs uphill or downhill, install silt fence perpendicular to the direction of runoff and parallel to contour lines.
 - b. Install a silt fence segment at every 5 feet in elevation change along the utility route. Less frequent intervals will be allowed if the Contractor can demonstrate erosion can be prevented and disturbed soil can be stabilized by other erosion control means such as mulching.
 - c. Turn the ends of each silt fence segment in the uphill direction to collect sediment.
 - d. Install silt fence segments from edge of land disturbance to edge of land disturbance.
4. Install silt fence along the length of the utility route in accordance with the following:
 - a. At locations where the utility route runs along the slope, install silt fence at the edge of the land disturbance on the downhill side of the utility route.
 - b. Silt fence installed along the utility route shall be continuous until the land disturbance termination point or the direction of the slope begins to be uphill or downhill with the utility route.
 - c. Turn the ends of each silt fence segment in the uphill direction to collect sediment.

C. Fiber Filtration Tubes

1. Install in accordance with manufacturer's instructions.
2. Use fiber filtration tubes for the slowing and filtering of stormwater.
3. Use the appropriate tube size for the slope and the distance between tubes as specified by the manufacturer.
4. The tubes shall allow water to flow freely and provide filtration of suspended particles.

D. Straw Bale Filters

1. Install according to the Drawings
2. Do not use as storm drain inlet protection.
3. Do not use along waterways, unless used in conjunction with another structural control, such as silt fence.
4. Do not use across a stream, ditch, channel, swale, or where concentrated flows will occur.
5. Trench straw bales into the ground so that runoff filters through the straw bale and not around or under the straw bale.

E. Dust Control

1. Use water to dampen surfaces to minimize dust and prevent wind erosion.
2. Do not rinse surfaces with water unless water is collected and disposed of properly.
3. Implement dust control methods on a routine basis where conditions warrant.
4. Provide water and dust suppression when requested by the Engineer.

F. Pumping Bags

1. Install pumping bags according to the Drawings.
2. Provide pumping bags to filter sediment from dewatering operations.
3. Properly dispose of used pumping bags.
4. Appropriately size the bags for the amount of flow.
5. Use pumping bags on an erosion resistant surface.
6. Do not discharge sediment-laden water from dewatering operations into or near stormwater conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto. Refer also to Section 02102 for the disposal of sediment-laden water.

G. Outlet Protection

1. Construct outlet protection to prevent erosion, provide energy dissipation and retain sediment in areas of concentrated flow where stormwater conveyances outfall.
2. Place at pipe and channel outfalls and in locations as specified in the Drawings

H. Inlet Protection

1. Install inlet protection at all stormwater inlets within the construction area, or in areas that receive runoff from disturbed areas, to prevent sediments, construction debris, and other potential stormwater pollutants from entering storm sewer inlets and catch basins.
 2. For inlets within a road or driving lane, equip the inlet protection practice with an overflow or bypass so ponding water does not cause unsafe driving conditions.
 3. Remove accumulated sediment and debris collected by inlet protection practices and dispose of properly after every rain event.
 4. When cleaning or removing inlet protection, do not place sediment and debris in a ditch, stream, wetland, waterway, or stormwater conveyance.
- I. Riprap Check Dam: Install riprap check dams as illustrated on the Drawings or as needed to reduce erosion potential and capture potential pollutants in drainage channels or areas of concentrated flow.
- J. Concrete Washout Area: Refer to Section 02102 for Concrete Washout requirements.
- K. Temporary Slope Drains: When necessary, route runoff away from steep slopes using a temporary slope drain. Install in accordance with the Drawings.
- L. Temporary Sediment Trap: Construct a temporary sediment trap as shown on the Drawings to retain sediment in a pooling area. Construct the temporary sediment trap of an embankment or excavated area and provide a stone outlet structure.

M. Grass

1. Restore all non-paved surfaces that were disturbed during construction with permanent seeding or sod unless shown otherwise on the Drawings.
2. Prior to seeding disturbed areas must be graded and receive a minimum of 6 inches of topsoil. Use excavated material which meets the specified requirements for topsoil, or if the quantity of suitable topsoil is not sufficient, use topsoil obtained from another source.
3. Scarify the planting area to a minimum depth of 6 inches. Mix soil amendments such as fertilizer and lime if required, in the top 2 to 4 inches of topsoil with a disk or rake operated across the slope.
4. Apply seed uniformly with a drill or cultipacker seeder, or by broadcasting. Cover seed with topsoil a minimum of 1/2 inch. Cover newly seeded areas with anchored mulch or erosion control blanket.
5. Keep seeded and fertilized areas adequately watered to a minimum of 1-inch depth per week until germination of all seed is complete and uniform grass cover is accomplished.
6. Immediately prior to installing sod, water the planting area with a fine spray to a minimum penetration of 1 inch.
7. Do not place frozen sod, and do not place sod on frozen or dry soil. Do not place sod when the air temperature is less than 32 degrees Fahrenheit.

8. Lay sod with closely fitted abutting joints without stretching and overlapping and stagger the ends of the strips. Trim and fit sod into irregular areas to eliminate gaps.
9. On slope areas, lay sod starting from the bottom of the slope and lay sod horizontal to the contour. Where slopes are greater than a horizontal to vertical ratio of 3 to 1, staple or stake each sod strip at the corners and in the middle.
10. After initial watering, tamp or roll sod with a roller to eliminate irregularities. Repeat watering at regular intervals to keep sod moist until it is rooted and to maintain growth until final acceptance.

N. Mulch: Anchor mulch unless held in place by a tackifier or netting.

O. Erosion Control Blanket

1. Where construction disturbs slopes equal or steeper than 3 to 1 or within drainage channels, protect bare slopes with an erosion control blanket as shown on the Drawings.
2. When vegetation is to be established, place erosion control blanket over the seed and anchor according to manufacturer's instructions to prevent the seed from washing away.
3. Place erosion control blankets on seedbeds free of sticks, rocks, and other objects larger than 1 inch.

3.06 Soil Stockpiles

- A. Manage soil stockpiles for wind erosion, stormwater erosion and sediment control.
- B. Temporarily or permanently stabilize stockpiled soil that is scheduled or likely to be left inactive for 14 days or more with measures appropriate for the season to minimize erosion potential. Stockpile side slopes shall not exceed a ratio of 2:1.
- C. Position stockpiles away from any ditch, stream, wetland, or stormwater conveyance.
- D. Properly dispose of soil that will not be used for the project.

3.07 Trench Excavation

- A. Pile material from trench excavations in an area away from any ditch, stream, wetland, or stormwater conveyance and install silt fence around the material for sediment control.
- B. Install inlet protection within the project area when excavated material is placed on a paved surface.
- C. Following pipe installation, backfill trenches and temporarily or permanently stabilized all bare areas to prevent soil erosion.

3.08 Directional Drilling or Horizontal Boring Erosion and Sediment Control

- A. Install erosion and sediment control measures in accordance with the Drawings.

- B. Install silt fence around all Work areas at bore and receiving pits to control sediments.
- C. Pile materials from ditch excavation away from ditches, streams, wetlands, or stormwater conveyances.
- D. Properly dispose of material that is not used to back fill pits.
- E. Filter pit dewatering discharge in accordance with 02102 for the Disposal of Sediment-Laden Water
- F. Seed and mulch disturbed soil surfaces

3.09 Work within a Waterway (Stream Crossing) or Floodway

- A. Minimize tree removal and brush clearing within floodplains and near waterways. When possible, maintain a stream setback width of at least 25 feet from the top bank of all waterways
- B. All avoided waterways and stream setback areas shall be demarcated in the field and protected with suitable materials (e.g., silt fencing, snow fencing, signage, etc.) prior to site disturbance. Retain these materials in place, maintain throughout the construction process, and remove entirely once construction is completed.
- C. Do not place heavy equipment below the ordinary high water mark of any waterway, except when no other alternative is practicable.
- D. Provide suitable non-erodible material for temporary fill for purposes of access or staging and maintained to minimize erosion.
- E. Avoid disturbing the ground within the drip line of any tree. When possible, utilize a physical barrier to protect this zone from construction activities.
- F. Install erosion and sediment control practices during and after construction to minimize impacts to a waterway or floodplain.
- G. Stabilize bare areas immediately following construction activities.
- H. Reclaim all disturbed areas within and adjacent to waterways that are to be revegetated, with native species.
- I. Install erosion control blanket to cover bare areas and seedbeds and to prevent erosion until vegetated species are established.
- J. Stockpiling of soil, excavated materials, or stone is not permitted within or near a ditch, or waterway.
- K. When installing pipe by open cutting a trench across a waterway, if the Work cannot be completed during dry conditions, bypass pump stream flows using the dam and pump method as shown on the Drawings.

- L. Utilize existing roads to move equipment and materials from one side of the waterway to the other.

3.10 Working Near Karst Features or Water Wells

Karst features are underground geological formations that range from sinkholes, vertical shafts, and springs, to complex underground drainage systems and caves. Underground karst features and water well aquifers are to be protected from construction activities and potential pollution sources.

- A. Identify water wells and known karst features on the Drawings.
- B. Implement erosion and sediment control practices to reduce sedimentation introduction into karst features and groundwater.
- C. Position construction materials and equipment so that the area slopes away from karst features and wells.
- D. Provide secondary containment for all chemicals, fuels, or other liquids to capture spills or leaks.
- E. Clean up spills with absorbents or dry methods. Do not allow spills to soak into the ground and do not wash off with water or detergents.
- F. Properly dispose of waste materials.

3.11 Field Quality Control

A. Inspections

1. Inspect all erosion and sediment control measures at least once every 7 days.
2. Inspect all erosion control measures the next business day after any storm event with greater than 0.5-inch of rain has occurred.
3. Conduct a weekly inspection of the construction site to identify areas contributing to stormwater discharges associated with construction activity.
4. On a regular basis inspect disturbed areas, material storage areas, and equipment storage areas that are exposed to precipitation for evidence of, or the potential for, pollutants leaving the project site or entering a storm drainage conveyance.
5. Inspect stormwater discharge locations to determine if control measures are effective in preventing adverse impacts to receiving waters.
6. Observe erosion and sediment control devices to ensure that they are operating properly.
7. Inspect haul routes and construction entrance(s) daily for evidence of off-site vehicle tracking of sediments.
8. Inspect staging area to ensure that solid and liquid wastes are being properly disposed of and are not allowed to be discharged into stormwater runoff.

B. Inspection Reports

1. Summarize the results of each inspection.

2. Include the following:
 - a. Inspection date
 - b. Names, titles, qualifications, and signature of personnel making the inspection
 - c. Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event
 - d. Approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred
 - e. Weather information and a description of any discharges occurring at the time of the inspection
 - f. Location(s) of discharges of sediment or other pollutants from the site
 - g. Location(s) of BMPs that need to be maintained
 - h. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location
 - i. Location(s) where additional BMPs are needed that did not exist at the time of inspection
3. Corrective action required including any changes to the SWP3 necessary and implementation dates. Retain inspection reports for three (3) years following approval of final payment.
4. Make reports available immediately upon in-person request of an inspecting authority during working hours and within 7 days of a written request

3.12 Maintenance

- A. Maintain all erosion and sediment control measures and perform the following maintenance procedures throughout the project and until such time as the disturbed area has been completely stabilized or other provisions have altered the need for these measures.
 1. Implement maintenance practices as specified in the Drawings.
 2. Replace mulch materials to their original level when the level has been substantially reduced due to decomposition of the organic mulches and displacement or disappearance of both the organic and inorganic mulches.
 3. Remove rubbish and channel obstructions from bare and vegetated channels within the project limits. Repair damage from scour or bank failure, rodent holes, and breaching of diversion structures. Remove deposits of sediment.
 4. Immediately repair excessive wear, movement, or failure of erosion control blankets.
 5. Repair any damage to silt fence barriers immediately and monitor barriers daily during prolonged rainfall.
 6. Repair or replace any filter fabric which has decomposed or become ineffective prior to its expected usable life.
 7. Remove sediment deposits after each storm event. Remove sediment when deposits reach approximately half the height of a silt fence barrier.
 8. Till and smooth to conform to the existing grade and reseed any sediment deposits remaining in place after erosion and sediment control measures are no longer required and have been removed.

9. Maintain construction entrances in a condition to prevent tracking or flowing of sediment onto roads. This could require periodic top dressing of the construction entrance with additional surface materials as conditions demand. Repair and clean out any features used to trap sediment and remove all sediment spilled, dropped, washed, or tracked onto road surfaces and dispose of properly.
10. Remove accumulated sediments and debris from inlet protection devices after each storm event.
11. Periodically remove concrete and residual liquid from the concrete washout area, as needed to maintain available space for the future washout and rainwater. Dispose of in accordance with Section 02102.
12. Repair all rills that may appear. Re-grade to eliminate rill and stabilize ground by seeding or other approved methods.
13. Remove and dispose of all temporary erosion and sediment control practices within 30 days after site stabilization is achieved or after the temporary practices are no longer needed.
14. Stabilize the site and reapply seed and mulch to achieve 70 percent density of cover on vegetated areas.

3.13 Schedules

- A. Coordinate erosion and sediment control measures with construction activities so controls are in place before construction begins.
 1. Install the temporary construction entrance and sediment traps or filters before clearing and grading begins.
 2. Install temporary perimeter controls (e.g., silt fences and inlet protection) before clearing and grading begins.
 3. Do not clear, grub or grade until it is necessary for construction to proceed. Maintain natural vegetation and vegetated buffers when practical to reduce the need for control devices. Maintain all controls as described throughout the construction project and until upstream drainage areas are stabilized.
 4. Permanently stabilize bare soils once construction activities cease in an area.
- 3.14 Payment: Stormwater Pollution Prevention and Erosion Control Work will not be measured and paid for directly but be considered as a subsidiary obligation of the Contractor with costs included in the contract prices bid for the items to which they apply unless otherwise shown in the Itemized Bid Attachment.

-END-

SECTION 02102 – MATERIAL HANDLING AND SPILL PREVENTION PLAN

PART 1 - GENERAL

1.01 Summary

A. Section includes a plan outlining procedures to:

1. Help protect the health and safety of those working at the project site as well as the environment
2. Prevent the contamination of stormwater runoff by onsite pollutants
3. Help prevent fuel and chemical spills
4. Provide a response procedure should a spill occur

B. Related Sections

1. Section 02101 – Stormwater Pollution Prevention and Erosion Control
2. Section 02110 - Site Clearing

1.02 References

A. Ohio Revised Code 3750 – Emergency Planning

B. Ohio Administrative Code 3745-56 – Above Ground Storage Tanks and Hazardous Materials

C. AWWA C651 – Disinfecting Water Mains

1.03 Definitions

A. Minor Spill: Approximately 10 gallons or less of pollutant with no contamination of ground or surface waters. Minor spills can generally be controlled by the first responder with help from other site personnel.

B. Major or Hazardous Spill: More than 10 gallons with the potential for death, injury, or illness to humans or animals or has the potential for surface or groundwater pollution.

C. Pollutants generated onsite may include gasoline, diesel fuel, oils, grease, paints, pesticides, nutrients, concrete washout, soil, solvents, paper, plastic, Styrofoam, metals, glass, and other forms of liquid or solid wastes.

1.04 Quality Assurance

A. Regulatory Requirements

1. Ensure material handling and storage associated with construction activity complies with the spill prevention and spill response requirements in Ohio Revised Code 3750 Emergency Planning

2. Ensure aboveground storage tanks containing hazardous materials are stored appropriately according to the requirements in Ohio Administrative Code Chapter 3745-56.
3. Dispose of contaminated soils, absorbents and spill cleanup materials in accordance with all Federal, State, and local regulations.
4. Do not use water to flush spilled material unless authorized by a Federal, State, or local agency.
5. Additional regulation or requirements may be required. Consult a spill response professional to ensure all appropriate and required steps have been taken.
6. Do not remove contaminated material from the site until approval is given by Emergency Response (when emergency response is required).

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Preparedness

- A. Prepare a contact list of First Responders and the chain of command in the event of a spill on the site. Include names, contact numbers and information on circumstances requiring the initiation of the contact list and chain of command.
- B. Maintain a list of qualified contractors, vacuum trucks, tank pumpers, and other equipment and businesses qualified to perform cleanup operations.
- C. Provide a list and quantity of absorbent materials and supplies the Contractor will make available onsite in sufficient quantities to address minor spills.
- D. Train construction personnel, equipment operators, subcontractors and other employees on proper fueling procedures, prevention of spills, spill response procedures, and communication procedures.

3.02 Spill Response

A. Minor Spills

1. Contain the spill to prevent material from entering the waterways and the storm or groundwater systems. Immediately clean up the spill with absorbent materials.
2. Do not flush with water, bury or allow soaking in to the ground.
3. Tarps can be used to cover spilled material during rain events on land.
4. Use absorbent material to cleanup spills on land.
 - a. Contain spills on impervious surfaces with a dry absorbent.
 - b. Contain spills on clayey soils by constructing an earthen dike and dispose of as soon as possible to prevent migration deeper into the soil and groundwater. Remove contaminated soils.

5. Use containment booms to prevent the migration of spills on water.
 - a. Contain spills on water with a containment boom and absorb with an oil-only boom, mechanical skimmer or other similar device.
 - b. Outside agencies will determine additional cleanup measures.
 - c. Report oil spills that cause a sheen upon the waters.
6. Place contaminated absorbents and soils into a container for later disposal. Ensure the lid is closed and mark or label the container for identification purposes.
7. Contact 911 if the spill could be a safety issue.
8. Contact supervisors and designated inspectors immediately.
9. Dispose of waste appropriately.

B. Major or Hazardous Spills

1. Control or contain the spill without risking bodily harm.
2. Temporarily plug or cover storm drains if possible to prevent migration of the spill into the stormwater system.
3. Use containment booms to prevent the migration of spills on water.
 - a. Contain spills on water with a containment boom and absorb with an oil-only boom, mechanical skimmer or other similar device.
 - b. Outside agencies will determine additional cleanup measures.
 - c. Report oil spills that cause a sheen upon the waters.
4. Immediately contact the local Fire Department at 911 to report any hazardous material spill.
5. Contact supervisors and designated inspectors immediately. Contact county or municipal officials responsible for stormwater facilities. The Contractor is responsible for having these contact numbers available at the job site. Submit a written report to the Owner as soon as possible.
6. Contact the Ohio Environmental Protection Agency (OEPA), Office of Emergency Response as soon as possible, but within 2 hours of discovery at 1-800-282-9378. Note the following information for future reports to the OEPA or the National Response Center (1-800-424-8802):
 - a. Name, address and phone number of person making the spill report
 - b. The location of the spill
 - c. The date and time of the spill
 - d. Identification of the spilled substance
 - e. Cause of the spill
 - f. Approximate quantity of the substance that has been spilled or may be further spilled and the amount recovered
 - g. The duration and source of the spill
 - h. Name and location of the damaged waters
 - i. Name of spill response organization
 - j. Measures taken in the spill response
 - k. Other pertinent information

3.03 Spill Prevention and Material Handling Practices

A. Vehicle and Equipment Fueling

1. Purpose: To prevent fuel spills and leaks and to reduce or eliminate contamination of stormwater and waterways.
2. Implementation
 - a. Use offsite commercial fueling stations when possible. Use onsite vehicle and equipment fueling only where it is impractical to send vehicles and equipment offsite to a commercial fueling station.
 - b. When performing fueling onsite provide a designated fueling area.
 - c. Do not "top-off" fuel tanks.
 - d. Keep available absorbent spill cleanup materials and spill kits in fueling areas and on fueling trucks.
 - e. Use drip pans or absorbent pads during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
 - f. Inspect vehicles and equipment daily for leaks. Repair leaks immediately or remove them from the project site.
 - g. Protect dedicated fueling areas from stormwater run-on and runoff, and locate them at least 50 feet away from the downstream drainage facilities, stormwater conveyances or waterways.
 - h. Perform fueling on level-grade areas.
 - i. Protect fueling areas with berms and dikes to contain spills.
 - j. Equip nozzles used in vehicle and equipment fueling with an automatic shut off.
 - k. Do not leave fueling operations unattended.
 - l. Avoid mobile refueling of construction equipment; rather transport the equipment to the designated fueling area.
 - m. Store all petroleum products in tightly sealed containers which are clearly labeled.
 - n. Observe Federal, State, and local regulations for any stationary above ground storage tanks.

B. Vehicle Maintenance Areas

1. Purpose: To prevent spills during the normal maintenance of construction machinery.
2. Implementation:
 - a. As feasible, perform maintenance offsite in a covered facility with an impervious floor.
 - b. Use a dedicated site for machinery maintenance.
 - c. Locate maintenance areas at least 50 feet from stormwater inlets or water bodies.
 - d. Maintain spill kits and absorbent materials in close proximity to maintenance areas. Utilize drip pans and absorbent pads to prevent oils or other maintenance fluids from reaching the soil surfaces.
 - e. Inspect equipment daily for leaks or worn hoses. Repair or replace as needed to prevent onsite spills.
 - f. Properly dispose of all spilled fluids and fluids removed from machinery.

C. Solid Waste Management

1. Purpose: To prevent or reduce the discharge of pollutants to waterways or stormwater from construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.
2. Suitable Applications: Suitable for construction sites where the following wastes are generated or stored:
 - a. Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
 - b. Packaging materials including wood, paper and plastic
 - c. Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
 - d. Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
 - e. Construction waste including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, plastic and other packaging for construction materials
 - f. Sediments and other materials collected in erosion and sediment control measures (silt fence, inlet protection, catch basin sumps, etc.)
 - g. Natural debris such as excess soil, stone, sand, leaves, branches, brush or wood
3. Implementation:
 - a. Develop a plan for proper waste disposal including the disposal of excess soil and excavated material. If a commercial disposal facility will not be utilized for soil disposal, then develop a Stormwater Pollution Prevention Plan for the selected disposal area.
 - b. Select designated waste collection areas onsite.
 - c. Inform trash-hauling contractors that only watertight dumpsters are acceptable for onsite use.
 - d. Inspect dumpsters for leaks, and repair dumpsters that are not watertight.
 - e. Provide an adequate number of containers with lids or covers to prevent loss of wastes from wind and to prevent the collection of rainwater.
 - f. Collect site trash daily or more frequent if needed during demolition Work. Do not allow containers to overflow. Clean up immediately if a container spills, leaks or overflows.
 - g. Remove solid waste promptly from erosion and sediment control devices.
 - h. Ensure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acid, pesticides, additives, curing compounds) are not disposed of in dumpsters designed for construction debris.
 - i. Do not hose out dumpsters on the construction site. Ensure that dumpster cleaning is conducted by the trash hauling contractor off site.
 - j. Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas. Do not locate solid waste storage areas in areas prone to flooding or ponding.
 - k. Locate solid waste dumpsters a minimum of 50 feet away from waterways, stormwater inlets or other drainage facilities.
 - l. Minimize the potential for spills or leaks to drain immediately into a waterway or drainage facility.
 - m. Do not bury construction waste onsite.

- n. Cover construction material hauled from the site in dump trucks with a tarpaulin.
- o. Inspect construction waste areas regularly.

D. Fluids, Paints, Solvents and Other Chemicals Storage and Use

- 1. Purpose: To prevent spills during the use and storage of the materials.
- 2. Implementation
 - a. Store materials in manufacturer's containers.
 - b. Maintain Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) on all products.
 - c. Store materials in a weather proof/vandal resistant locker or building.
 - d. Keep materials away from flammable sources.
 - e. Follow manufacturer's instructions for the proper use and storage of all materials.
 - f. Do not perform washout of solvent from paint supplies near or into a waterway or stormwater inlet. Wash water is to be disposed of as wastewater.
 - g. Tightly seal and store paint containers and curing compounds when not required for use.
 - h. Do not discharge excess paint to a waterway or storm system. Properly dispose of excess paint according to the manufacturer's instructions and in accordance with all Federal, State, and local regulations.

E. Secondary Containment

- 1. Provide secondary containment for aboveground storage tanks or storage areas containing hazardous materials that are located outside.
- 2. Provide secondary containment consistent with good engineering standards.
- 3. Provide secondary containment that is compatible with the hazardous materials being stored.
- 4. Provide secondary containment that will prevent a release from entering waters for a 72 hour period.
- 5. Secondary containment must meet one of the following:
 - a. Double-walled tank,
 - b. Dikes, berms, retaining walls, trenches, or
 - c. Diversionary system
- 6. Provide secondary containment with a capacity to contain at least 110% of the volume of the largest aboveground tank or the volume of the largest aboveground tank plus enough freeboard to contain precipitation generated by a 25 year/24 hour rain event.
- 7. Provide secondary containment with a minimum 120 gallon capacity for storage area holding only drums.
- 8. Maintain the secondary containment to protect the integrity and capacity of the area.
- 9. Remove collected liquid in the secondary containment area within 72 hours of its discovery to maintain the capacity. Remove ice as soon as weather permits. Liquid that collects within the secondary containment area must meet all applicable requirements of the Water Quality Standards if discharged to waters of the state.

F. Disposal of Sediment-Laden Water

1. Purpose: To prevent the purposeful discharge of sediment-laden water from the project site.
2. Implementation:
 - a. Do not discharge sediment-laden water from pumping operations into or near stormwater conveyances, wetlands, rivers, streams, waterways and impoundments or into natural or manmade channels leading thereto.
 - b. Discharge sediment-laden water from dewatering of trenches, or other excavations by means of a pump or similar means into a manufactured pumping bag for filtering in accordance with the manufacturer's instructions unless the pumped water is routed through another erosion control measure such as a sediment trap or outlets onto a well-established vegetated area without eroding.
 - c. Pumping operations moving clean water through a site are not required to have a pumping bag or similar device at the outlet.
 - d. Protect the point of discharge to prevent soil erosion.

G. Concrete Washout Area

1. Provide a designated concrete washout area for use of washing out concrete trucks in order to contain potential stormwater pollutants. Use one of the following methods:
 - a. Construct a minimum 10-foot by 10-foot by 3-foot deep area (or larger as required to contain liquid and solid waste from concrete washout operations) with a polyethylene lining. Construct and prepare the base of the system so that it is free of rocks and other debris that may cause tears or punctures in the polyethylene lining.
 - b. Install and maintain a pre-fabricated containment system in accordance with the manufacturer's instructions.
 - c. Use a polyethylene-lined roll-off dumpster when other methods are not practicable.
 - d. Subcontract with a concrete supplier that collects all washout water and pumps it back into the mixer drum for proper disposal off-site. In this instance, a concrete washout area would not be required.
2. Install orange safety fencing around concrete washout area perimeter. Post signage directing contractors and suppliers to the designated concrete washout location.
3. Locate washout areas at least 50 feet from storm drains, open ditches, or water bodies.
4. Inspect system daily and after each storm event. Inspect the integrity of the overall structure including, where applicable, the containment system. Inspect the system for leaks, spills, and tracking of soil by equipment. Inspect the polyethylene liner for failure. The liner may need to be replaced after every cleaning if removal of material has damaged the liner. Repair the concrete washout structure, as needed, or construct a new system.
5. Allow concrete wastes to set. Break up and properly dispose of hardened wastes. Liquid that collects in the washout area could be high in alkalinity and could contain pollutants. Liquid must be disposed of as wastewater. Upon removal of waste, inspect the structure.

6. Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose of in the trash.
7. Discuss the concrete management techniques (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
8. Incorporate requirements for concrete waste management into material supplier and subcontractors' agreements. Inspect construction activities on a regular basis to ensure suppliers, contractors, and others are utilizing designated washout areas. If concrete waste is being disposed of improperly, identify the violators and take appropriate action.
9. Perform washout of concrete trucks offsite or in designated areas only. Never dispose of washout from concrete trucks in a ditch, stream, wetland, waterway, or storm water conveyance.
10. Do not dump excess concrete onsite, except in designated areas.
11. When concrete washout systems are no longer required, close the concrete washout systems. Dispose of all hardened concrete and other materials used to construct the system. Backfill, grade, and stabilize any holes, depressions, and other land disturbances associated with the system.

H. Fertilizers

1. Apply fertilizers only in the minimum amounts recommended by the manufacturer.
2. Work fertilizers into the soil to limit exposure to storm water.
3. Store fertilizers in a covered area and transfer partially used bags to a sealable container to avoid spills.

I. Chlorinated Water

1. Neutralize and dispose of heavily chlorinated water following completion of the disinfection and testing of water lines in accordance with AWWA C651, Appendix C.

-END-

SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing all labor, tools, equipment, and materials necessary to complete clearing and grubbing, removal of trees, stumps, and fences as applicable, and disposal of removed items and debris as shown on the Drawings and described herein.

B. Related Sections

1. Section 02101 - Stormwater Pollution Prevention and Erosion Control
2. Section 02200 - Earthwork

PART 2 - PRODUCTS

2.01 Topsoil

A. Topsoil shall be reasonably free from subsoil, debris, and stones larger than 1 inch in diameter.

B. Refer to Section 02101 and Section 02200 for additional topsoil requirements.

PART 3 - EXECUTION

3.01 Clearing

A. Remove trees, bushes, and fences only where shown on the Drawings which will interfere with the new construction. Dispose of materials and debris at a location secured by the Contractor and in accordance with all applicable laws.

3.02 Grubbing

A. Remove any stumps, roots larger than 1-1/2 inches in diameter, vegetation, boulders, and other objectionable material within the limits of the construction area.

B. Remove tree stumps and roots to the following depth:

1. Within paved area: 24 inches below subgrade
2. Within structure areas: 36 inches below subgrade
3. Within lawn areas: 24 inches below subgrade

C. Scrape clean all areas to be stripped of topsoil. Remove all brush, weeds, grass, roots, and other materials that will interfere with lawn maintenance.

- D. Strip the construction area of all topsoil to its entire depth. Do not use topsoil for subgrade fill. Stockpile topsoil for use in finish grading operations in approved areas and protect from erosion.
- E. Dispose of all rubbish and debris resulting from clearing and grubbing operations off the property and in accordance with all applicable laws. Do not burn any rubbish and debris onsite.

3.03 Trimming

- A. Remove interfering branches without injury to tree trunks. Do not paint or cover wounds to the tree or pruned branches.

3.04 Protection

- A. Protect existing trees and shrubbery in the construction area that are to remain. Remove and replace in kind all trees and shrubbery in the construction area that are to remain but that are damaged or killed during construction.
- B. Tree Protection During Excavation - Adhere to the following procedure when installing underground electric, water, sewer lines and structures near trees.
 - 1. When possible, avoid trenching inside the dripline of a tree.
 - 2. Cut roots cleanly. Do not paint cut roots.
 - 3. Backfill the trench as soon as possible. Do not leave the roots exposed to air.
 - 4. Clean up around trees immediately after construction.
- C. Protect existing utilities that are to remain.

3.05 Tree Protection for Federal and State Listed Bat Habitat

- A. To avoid impacts to state and federally listed bat species *Myotis Sodalis* (Indiana Bat), *Myotis septentrionalis* (Northern Long-eared Bat), *Perimyotis subflavus* (Tri-colored Bat), and *Myotis lucifugus* (Little Brown Bat), removal of trees larger than 3 inches at breast height (54 inches above the ground surface) is not allowed from **April 1st through September 30th**.
- B. Contact ODNR-DOW at 1-800-945-3543 if federally or state listed bat species are encountered.

3.06 Management of Trees for the Emerald Ash Borer

- A. Emerald Ash Borer (EAB), *Agrilus planipennis Fairmaire*, is an exotic beetle that damages all species of ash trees (genus *Fraxinus*) and other hardwood trees. In accordance with federal regulations (7 CFR 301.53-1 through 301.53-9), all trees potentially containing EAB are not to be moved out of the federally quarantined area. Coniferous trees (such as pine, spruce, or fir) are not regulated by 7 CFR

301.53-1 through 301.53-9. The EAB quarantine restricts movement of the following:

1. Cut firewood of any kind, except pine. Firewood may move between federally quarantined states in the quarantined area if this is allowed by each state. It is best to verify with each destination state Department of Agriculture for their rules or contact ODNR Division of Forestry for assistance and the latest information on quarantine status.
2. Living EAB insects of any life stage from immature to adult.
3. Any whole ash trees, including nursery trees.
4. Limbs, stumps, branches, or debris from ash trees with a diameter of 1 inch or more.
5. Ash logs, slabs, or untreated ash lumber with the bark attached.
6. Ash chips and ash bark chips (both composted and non-composted) that are 1 inch or more in diameter.
7. Any product made from ash wood that was recently alive and growing that might move any life stage of the beetle.

For additional guidance regarding the proper disposal of tree material that could potentially be infested with EAB, contact the Ohio Division of Forestry at 1-877-247-8733.

-END-

SECTION 02111 – RECORDING OF CONSTRUCTION AREAS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Providing all labor, materials, equipment, services, and operations necessary to produce color, audio-visual, digital recording of the existing surface features and conditions within the construction area prior to beginning construction.
2. Providing corresponding runsheet logs.

1.02 Submittals

- ##### A. Submit still frame capable, color videos on a digital media storage device compatible for playback on a personal computer (USB flash drives acceptable).

PART 2 - PRODUCTS

2.01 Equipment

- ##### A. Use a high-quality color camcorder with 1/4-inch, 1/3-inch, or 1/2-inch charged coupled device-imaging system. Camera must:
1. Utilize optical stabilization (Electronic stabilization is not acceptable.)
 2. Be capable of 20x minimum optical magnification
 3. Be capable of producing NTSC 525 lines resolution/60 fields/30 frames per second
 4. Have minimum illumination capabilities of at least 3-lux

PART 3 - EXECUTION

3.01 General

- ##### A. Prior to beginning construction, walk each Work site with a member of the Owner's staff (and Engineer) and record existing site conditions. Provide audio-visual recordings of all existing surface features and site conditions located within the construction zone of influence.
- ##### B. The purpose of this coverage is to accurately document the pre-construction conditions of the surface features.

3.02 Information to be Included

- ##### A. The construction zone of influence shall be defined as an area located within the permanent and temporary construction easement, an area 30 feet beyond either side of the centerline of the construction area, the road right-of-way, and shall

include those areas adjacent to these areas which may be affected by routine construction operations, or as requested by the Engineer.

- B. The surface features within the construction zone of influence shall include, but not be limited to, all visible roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery and fences.
- C. Provide a runsheet log that accurately catalogs the contents of each video. Information in the runsheet must include:
 - 1. Street name, easement, or address
 - 2. Drawing sheet number(s) relative to the line entry of a particular area of coverage
 - 3. Media storage device numbers
 - 4. Real time code indexing for each segment of the project. Real time code indexing will indicate hours, minutes, and seconds to cross reference with playback equipment to locate specific points of interest on the project.
 - 5. Direction of travel for each specific segment
 - 6. Viewing side for each specific segment
 - 7. Starting point for each specific segment
 - 8. Ending point for each specific segment
 - 9. Project information, i.e., project title, owner, date
- D. All media storage devices must be tagged/labeled with appropriate project information and be able to be cross-referenced with runsheets. Information on media storage device labels shall include:
 - 1. Video number
 - 2. Project Title
 - 3. Location of project
 - 4. Month and year of coverage
 - 5. If multiple copies of each video is to be made available, media storage devices must be marked as sets, i.e., Engineer's set, Owner's set, Contractor's set.
 - 6. Quick reference list of contents of a particular video

3.03 Miscellaneous Details

- A. Conduct recording of the project prior to the placement of equipment and materials on the jobsite. Log and present all videos to the Engineer before the actual construction is started for their review. Give particular and detailed attention to any defects noted, such as cracks, disturbed areas, damaged items, or as may be required by Engineer. It is the intent of this coverage to document pre-existing conditions accurately and clearly, especially any items that may result in construction claims.
- B. To prevent tampering or editing of videos, all recordings must digitally display continuous and simultaneously generated information including the date and time of recordings, as well as the corresponding engineering stationing numbers. The date information will contain the month, day and year.

- C. Accompanying the recording shall be a corresponding and simultaneously recorded audio track containing the commentary of the camera operator. Each video shall begin with the current date, project name, municipality, and the general location, i.e., name of street, viewing side, and direction of progress. The commentary shall assist in the maintenance of viewer orientation, identification of surface features, and objective description of the points of interest being shown on the video portion of the recording.

3.04 Recording

- A. Perform recordings during times of good visibility. Do not record during periods of visible precipitation, or when more than 10 percent of the ground area is covered with snow, unless authorized by the Engineer.
- B. Identify houses and buildings visually by house number, when visible, in such a manner that structures of the proposed system, i.e., manholes on a sewer system, gate valves and hydrants on a water system can be located by reference. In all instances, locations shall be identified by audio or visual means at intervals not to exceed 100 linear feet.
- C. To produce the proper detail and perspective, provide adequate lighting to fill in shadow areas caused by trees, utility poles, road signs, and other such objects.
- D. The rate of speed in the general direction of travel of the conveyance used during taping shall be directly proportional to the number, size, and value of the surface features within that construction area's zone of influence. The rate of speed shall not exceed 48 feet per minute in residential areas, or 100 feet per minute in non-residential areas. The rate of travel for haul routes, rainfall studies, and road surface view shall be approximately five (5) miles per hour. Panning rates and zoom-in, zoom-out rates shall be electronically or manually controlled sufficiently such that during playback will produce clarity of the object viewed. The playback picture shall be in focus and be of extreme clarity at all times.
- E. Where conventional wheeled vehicles are used, mount the camera securely to produce steady viewing. Camera lens is to be a minimum of eight (8) feet from ground of viewing area, or at a level to facilitate best perspective and line of sight. Vehicles used while performing documentation must be plainly marked with Company name and phone number. Use caution signs, flags, and strobes on vehicle as necessary.
- F. Televisе and tape areas with paved roads, along co-owned easements through parks, lawns, and open fields. If recording on private property, give the Owner sufficient prior notice of such entry so that property owners may be advised of and their permission obtained for the Work. If permission is denied, runsheet log shall be duly noted.
- G. The Engineer shall have the authority to designate what area may be omitted or added for recording.

H. The Engineer shall have the authority to reject all or any portion of the recording not conforming to Specifications.

-END-

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 Summary

A. Section includes

1. Stripping, storage and redistribution of topsoil, cut and fill operations, and rough and finish grading.
2. Excavation, backfilling, compaction, hauling, and disposal of materials
3. Dewatering operations

B. Related Sections

1. Section 02101 – Stormwater Pollution Prevention and Erosion Control
2. Section 02110 – Site Clearing
3. Section 03300 – Cast-in-Place Concrete

1.02 References

- A. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
- B. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- C. Ohio Department of Transportation (ODOT) Standard Specifications, latest edition

1.03 Definitions

- A. Pavement/Structure Loading Zone: The area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, structure, vault, tank, pad or other load bearing feature.
- B. Structural Pad: The area within an imaginary line that extends downward from the outside edge of a footing, foundation, mat or other load-bearing feature at a 1H:2V slope.
- C. Structural Fill: Material placed beneath foundations and structures and used to fill an excavation around the vertical sides of structures, directly over structures, and where described in the Specifications and indicated on the Drawings.
- D. Plastic Clay: Soil type CH with a Liquid Limit above 50.
- E. Common Excavation: All excavation not classified as rock excavation or excavation that is otherwise classified.

F. Rock Excavation

1. Igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or the use of a modern power shovel of no less than one cubic yard capacity, properly used, having adequate power and in good running condition, or the use of other equivalent power equipment.
2. Boulders or detached stones each having a volume of one half (1/2) cubic yard or more.

G. Unclassified Excavation: Excavation of all materials of whatever character encountered in the Work.

H. Borrow: Approved material required for the construction of embankments or other portions of the Work, and obtained from offsite.

I. Unsuitable Material: Include frozen soil, relatively soft material, relatively wet material, deleterious material, plastic clays, or soils that exhibit a high organic content.

1.04 Submittals

A. Test Results

1. Structural fill material testing and classification results, including: material source, natural and optimum moisture content, sieve analysis, maximum dry density, classification.
2. Test report on borrow material soil classification (if applicable)
3. Field compaction test results
4. Subgrade evaluations

1.05 Quality Assurance

A. Qualifications

1. Provide the services of a qualified testing laboratory to perform all laboratory tests and evaluations.
2. Provide the services of a qualified testing agency experienced in geotechnical engineering and field determinations of soil suitability for the evaluation of foundations, pavements, and structures subgrade soils and conditions.

1.06 Job Conditions

A. Maintain benchmarks, monuments, and other reference points, and replace any that are disturbed or destroyed.

1.07 Warranty

A. Refill and restore to the original grade settlement in the backfill which takes place within the warranty period at no additional cost to the Owner. Restore the surface area where settlement has occurred, including, but not limited to seeding; fertilizing; erosion control; and restoration of streets, drives, yards, and sidewalks.

- B. Guarantee survival of all disturbed and replaced trees and shrubs during the warranty period.

PART 2 - PRODUCTS

2.01 Materials

A. Regular Backfill

- 1. Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

B. Structural Fill

- 1. Clean, well-graded, coarse-grained granular material free of organic material, debris, deleterious materials, or frozen soils.
 - a. Coarse-Grained Granular Material
 - 1) Less than 5% fines, by weight, passing a No. 200 sieve
 - 2) 100% passing a 1" sieve
 - 3) Coarse sands and gravel-sand mixtures, including variously graded sands and gravels. Soil types GW, GP, SW and SP are included in this class.
- 2. Lean Concrete
 - a. Seven-Day Compressive Strength: 700 psi min
 - b. Material meeting Section 03300

C. Topsoil

- 1. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth
- 2. Uniform composition throughout, without admixture of subsoil
- 3. Free of stones, lumps, clods, and sticks larger than 1-inch; live plants and their roots, sticks, and other extraneous matter

PART 3 - EXECUTION

3.01 Preparation

- A. Clear areas as specified in Section 02110.
- B. Remove all topsoil at construction areas. Stockpile topsoil for use in finish grading operation. Do not use topsoil for fill.
- C. Do not place fill materials until the subgrade and construction have been inspected by the Engineer.

- D. Before borrow or disposal operations begin, provide the Engineer plans for the control of water including measures to keep sediment from entering streams.

3.02 Excavation

- A. Keep open excavations free of water to avoid impacting the Work.
 - 1. Provide and maintain adequate dewatering equipment to remove and dispose of surface water and groundwater entering excavations.
 - 2. Use appropriate measures to prevent surface water from entering the excavation and to provide adequate drainage of the areas adjacent to the excavation.
 - 3. Filter water from dewatering operations to remove sediment before discharge and disposal in accordance with Section 02101.
- B. Protect open excavations by roping areas off, or with barricades or railings, to prevent injury to personnel. Comply with all applicable Occupational Safety and Health Administration (OSHA) regulations.
- C. Excavate true to line and grade, and elevation at bottom of the excavation. Excavate to undisturbed structurally stable subsoil. Notify Engineer where excavation, in order to reach such subsoil, must continue deeper than required by the elevations indicated on the Drawings. No additional payments will be made for unauthorized excess excavation.
- D. Excavate to the dimensions indicated for new construction plus sufficient space as applicable to permit erection of forms, shoring, masonry, foundations, structure installations, and excavation inspections.
- E. Excavate below structures, slabs and pavement to permit placement of subbase material.
- F. Provide shoring or piling as required to protect excavation bank.
- G. Boulders, if encountered, must be disposed of outside of the construction area.

3.03 Contaminated Soils and Groundwater

- A. If suspected contaminated soils or groundwater are discovered during excavation, inform the Engineer immediately and cease excavation.
- B. Contact the corresponding regulatory agency based on the excavation location.
 - 1. If the excavation is within the ODOT right-of way, contact ODOT Office of Environmental Services (614-728-7368) and report the suspected contamination to the Ohio Environmental Protection Agency's (EPA) 24-hour spill hotline (1-800-282-9378). Follow ODOT Site Assessment Guidelines for proper investigation and handling of the suspected contaminated soils or groundwater.
 - 2. If the excavation is outside of the ODOT right-of-way, the Owner will report the suspected contamination to Ohio EPA's 24-hour spill hotline. Ohio EPA may

direct the Owner to additional regulatory agencies depending on the nature of the suspected contamination.

- C. Keep suspected contaminated soils separate from soils that appear to be “clean” or uncontaminated.
 - 1. DO NOT place suspected contaminated soils, in environmentally sensitive areas such as waterways, floodways, wetlands, karst features, or stormwater conveyances.
 - 2. Place suspected contaminated soil on a plastic tarp and cover with an additional plastic tarp or place in containers (e.g. drums) with a lid.
 - 3. Place a berm around the covered stockpile to ensure that soils are not blown by wind or carried by stormwater.
 - 4. Follow the direction of the regulatory agency in handling, storage, characterization, and disposal of contaminated soils.

- D. Leave suspected contaminated groundwater in the excavated area.
 - 1. If the suspected contaminated groundwater must be removed from the excavated area, pump to covered containers (e.g. drums or totes) for proper disposal.
 - 2. Follow all federal, state and local disposal requirements for suspected contaminated groundwater.
 - a. Discharging contaminated groundwater to a waterway or stormwater conveyance requires an emergency NPDES permit from Ohio EPA’s Stormwater Program. The contaminated groundwater must meet the NPDES drinking water quality standards. Contaminated groundwater may not be discharged until the permit is obtained (typically 90 days).
 - b. Discharging contaminated groundwater to the sanitary sewer requires local approval and analytical tests per the local sewer use ordinance or wastewater discharge requirements.

- E. Any increase or decrease of cost resulting from encountering contaminated soils or groundwater will be adjusted in the manner provided in the General Conditions.

3.04 Subgrade Evaluation

- A. Prepare all areas that will support foundations, floors, pavements, or newly placed structural fill prior to subgrade evaluation. Remove all loose surficial soil, topsoil, and other unsuitable materials at least 5 feet beyond the limits of the proposed pavement and structures when feasible.

- B. Once excavations have reached the required elevations and dimensions, notify the Engineer and Contractor’s testing agency so the subgrade can be evaluated. Do not place fill material until the subgrade and construction has been inspected and approved by the Engineer and Contractor’s testing agency.

C. Foundation subgrade evaluation

1. The Contractor's testing agency will test the exposed subgrade to confirm that a bearing surface of adequate strength has been reached.
2. Further excavate localized soft soil zones encountered at the bearing elevation until adequate support soils are encountered, or the minimum undercut depths are achieved, whichever is greater.
3. Replace the undercuts with compacted structural fill.
4. For each type of soil on which footings will be placed, conduct at least one bearing test for every 500 square feet of structure foundation, but in no case less than three tests, to verify required design bearing capacities.

D. Paved and slab area subgrade evaluation

1. Under observation of the Engineer and Contractor's testing agency, proof-roll the subgrade in the location of the new pavement and structures shown on the Drawings.
2. Proof rolling shall consist of repeated passes of a loaded pneumatic-tired vehicle meeting the requirements in Item 204.06.
3. Any areas found to rut, pump, or deflect excessively must be compacted in place or undercut and replaced with compacted structural fill, as directed by the Engineer.

E. Minimum undercut depths to be provided if unsuitable soils, plastic clays, or other unsuitable subgrade conditions are encountered shall be as follows:

1. Subgrade under foundation: minimum 24" undercut
2. Subgrade under slabs: minimum 18" undercut
3. Subgrade under paved areas: minimum 12" undercut

3.05 Filling and Backfilling

A. General

1. Once the subgrade has been approved by the Contractor's testing agency and the Engineer, fill and/or backfill the excavations to the required grades as shown on the Drawings.
2. Suspend earthwork operations when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions in the field.
3. Material shall be of the proper moisture content before compaction. Do not perform filling or backfill if the material is too wet to permit proper compaction.
4. Place layers in the deepest portion of the fill first. As placement progresses, construct layers approximately parallel to the finished grade line.
5. Place layers in successive horizontal layers for the full width of the section and at the loose lift thickness specified.

B. The Contractor is responsible for the stability of the fill above the top of footings. Do not backfill until walls are braced or shored and the Engineer has approved the

backfilling operation. If fill is to be provided on both sides of walls, fill on both sides at same time.

- C. Install vapor barrier on drainage fill prior to installing slab-on-grade floor slabs. Place drainage fill under floor slabs, slabs on grade, walks, and paving to indicated depths but not less than four (4) inches in depth.

3.06 Compaction

A. General

1. Compact fill using equipment capable of compacting each lift its full depth. Maintain moisture at optimum content during compaction operations.
2. Provide compacting equipment of the design, weight, and quantity to obtain the required soil compaction. Under no circumstances will a bulldozer or similar tracked vehicle be used as compacting equipment.
3. Use water distribution equipment with suitable sprinkling devices to add moisture to the soil, if required.
4. Compact areas inaccessible to a roller by mechanical tampers. Operate the equipment in such a manner that hardpan, cemented gravel, clay, or other chunky soil material are broken up into small particles and become incorporated with the material in the layer.
5. Compaction by flooding is not acceptable.
6. If a fill area excavation extends beyond the limits of that fill area definition, continue with the same fill material and compaction across the entire excavation unless approved by Engineer.

B. Degree of Compaction

1. Compact to the limits specified below and in accordance with ASTM D698.
2. Fill areas beneath footings, foundations, and mats (within the Structural Pad):
 - a. From bottom of fill to within 12" of top of fill: Place Structural Fill in 8" maximum loose lifts and compact each layer to 100% of maximum dry density (ASTM D698).
 - b. Final 12" of fill: Place Structural Fill in 6" maximum loose lifts and compact each lift to 100% of maximum dry density (ASTM D698).
3. Fill areas beneath floor slabs, adjacent to and within 5' of foundations, and over foundation (outside the Structural Pad but within the Structure Loading Zone):
 - a. From bottom of fill to within 12" of top of fill: Place Structural Fill in 8" maximum loose lifts and compact to not less than 95% of maximum dry density (ASTM D698).
 - b. Final 12" of fill: Place Structural Fill in 6" maximum loose lifts and compact each lift to 100% of maximum dry density (ASTM D698).
4. Fill areas adjacent to walls:
 - a. Place Structural Fill in 8" maximum loose lifts and compact to 90% of maximum dry density (ASTM D698) for fills not required to support structural loads above and compact to 95% maximum dry density (ASTM D698) for fills required to support structural loads above.
5. Fill areas within the Pavement Loading Zone:
 - a. Place structural fill in 8" maximum loose lifts.

- b. Compact materials that have a maximum dry density of 100 to 105 pounds per cubic foot to not less than 102 percent of maximum dry density. Compact all other subgrade materials to not less than 100 percent of maximum dry density .
 - c. Compact the subgrade under pavements to a depth of 12 inches below the subgrade surface and 18 inches beyond the edge of the surface of the pavement, paved shoulders, or paved medians. Compact all subgrades under paved driveways, paved mailbox turnouts, curbs and gutters to a depth of 12 inches below the subgrade surface.
6. For all other fill areas: Place regular backfill in 8" maximum loose lifts and compact each layer to 90% of maximum dry density (ASTM D698).

C. Field Density Testing

1. Perform one field density test for every 500 square feet of fill on each lift, but in no case less than three tests, to ensure that adequate compaction is being achieved.

3.07 Proof Rolling of Fills

- A. Perform proof rolling operations using a pneumatic tire roller conforming to the requirements of ODOT Construction and Material Specifications Item 204.
- B. Perform a minimum of two complete coverages.
- C. Correct all roller marks, irregularities, and failures.
- D. After completion of filling and compaction operation, proof roll area with smooth wheel vehicle to leave a smooth surface sealed to shed all water.

3.08 Grading

- A. Furnish, operate, and maintain equipment necessary to control uniform layers, section, and smoothness of grade for maximum compaction and drainage.
- B. Rough Grading
 1. Evenly grade to an elevation 6 inches below the finish grade elevations indicated.
 2. Protect all constructed items during grading operations, and repair if damaged.
 3. All areas in the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted, and free from irregular surface changes.
 4. Provide a finish grade ordinarily obtainable from either blade-grader or scraper operations, unless otherwise specified.
 5. The finished subgrade surface generally shall be not more than 0.3 feet above or below the established grade or approved cross-section, with due allowance for topsoil and seeding or sod as applicable.
 6. The tolerance for areas within 10 feet of buildings shall not exceed 0.15 feet above or below the established sub-grade.

7. All ditches, swales and gutters as applicable shall be finished to drain readily.
8. Evenly slope the subgrade to provide drainage away from the building walls in all directions at a grade not less than 1/2-inch per foot.
9. Provide grade rounding at top and bottom of banks and at other breaks in grade.

C. Protection

1. Protect newly graded areas from the action of the elements.
2. Repair settlement or washing that occurs prior to acceptance of the Work, and reestablish grades to the required elevations and slopes.
3. Fill to required subgrade levels any areas where settlement occurs.

D. Finish Grading

1. Proceed to finish elevations shown on Drawings with a tolerance of plus or minus .04 ft. (1/2 inch).
2. Rake subsoil clean of stones and debris. Scarify to a depth of 3 inches.
3. Spread stockpiled topsoil over prepared subgrade to a minimum depth of 6 inches, and roll until suitable for seeding or placement of sod as applicable.
4. Maintain surfaces and replace additional topsoil necessary to repair erosion.

E. Complete final restoration operations including grading, seeding, and/or other necessary treatments to blend the area into the surrounding landscape as shown on the Drawings. Assure restored areas within 150 feet of the nearest right-of-way line are well drained.

F. No additional payments will be made for restoration of borrow areas. Drainage, location, or use of the pit, shall comply with existing laws, regulations, and ordinances. Under no conditions shall borrow sites detract from the appearance of the natural topographical features or increase any potential hazard.

-END-

SECTION 02226 - TRENCHLESS EXCAVATION - DIRECTIONAL DRILLING

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Installation of conduit by the directional drilling method, including all related Work, for a complete installation as shown on the Drawings and specified herein.
- B. Related Sections
 - 1. Section 02101 - Stormwater Pollution Prevention and Erosion Control
 - 2. Section 02111 - Recording of Construction Areas

1.02 References

- A. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

1.03 Submittals

- A. Quality Control Submittals
 - 1. Details of equipment and written procedure with working drawings describing in detail the proposed boring method and the entire operation to be used.
 - 2. Documentation of experience requirements per paragraph 1.04A.
 - 3. Fraction Mitigation Plan which includes contractor responsibilities, detection, corrective action, containment measures, clean-up, and agency notification, at a minimum.

1.04 Quality Assurance

- A. Qualifications
 - 1. Demonstrate experience and expertise in trenchless excavation methods by providing a list of 6 references for whom similar Work has been performed prior to commencing any Work. Include a name and telephone number for each contact.
 - 2. Provide documentation showing successful completion of at least 50,000 linear feet of directional drilling or obtain the services of an experienced directional drilling subcontractor meeting the experience requirements of this section to supervise the installation prior to commencing any Work. Conventional trenching is not considered applicable experience.
 - 3. Supervisory field personnel shall be adequately trained and have at least 4 years of experience in directional drilling. Submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any Work.

B. Regulatory Requirements

1. Perform all directional drilling Work in accordance with federal, state, and local laws and permits, requirements, and regulations of the U.S. Army Corps of Engineers.

PART 2 - PRODUCTS

2.01 Carrier Pipe

- A. Meet the requirements as specified in Section 16111 - Conduit

PART 3 - EXECUTION

3.01 General

- A. Attend all meetings and provide data, reports, information, details, and construction schedules requested by the Engineer.
- B. Complete the Work in a careful, workmanlike manner to the satisfaction of the Engineer.

3.02 Examination

- A. Verify the location of all known and unknown utilities and structures by test pitting prior to any boring or drilling. These utilities and structures may include, but are not limited to:
 1. Underground utilities
 - a. Storm drains
 - b. Electric cables
 - c. Water mains
 - d. Sewer lines and septic systems
 - e. Gas lines
 - f. Telephone lines
 - g. Fiber optic lines
 - h. Cable television lines
 - i. Wells
 - j. Field drain tiles
 2. Above-ground utilities and other obstructions
 - a. Electric and telephone poles
 - b. Buildings
 - c. Trees
 - d. Road signs
- B. Be responsible for inspecting the site, conducting investigations, surveys and tests, including subsurface investigations and tests, that are necessary for the complete execution of all the Work under this Contract.

3.03 Installation

A. General

1. Before beginning any Work, submit plans and details describing the materials and methods which are proposed for use. Do not proceed with the Work until such drawings and methods have been reviewed for conformity with the approved permit by the Engineer. The review by the Engineer of any drawings or method shall not relieve the Contractor of his responsibility in any way.
2. Notify the Engineer 48 hours in advance of starting directional drilling Work. Do not begin the directional drilling until the Engineer, or his authorized representative, is present at the job site and proper preparations for the operation have been made. The Engineer's consensus for beginning the installation shall in no way relieve the Contractor of the responsibility for the satisfactory completion of the Work as authorized under the Contract.
3. Do not cut or disturb pavement, asphalt, or excavate within the relative limits of the roadway surface to retrieve any lost boring appurtenances or equipment.
4. Maintain a log of drilling operations which includes vertical depths of the pipe at established horizontal intervals every 25 feet.

B. Equipment

1. The directional drilling system to be used must have the following features:
 - a. The system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. The system shall be able to control the depth and direction of the pipe and must be accurate to ± 2 inches.
 - b. The system shall utilize a fluid-cutting process, using a liquid clay such as bentonite. This clay shall be totally inert and contain no risk to the environment.
 - c. The liquid clay shall remain in the tunnel to increase the stability of the tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.
 - d. Recover spoils by use of a vacuum system mounted on a vehicle for removal of the spoils.
 - 1) Do not discharge spoils into sewers or storm drains.
 - 2) Properly dispose of all spoil material.
 - e. Equipment shall be fitted with a permanent, inherent alarm system capable of detecting an electrical current. The system shall have an audible alarm to warn the operator when the drill head nears electrified cables within a safe operating distance.

- C. Mechanical, pneumatic, or water-jetting methods are not acceptable due to the risk of surface subsidence and damage.

D. Protection

1. Protect personnel against existing buried electrical cables that may be energized.
 - a. Provide all crews with grounded safety mats, heavy gauge ground cables with connectors, hot boots, and gloves.

E. Drilling Procedure

1. Prior to any alterations to the Work site, video tape the entire Work area, including entry and exit points as specified in Section 02111. Provide one copy of the video to the Engineer and keep one copy for a period of 1 year following the completion of the project.
2. Grade or fill the Work site as indicated on the drawings, within the right-of-way, to provide a level working area. Make no alterations beyond what is required for operations. Confine all activities to the designated Work areas and construction limits.
3. Accurately survey the entire drill path and place entry and exit stakes in the appropriate locations within the areas indicated on the Drawings. If using a magnetic guidance system, survey the drill path for any surface geo-magnetic variations or anomalies.
4. Place environmental protection necessary to contain any hydraulic or drilling fluid spills, including berms, liners, turbidity curtains, and other erosion control measures as specified in Section 02101. Adhere to all environmental regulations. Do not store fuel and oil in bulk containers within 200 feet of any waterbody or wetland.
5. Place pipe resting on paved or hardened surfaces (i.e., sidewalks, asphalt, concrete, gravel, etc.) on pipe rollers before being pulled into the drill hole, with rollers spaced close enough to prevent excessive sagging and dragging of the pipe on rough surfaces which could scar the pipe.
6. Calibrate the directional drilling head locator at the start of the day and at each new directional drilling operation. Keep a daily calibration log for the Engineer's review.
7. Ensure the directional drilling operator has full control of the direction of the drilling tool at all times. Abandon and fill shallow, misdirected, or other unsuccessful drills at the direction of the Engineer and at Contractor's expense.
8. The maximum drill angle shall be 15 degrees measured perpendicular to grade to the design depth elevation.
9. Drill a pilot hole on the drill path with no deviations greater than 5 percent of depth over a length of 100 feet. In the event the pilot hole does deviate from the drill path more than 5 percent of depth in 100 feet, notify the Engineer. Engineer may require pull back and re-drill from the location along the drill path before the deviation.
10. In the event of a drilling fluid fracture (frac out), discharge of drilling fluids, inadvertent returns, or returns loss occurs during drilling operations, cease drilling and contact the Engineer, National Park Service (NPS), Ohio Environmental Protection Agency, and Ohio Scenic Rivers Program. Any discharge must be contained and any instream work or post event restoration activities will require a determination from the NPS either prior to or after the fact of an emergency action.
11. Upon successful completion of the pilot hole, ream the drill hole to a minimum of 25 percent greater than the outside diameter of the pipe using appropriate tools. Do not attempt to ream, at one time, more than the drilling equipment and mud system are designed to safely handle.
12. After successfully reaming the drill hole to the required diameter, pull the pipe through the drill hole. In front of the pipe will be a swiveling mandrel. Once pull-

back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the drill hole. Do not apply more than the maximum safe pipe pull pressure at any time during pull-back operations.

13. Pull back 2 strands of tracer wire with the pipe.
 - a. Tracer wire shall be Copperhead Direct Burial #12 AWG, solid steel core, hard drawn, extra-high strength, horizontal directional drill tracer wire with:
 - 1) 1150 pound average tensile break load,
 - 2) 45 mil high molecular weight-high density yellow polyethylene jacket complying with ASTM D1248, and
 - 3) 30 volt rating.
 - 4) Include the tracer wire in the cost of the pipe.
14. In the event the pipe becomes stuck during pull-back, cease pulling operations to allow any potential hydro-lock to subside and then commence pulling operations. If the pipe remains stuck, notify the Engineer. The Engineer and the Contractor will discuss options and then Work will proceed accordingly.
15. At drill pits and directional drilling entrances and exits to the surface, use a backhoe or equivalent to gradually return the bore depth to the prescribed depth.
16. Upon completion of drilling and pipe installation, remove spoils from starting and termination pits. Backfill and compact drill pits and directional drilling entrances and exits to the surface as specified in Section 02220. Restore pits to their original condition.
17. All conduit shall be tested to ensure continuity and the absence of obstructions by pulling through each conduit a swab followed by a mandrel 85% of the conduit inside diameter.

3.04 Field Quality Control

- A. Maintain a daily calibration log of the directional drilling head locator. Provide completed forms or computer-generated output to the Engineer daily for checking line and grade of the drilling operation.

-END-

SECTION 02660 - WATER MAINS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Furnishing and installing all water mains by open cut method, fittings, valves, hydrants, and appurtenances as shown on the Drawings and as specified herein.
2. All pipe, fittings, valves, and hydrant sizes referenced on the Drawings or in these Specifications are intended to be nominal size and diameter.

B. Related Sections

1. Section 02675 – Disinfection

1.02 References

A. American Society of Mechanical Engineers (ASME), latest editions

1. ASME B16 - Valves, Flanges, Fittings, and Gaskets
2. ASME B18.2.1 - Bolts and Screws

B. American Society for Testing and Materials (ASTM) Standard Specifications, latest editions

1. ASTM A36 - Carbon Structural Steel
2. ASTM A194 - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
3. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications
4. ASTM A307 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
5. ASTM D1330 - Rubber Sheet Gaskets
6. ASTM F3190 - Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings

C. American Water Works Association (AWWA), latest editions

1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings
2. AWWA C110 - Ductile Iron and Gray Pipe Fittings
3. AWWA C111 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
4. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast
5. AWWA C153 - Ductile Iron Compact Fittings for Water Service (3-inch through 64-inch)
6. AWWA C223 – Fabricated Steel and Stainless Steel Tapping Sleeves

7. AWWA C502 - Dry Barrel Hydrants
8. AWWA C504 - Rubber-Seated Butterfly Valves
9. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
10. AWWA C515 - Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
11. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
12. AWWA C651 - Disinfecting Water Mains

D. Ohio Environmental Protection Agency (OEPA) Regulations in Chapter 3745 of the Ohio Administrative Code (OAC), latest edition

E. Ohio Plumbing Code, latest edition

F. National Sanitation Foundation (NSF) Standards 60 and 61, latest edition

1.03 Submittals

A. Manufacturer's Certificate of Compliance certifying compliance with the applicable specifications and standards

B. Shop Drawings

1. Pipe
2. Valves
3. Fittings
4. Joint restraints
5. Hydrants
6. Other related items and appurtenances

C. Test Results

1. Hydrostatic test

1.04 Delivery, Storage, and Handling

A. Store materials in an area safe from damage and deterioration.

B. Keep the interior of pipe, fittings, valves, hydrants and appurtenances free from dirt and foreign matter.

C. Drain and store valves and hydrants in a manner to prevent damage from freezing. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.

D. Do not stack pipe higher than manufacturer's instruction. Do not stack fittings, valves, and hydrants.

1.05 Warranty

- A. Locate and repair leaks on any and all water mains installed that occur within the 1-year warranty period at no cost to the Owner.

PART 2 - PRODUCTS

2.01 General

- A. All pipes, fittings, valves, hydrants, and appurtenances shall be new and unused.
- B. Brass and bronze products in contact with potable water shall be manufactured of a lead-free copper alloy in compliance with the most recent requirements of the U.S. Federal Safe Drinking Water Act (Reduction of Lead Act).
- C. Brass and bronze products not in contact with potable water shall be manufactured of 85-5-5-5 waterworks brass.

2.02 Ductile Iron (DI) Water Main Pipe and Fittings

A. Ductile Iron (DI) Pipe

1. Provide pipe centrifugally cast in metal or sand-lined molds and conforming to AWWA C151 Class 52. Provide pipe with a minimum of:
 - a. 350 PSI rated water working pressure for 12-inch diameter and smaller pipe
2. Mark each length of pipe with the manufacturer's name or trade mark, pipe class, year of manufacture and the AWWA Standard that it conforms to.
3. Pipe Joints
 - a. Supply buried pipe with mechanical joint or push-on type joints conforming to AWWA C111. Provide joint restraints on all buried DI pipe.
 - b. Supply exposed pipe with flange joints conforming to AWWA C115.
 - c. Provide screwed on DI flanged joints conforming to AWWA C115.
 - d. Field made flanges are not allowed unless approved in writing by Engineer. If allowed, facing will be done after turning pipe through flanges.
4. Gaskets
 - a. Provide gaskets conforming to AWWA C111.
 - b. Full face bulb-type black SBR rubber
 - c. Thickness: not less than 1/8-inch.
5. Nuts and Bolts
 - a. Use Xylan or Fluokote #1 T head bolts for buried piping.
 - b. Use Stainless-Steel heavy-duty hexagon bolts and hexagon nuts per AWWA C207, Type 316 for exposed piping with appropriate anti seize lubricant.
6. Manufacturers
 - a. Tyton Joint pipe as manufactured by U.S. Pipe
 - b. Fastite Joint pipe as manufactured by American
 - c. Or approved equal

B. Ductile Iron Fittings

1. Provide mechanical joint ductile iron fittings conforming to AWWA C153 and AWWA C110. Use restrained joints instead of thrust blocking.
2. Gaskets: conforming to AWWA C111.

C. Fitting Restraints

1. Series 1100 Megalug by EBAA Iron for DI pipe (3- to 48-inch diameter)
2. JCM 610 Sur-Grip Restrainer by JCM for DI, or C900 PVC pipe (4- to 12-inch diameter)
3. Ford Meter Box Uni-Flange Series 1400 Restrainer for DI pipe (3- to 36-inch diameter)

D. Pipe Joint Restraints

1. Series 1700 Megalug Restraint Harness by EBAA Iron for DI pipe (4- to 48-inch diameter)
2. Field Lok 350 Gaskets by U.S. Pipe & Foundry Company for DI pipe (4- to 24-inch diameter)
3. Flex-Ring Joint System by American Ductile Iron Pipe for DI pipe (14- to 48-inch diameter)
4. JCM 620 Sur-Grip Bell Joint Restrainer for DI or C900 PVC pipe (4- to 12-inch diameter)
5. Grip Ring Series 600 Pipe Restraining System manufactured by ROMAC Industries, Inc. for DI pipe and PVC pipe (4- to 12-inch diameter)
6. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for DI pipe (black body) (4- to 16-inch diameter)

E. Sleeve Couplings

1. 8 inch diameter and smaller pipes: Provide sleeve coupling with lengths of at least 5 inches fabricated out of $\frac{1}{4}$ inch thick steel.
2. Provide harnessed or restrained sleeve coupling.
3. Manufacturers
 - a. 12 inches and smaller
 - 1) Hymax Grip Coupling

F. Flanged Joint Adapters

1. The use of flange adapters and union flanges, such as Mega-Flange and Uni-Flange, shall not be allowed unless absolutely necessary to make a connection in the opinion of the Engineer.
2. The use of adapters will be strictly limited and will be reviewed by the Engineer on a case-by-case basis.
3. If allowed, provide flanged joint adapters with restrained joints designed for a pressure rating of 150 psi.

G. Coatings - Furnish DI pipe and fittings which have a standard thickness cement mortar lining as specified in AWWA C104 and a bituminous seal outside coating as specified in AWWA C151.

H. Nuts and Bolts - Furnish high strength, heat-treated cast-iron nuts and bolts which conform to AWWA C111. Nuts shall be hexagon and bolts shall be tee head.

2.03 Polyethylene Encasement

A. Install polyethylene encasement in accordance with "Polyethylene Encasement – Ductile Iron Pipe" as provided in the drawings.

2.04 Valves

A. Gate Valves

1. As Design: Unless otherwise shown or specified, furnish and install gate valves meeting the following requirements:

<u>Nominal Valve Size, Inches</u>	<u>Service</u>	<u>Standard</u>	<u>Type</u>
3 through 12	Potable Water	AWWA C509 or AWWA C515	Resilient Wedge

2. Materials: Unless otherwise shown or specified, furnish gate valves fabricated using the following materials:

a. Body and Handwheels:

- 1) Bronze
ASTM B16
ASTM B62
- 2) Cast Iron
ASTM A126, Class B
ASTM A48, Class 30 or 35
- 3) Ductile Iron
ASTM A536, 65-45-12

b. Stems
ASTM B138
ASTM B584

c. Stem Nuts
ASTM B138
ASTM B584
ASTM B763

d. Wedges
ASTM A126 Class B
ASTM A536, 65-45-12

e. Bolts and Nuts
Below Ground
ASTM F593/4 304 SST
Above Ground
ASTM A307 Grade B, Zinc Plated

3. Pressure Rating: Supply gate valves smaller than 3 inches with a minimum working pressure of 125 psig and a minimum nonshock cold water, oil or gas pressure rating of 200 psig, unless otherwise specified. Supply gate valves 3 inches in diameter and larger with a minimum working pressure of 200 psi.

4. Operators: Supply gate valves for buried services with non-rising stems. Provide 14-inch and larger gate valves with geared operators.

5. All gate valves shall be configured to open left (counterclockwise).
6. Resilient Wedges: Fabricate the wedges of cast or ductile iron and completely encapsulate the wedges in rubber. Permanently bond the sealing rubber to the iron wedges as needed to pass the rubber metal bond tests in ASTM D429.
7. Seals: Assemble and seal the valve joints and stuffing boxes with rings. Provide at a minimum two O-ring seals above the thrust collar and one O-ring seal below the thrust collar on non-rising stems.
8. Stems Assemblies: Fabricate non-rising stem assemblies of cast bronze with integral collars. Fabricate rising stems of bronze.

B. Silent Check Valve

1. Design
 - a. Provide globe style (2" through 24") swing check valves with resilient-seated disc and hinge mechanism.
 - b. Provide valves with hand replaceable seat and disc.
 - c. Provide valves with a flow area through the body equal to or greater than the cross-section area of the equivalent pipe size.
2. Materials
 - a. Body
 - 1) Ductile Iron ASTM A536 Grade 65-45-12
 - 2) Cast Iron ASTM A126 Grade B
 - b. Disc
 - 1) Stainless Steel ASTM A276 T304
 - 2) Bronze ASTM B584 Alloy C83600
 - c. Seat
 - 1) Metal Seat
 - a) Stainless Steel ASTM A276 T304
 - b) Bronze ASTM B584 Alloy C83600
 - 2) Resilient Seat: Buna-N rubber
 - d. Spring: Stainless Steel ASTM A276 T316/ ASTM A313
3. Pressure Rating
 - a. Working Pressure: 250 psig
 - b. Differential Pressure: 175 psig

2.05 Valve Boxes

- A. Provide all buried valves with adjustable 5-inch diameter valve boxes with a minimum thickness of 3/16 inch, constructed so that the removable cover will not be thrown out by travel over it.
- B. Provide cast iron, extension type valve boxes with slide or screw type adjustment to permit movement of the top section without transmitting forces onto the valve body.
- C. The valve box shall rest on the valve bonnet and be centered over the valve, and the top of the section shall be approximately on line with nut at top of valve stem. The entire assembly shall be plumb.
- D. Covers for valve boxes on water service valves shall be marked "WATER".

2.06 Valve Joints

1. Provide valves that will be exposed and are 4 inches in diameter and larger with flanged type joints, unless otherwise specified. Provide flanges that are faced accurately at right angles to the axis of the casting. Face and drill flanges and shop coat with a rust preventive compound before shipping.
2. Fabricated flanges to dimensions and drillings meet the requirements of ANSI with ANSI grade 304 Stainless Steel nuts, washers and bolts. For valves installed in pipelines with test pressures in excess of 125 psi, provide flanges with pressure ratings equal to or exceeding the specified test pressure of the pipeline.
3. Supply valves that will be buried and are 4 inches in diameter and larger with mechanical joints conforming the requirements contained in AWWA C111.

2.07 Hydrants

A. Manufacturers

1. Mueller Company – Model A-423 Super Centurion
2. Kennedy – Model 81A
3. American Darling – Model B62B
4. EJ – Watermaster CD250
5. Or approved equal

B. Standard Fire Hydrants - Type "H-3"

1. Provide dry barrel, compression shutoff, traffic model hydrants conforming to AWWA C502 with 5-1/4-inch main valve opening, 6-inch mechanical joint inlets, two 2-1/2-inch hose nozzles, and one 4-1/2-inch pumper nozzle.
2. Supply hydrants with nozzle threads and operating directions consistent with existing hydrants in the Owner's distribution system.

C. Auxiliary Gate Valves

1. Install auxiliary gate valve with every hydrant.
2. 6-inch valve for Type "H-3".
3. Refer to Paragraph 2.04B. for gate valve specifications.

D. Hydrant coating

1. Provide each hydrant with a 2-component exterior grade full gloss polyurethane exterior enamel topcoat.
2. Color to be selected by the Owner.
3. Touch-up painting for field repairs shall be in accordance with Manufacturer's instructions.

2.08 Location Material

- A. Provide non-detectable tape for DI pipe such as Terra Tape Non-Detectable Standard Tape, as manufactured by Reef Industries, Inc. or approved equal. Supply blue location material marked with "Caution Water Line Buried Below".

PART 3 - EXECUTION

3.01 General

- A. Install all water mains, fittings, valves, hydrants, and appurtenances as shown on the Drawings and as specified in this Section. Do not install pipe when, in the opinion of the Engineer, trench conditions are unsuitable.
- B. Inspect water mains, fittings, valves, hydrants, and appurtenances prior to installation and promptly remove damaged or unsuitable materials from the job site. Replace damaged or unsuitable materials with new and unused materials.

3.02 Installation of Water Mains

- A. Provide all tools, labor, and equipment necessary for the safe and expeditious installation of water mains and appurtenances.
- B. Install water mains to the lines shown on the Drawings, except as specified in this Section.
- C. Install fittings, valves and hydrants in the locations shown on the Drawings.
- D. Water mains installed parallel to existing sanitary and storm sewers or sewage force mains shall have a minimum horizontal separation of 10 feet measured from edge of pipe to edge of pipe. Where local conditions prevent this separation, install water mains with the bottom of the main at least 18 inches above the top of the sewer.
- E. Water mains crossing sanitary and storm sewers or sewage force mains shall have a minimum vertical separation of 18 inches measured edge to edge. This separation applies whether the water main is above or below the sewer or force main. Install water mains so that a full length of pipe is centered on the sewer or force main. No water main shall pass through or come in contact with any part of a sanitary sewer manhole.
- F. Install water mains with a minimum cover of 54 inches.
- G. Install temporarily plugs in installed piping systems at the end of each day's Work or other interruption of progress on a given line. Install plugs in a manner satisfactory to the Engineer, and ensure plugs are adequate to prevent the entry of animals into the pipe or the entrance or insertion of deleterious materials.
- H. Install hydrants with a minimum bury not less than that required for the water mains. Check the hydrant locations and determine whether the hydrant requires a deeper bury depth.
- I. Follow manufacturer's instructions when installing water mains, fittings, valves, hydrants, and appurtenances.
- J. Excavate trenches to widths which provide adequate working space for proper pipe installation, jointing and embedment. Shape the bottom of trench to give uniform

circumferential support to the lower quarter of each pipe. Lay pipe with bell ends facing in the direction of laying.

- K. Lower pipe, fittings, valves, and hydrants into trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage materials, coatings, or linings. Do not drop or dump pipe, fittings, valves, or hydrants into trench.
- L. As each length of pipe is installed, joint the pipe to the previously installed pipe. Bring the pipe to the correct line and grade and secure in place with bedding tamped under and around each side of the pipe. Deposit and compact backfill material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
- M. Wherever it is necessary to deflect pipe from a straight line in either a vertical or horizontal plane, do not exceed the amount of deflection allowed by the pipe manufacturer's specifications. If the alignment requires joint deflections in excess of the allowable, furnish and install fittings or a sufficient number of shorter lengths of pipe.
- N. Cut pipe in a neat and workmanlike manner without damage to PVC pipe or to the cement lining of DI pipe. Use a cutting machine so as to leave smooth ends at right angles to the axis of the pipe. Flame cutting with an oxyacetylene torch is not allowed on DI pipe. For bell and spigot joint installation, bevel the edges of all field cut pipe after cutting. For mechanical joint installation do not bevel the pipe end. Remove all burrs that form as a result of field cutting the pipe, whether the pipe end is beveled or not.
- O. For DI fittings with mechanical joints that require harnessing, provide DI mechanical joint retainer glands. For DI push-on joints that require harnessing provide push-on gripper gaskets. Use a stencil and paint the word "HARNESSED" in 2-inch safety orange letters on the top of the bell on each push-on joint assembled with a gripper gasket. Do not use gripper gaskets when installing plugs.

3.03 Installation of Appurtenances

- A. Clean the interiors of all fittings, valves, and hydrants of foreign matter prior to installation. Inspect valves and hydrants in open and closed positions to ensure all parts are in working condition.
- B. Provide joint restraints for all hydrants, valves, and fittings such as bends, tees, and plugs or a minimum of one full length of pipe on each side of all valves and fittings, whichever is more stringent. Where solid trench wall conditions are not present, tie fittings to the next full joint in each direction by use of tie rods or fittings with integral cast flanges or set screw devices.
- C. Place valves vertically on solid concrete block as shown on Drawings and bed them solidly. Center valve box over operating nut. Place and compact backfill in lifts around valve box so valve box remains plumb. Tamp backfill on all sides of each valve box to the undisturbed trench face. Adjust valve box covers so they are flush

with finish grade. Re-adjust covers as necessary so that they remain flush with the finished grade after final paving and grading Work is complete.

- D. Set hydrants plumb with the pumper nozzle facing toward the street or drive surface. Set hydrants so the centerline of hydrant outlet nozzles are not less than 18 inches nor more than 20 inches above finish grade. Provide hydrant extensions where required to obtain proper elevation. Install hydrants as shown on Drawings. Provide washed coarse gravel at hydrant shoe to a minimum of 6 inches above the hydrant drain to ensure proper drainage of hydrant barrel. Place and compact backfill around hydrant to finish grade so that hydrant remains plumb. Furnish and install a gate valve and valve box on each hydrant branch connection. Bag/cover all hydrants that have been installed but are not ready for service. Remove bag/cover when hydrants are ready for service.

3.04 Field Quality Control

A. Filling and Disinfection

1. Fill and sterilize all new water mains, services, leads and appurtenances in accordance with AWWA C651 and Section 02675. Each section of water main shall be complete and concrete thrust blocking shall have been in place for not less than 10 days prior to being tested.
2. Fill the new mains with water from the Utility distribution system. Expel all air from the mains as they are filled. Tap the water main at high points, if necessary, to assure removal of all air.
3. Flush all water mains and fire hydrants prior to disinfection. Flush mains with a flushing velocity of at least 2.5 feet per second (at the flowrate shown in Table 3.06-1). Flush water mains and hydrants until the water discharged is clear.

Table 3.06-1 Required Flow for Flushing Water Mains Prior to Disinfection

Nominal Pipe Diameter (in)	Flow (gpm)
	DI
3	70
4	110
6	250
8	450
10	690
12	980
14	1,330
16	1,730
18	2,180
20	2,680
24	3,840
30	5,940

4. Disinfect all new water mains, valves, and other items prior to placing in service in accordance with Section 02675.

B. Hydrostatic Leakage Test

1. Hydrostatically test all water mains installed. Perform leakage test under a hydrostatic pressure in accordance with AWWA C600 for Ductile Iron pipe or AWWA C605 for PVC pipe and these specifications. The hydrostatic pressure shall be 150 psi or 1-1/2 times the working pressure at the point of testing, whichever is greater, but shall not exceed 150 psi at the lowest point in elevation of the system being tested. Allow the pipeline to stabilize at the test pressure before conducting the hydrostatic test.
2. The hydrostatic test shall be at least 2 hours in duration. Maintain the test pressure within +/-5 psi during the test period by adding makeup water using a test pump. At the end of the test duration, return the line pressure to the original test pressure by adding makeup water. Accurately measure the total amount of makeup water added during and at the end of the test duration, or leakage, in gallons by means of a water meter installed on the supply side of the pressure pump.
3. The pipe installation will not be accepted if the leakage is greater than that determined by the following formula in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.:
 - a. Ductile Iron $L=0.0000068SD(P)^{1/2}$ See Table 3.06-1
4. Where the leakage rate exceeds the permissible maximum, locate and repair the leak or leaks. Repeat the leakage test until the test results are acceptable.
5. Repair all leaks discovered within 1 year from the date of final acceptance of the Work and retest the repaired segments to confirm leaks have been stopped.

Table 3.06-1 – Allowable Leakage for Ductile Iron Pipe per 1000 ft. of Pipeline* - gph

Average Test Pressure	Nominal Pipe Diameter – in.																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
psi	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88	7.74	8.60	9.17
400	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49	7.30	8.11	8.65
350	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07	6.83	7.58	8.09
300	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62	6.32	7.02	7.49
275	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38	6.05	6.72	7.17
250	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13	5.77	6.41	6.84
225	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86	5.47	6.08	6.49
200	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59	5.16	5.73	6.12
175	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29	4.83	5.36	5.72
150	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97	4.47	4.97	5.30
125	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63	4.08	4.53	4.83
100	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24	3.65	4.05	4.32

*If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

-END-

SECTION 02670 - WATER WELL, PUMPS AND MOTORS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. The project involves installation of three submersible well pumps, including associated motors, pitless adapters, and appurtenances as shown on the Drawings and specified herein.

B. Related Sections

1. Appendix A
2. Section 02675 - Disinfection
3. Section 09900 - Protective Coatings

1.02 References

A. Codes and standards referred to in this Section are:

1. API 5L – Specification for Line Pipe
2. ASTM A48 - Standard Specification for Gray Iron Castings
3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
4. ASTM A276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
5. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
6. ASTM B505 - Standard Specification for Copper Alloy Continuous Castings
7. ASTM A582 – Standard Specification for Free-Machining Stainless Steel Bars
8. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications
9. AWWA E102 – Submersible Vertical Turbine Pumps
10. AWWA E103 - Horizontal and Vertical Line Shaft Pumps
11. Hydraulic Institute Pump Standards
12. ISO 9001 – Quality Management Systems
13. NSF Standards 60 and 61
14. ODNR Regulations in Chapter 1521 of the Ohio Administrative Code (OAC)
15. OEPA Regulations in Chapter 3745-9 of the OAC
16. SSPC-SP 10 – Near White Blast

1.03 Project Conditions

A. Well Data Summary

1. PW-1
 - a. Casing Diameter: 16"
 - b. Well Depth: 90'
 - c. Well Flow Capacity: 1,200 GPM
 - d. Recommended Pump TDH: 284'
 - e. Static Water Level: 21.5'
 - f. Recommended Pump Setting EL: 545'
2. PW-2
 - a. Casing Diameter: 16"
 - b. Well Depth: 71'
 - c. Well Flow Capacity: 1,100 GPM
 - d. Recommended Pump TDH: 284'
 - e. Static Water Level: 18'
 - f. Production Test Pumping Level: 55'
 - g. Recommended Pump Setting EL: 562'
3. PW-3
 - a. Casing Diameter: 16"
 - b. Well Depth: 85'
 - c. Well Flow Capacity: 1,000 GPM
 - d. Recommended Pump TDH: 288'
 - e. Static Water Level: 21.69
 - f. Recommended Pump Setting EL: 550'

1.04 Submittals

A. Provide all submittals as specified in Section 01300, including the following:

1. Manufacturer's/Supplier's literature, illustrations, specifications and bill of materials for each component of the system.
 - a. Well pump and motor
 - b. Pitless Adapter
 - c. Electrical components
2. Complete fabrication and assembly drawings, together with detailed specifications and data covering materials, parts, devices and accessories forming a part of the equipment furnished. Include data and specifications for each pumping unit including, but not limited to:
 - a. Name of manufacturer
 - b. Type and model
 - c. Design rotative speed
 - d. Number of stages
 - e. Type of bowl bearings
 - f. Type of lineshaft bearings
 - g. Size of shafting
 - h. Size of pump column
 - i. Size of discharge outlet
 - j. OD of pump bowls

- k. Weight
 - l. Data on shop painting
 - m. Max overall dimensions
 - n. Total weight
3. Complete performance curves showing capacity versus head, NPSH required, efficiency, and brake horsepower plotted scales consistent with performance requirements.
 4. General arrangement drawings of the pump and motor. Include equipment weights, foundation loads, base plate dimensions and details, anchor methods and materials.
 5. Motor drawings and performance characteristics
 6. Spare parts list
 7. Operating descriptions, component descriptions, control schematics, electrical connection diagrams and general arrangement drawings, including front panel elevations, dimensions and fabrication details for the control equipment
 8. Operation and Maintenance Manuals: The operation and maintenance manuals shall be in addition to any instruction or parts lists packed with or attached to the equipment when delivered. Operation and maintenance manuals shall include the following:
 - a. Equipment function, normal operating characteristics, and limiting conditions.
 - b. Assembly, installation, alignment, adjustment, and checking instructions.
 - c. Operating instructions for startup, routine, and normal operation, regulation and control, shutdown, and emergency conditions.
 - d. Lubrication and maintenance instructions.
 - e. Guide to troubleshooting.
 - f. Parts list and predicted life of parts subject to wear.
 - g. Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.

1.05 Quality Control Submittals

- A. Pump Shop Tests: Perform a certified shop test on one of each type and capacity pumping unit in accordance with the test code of the Hydraulic Institute except as specified.
 1. When the pump input horsepower is determined by electrical input measurement, use the true efficiency of the driver. Determine the true efficiency by measurement of electrical energy input and mechanical energy output by means of a prony brake or calibrated dynamometer.
 2. Test at rated speed, to determine the curves of head, brake horsepower, and efficiency as a function of capacity. Take a minimum of ten points, including shutoff. Take one point as near as possible to each specified condition of head and capacity, one at or slightly above the maximum head specified, and one at the minimum head specified. Express capacity in gallons per minute and express head in feet of water. Furnish certified copies of the curves, raw test data, calculated results and sufficient information for computation and plotting of the curves.
 3. Subject each pump to a hydrostatic test in the shop. Use a test pressure of not less than 1-1/2 times the shutoff head of the pump as shown by the

characteristic curve. Under this test pressure, demonstrate that no part shows undue deflection.

1.06 Quality Assurance

- A. Perform all Work in the best practices of the well industry, National Water Well Association, AWWA, and in accordance with all applicable Federal, State and local codes and regulations including but not limited to OAC Chapter 3745-9. Obtain all permits necessary for the performance of the Work.
- B. All well construction Work and testing shall be performed by a licensed water well driller.
- C. PW-1, PW-2, and PW-3 requirements
 - 1. Provide new pumps and motors, Perform all work in accordance with AWWA standards.
- D. Pump supplier shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.

1.07 Delivery, Storage, and Handling

- A. Pack, support, transport and store all pumps, components, and motors in protective enclosures such that they are not subjected to forces, stresses, or elements that may result in damage.
- B. Do not stack the pump components or motors.

1.08 Maintenance

- A. Extra Materials: Furnish spare parts as specified. Suitably package and label spare parts with labels indicating the contents of each package.

1.09 Warranty

- A. Guarantee the equipment provided in this Section to be free from defective material and workmanship for a period of **one year** from the date of acceptance of the equipment by the Owner. Replace any defective materials, components, or workmanship during this time, including but not limited to all materials, labor, shipping, and transportation, at no cost to the Owner. Any repair Work performed during this one year period shall also be guaranteed to be free from defective material or workmanship for a period of one year from the date the repair Work is complete and shall be addressed in the same manner at no cost to the Owner.
- B. During the warranty period adjust, recalibrate, repair, replace and otherwise place back into service any equipment and any item(s) that may require service at no cost to the Owner for any reason.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 - 1. Submersible Pumps
 - a. FloWise
 - 1) PW-1, PW-2 and PW-3 – Model 11HC, 5 Stages, 100 HP, 230 or 460V, 3-phase, 60 HZ
 - b. American-Marsh Pumps
 - 1) PW-1 – Model 12GC, 4 Stages, 125 HP, 230 or 460V, 3-phase, 60 Hz
 - 2) PW-2 – Model 13MC, 4 Stages, 100 HP, 460V, 3-phase, 60 Hz
 - 3) PW-3 – Model 12KC, 5 Stages, 100 HP, 460V, 3-phase, 60 Hz
 - c. Approved Equal
 - 2. Pitless Adapter
 - a. Baker Pitless Adapter

2.02 Pump Performance and Design Requirements

- A. All submersible pumps shall conform to the applicable requirements of AWWA E102 and the Hydraulic Institute Pump Standards. Pumping units shall be designed for the performance and design requirements at maximum speed unless otherwise noted.
- B. All pitless adapters shall conform to the applicable requirements of AWWA, Recommended Standards For Water Works, 2012 Edition, and the Hydraulic Institute Pump Standards. Pumping units shall be designed for the performance and design requirements at maximum speed unless otherwise noted.
- C. The pumps are to be run utilizing a variable frequency drive and the pump curve shall be continuously rising and free from dips and valleys from the design point to the shutoff head. The shutoff head shall be at least 115% of the head that occurs at the design point.
- D. The pumps shall have continuously rising head capacity curve from runout flow through shutoff conditions.
- E. For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 55°F.
- F. Pump performance shall be stable and free from damaging cavitation, vibration, and noise within the operating head range. The performance of each pump with an enclosed impeller shall be based on a radial running clearance between the bowl wearing ring and the impeller of not less than 6 mils, or 0.5 mil per inch of wearing ring diameter, whichever is greater. The performance of each pump with an open impeller shall be based on a radial running clearance between the bowl and the impeller of not less than 15 mils.

- G. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.2.

2.03 Pump Service Conditions

- A. The design TDH listed in the following table is in addition to pump discharge head and column friction losses, which must be allowed for by the manufacturer.

Service	PW-1	PW-2	PW-3
Quantity	1	1	1
Design Flow (GPM)	1,200	1,100	1,000
Design TDH	284'	284'	288'
Maximum RPM at Design Conditions	3,600	3,600	3,600
Minimum Bowl Efficiency at Design Flow/TDH	83%	82%	82%
Maximum Motor HP	125	100	100
Pump Operation	Variable Speed	Variable Speed	Variable Speed

B. Pitless Adapter

1. All submersible vertical turbine pumps shall conform to the applicable requirements of AWWA E102 and the Hydraulic Institute Pump Standards. Pumping units shall be designed for the performance and design requirements at maximum speed unless otherwise noted.
2. Well Cap
 - a. Provide a watertight well cap with a sealed conduit entrance.
 - b. Provide the watertight cap can that it may be removed without affecting the sealed conduit or wiring to the submersible pump motor.
 - c. Provide the watertight cap with a separate protected downward facing stainless steel screened well vent with pipe nipple.
 - d. Construct the cap and well vent with heavy duty gray cast iron and factory coat with a green enamel finish.
 - e. Secure the watertight cap to the pitless casing with a compression gasket.
 - f. Provide a 16" Baker-Monitor premium watertight cap.
3. Upper Casing
 - a. Provide an upper casing that is factory assembled to the discharge body, and a lift out and hold down mechanism that is factory assembled to the spool.
 - b. Provide an upper casing thickness conforming to the *Recommended Standards for Water Works*.
 - c. Factory coat the casing with a rust protective coating.
 - d. The upper casing must provide a watertight connection from the discharge body to the well cap. The discharge port center line to be five (5) feet below grade, and the pitless upper casing to extend two (2) feet above grade.
 - e. Provide standoffs or connection points for submersible pressure transmitter installed in stilling well.

4. Spool
 - a. Provide a spool with a ANSI B 1.20.1 male or female drop pipe connection and shall be constructed of lead-free galvanized heavy duty gray cast iron, ductile iron, or steel with a lead-free galvanized plating on the wetted surface of over 0.010 inches thick.
 - b. Provide a spool with o-ring grooves machined into the spool retaining the o-rings when setting or pulling the system.
 - c. Construct the positive pressure o-ring seals of neoprene or equivalent.
 - d. Design the spool to accommodate probe tubes or water samplers and NPT ports for discharge pressure taps. Provide O-ring protection to prevent the seals from dragging on the upper casing when the pump is installed or removed.
 - e. Provide standoffs or connection points for submersible pressure transmitter installed in stilling well.
5. Discharge Body
 - a. Construct the discharge body of lead-free galvanized ductile iron.
 - b. Design the O-ring seat to prevent crevice and galvanic corrosion, dissimilar metals must be avoided.
 - c. Design the discharge body to be strong enough to prevent distortion due to vertical movement of discharge pipe thereby allowing spool to bind in the discharge body. Minimum I.D. of the discharge body to be equal to or greater than I.D. of the well casing for ease in well servicing.
6. Hold Down Mechanism
 - a. The Pitless Unit spool shall have a hold down mechanism, factory assembled to spool and capable of preventing rotation of the pitless spool relative to the discharge body, at full rated locked rotor torque of the submersible pump motor. The spool must also have a factory assembled lift out pipe and bail, or spider capable of lifting a water filled drop pipe and pump out of the well for service. Components to be constructed of ductile iron or steel with a corrosion resistant coating.
7. Drop Pipe
 - a. The drop pipe shall be of ASTM A-312 stainless steel pipe in interchangeable sections of not over 20' in length for 3,600 RPM with ends of each section faced parallel.
 - b. The weight of the drop pipe shall be no less than that stated in AWWA E102. The drop pipe size shall be such that friction loss will not exceed 6.5' per 100', based on the rated capacity of the pump.
 - c. The drop pipe size shall also be such as to provide a velocity of not less than 5' per second at the rated capacity.
8. Submersible Pressure Transmitter
 - a. Provide a submersible pressure transmitter for continuous measurement of groundwater levels in the well casing. Provide the pressure transmitter in accordance with Section 13420.
 - b. Install a 2-inch well access pipe within the casing for installation of the water level measurement system. Provide a water-tight cap for the electrical cable.
 - c. The actual length of cable shall be determined during construction by the Owner and may extend to but will not exceed the bottom of the pump bowl assembly.

- d. Install the pressure transmitter and signal cable in a Sch. 80 PVC conduit from 2 feet below the bottom of the pressure transmitter to the bottom of the pump head. Provide perforations to allow the water level in the PVC casing to match the water level in the well casing.
- e. Configure the installation so that the transmitter can be easily removed from the conduit from the casing without removal of the pump.

C. Pump Bowl Assembly

1. Bowls: Close grain, cast iron ASTM A48 Class 30. Provide bowls with waterways that are smooth and free from nodules, bumps, dips, blow holes, sand holes, and other detrimental defects. Accurately machine and fit bowl assemblies with a suction bell with integral cast ribs supporting the suction bearing.
2. Impellers: Stainless Steel 304SS ASTM A744, enclosed and statically balanced. Impellers through 22" shall be securely fastened to the shaft with taper split bushings of steel, larger sizes shall be double-keyed. Impellers shall be adjusted vertically by an external means.
3. Pump shaft: A582 Grade 416 stainless steel, turned, ground and polished. It shall be supported by bronze bearings of ASTM B505 alloy C84400 above and below each impeller. The suction cast bearing shall be grease lubricated and protected by a bronze sand collar of ASTM B584 alloy C83800. The size of the shaft shall be no less than that determined by AWWA E103.
4. Discharge case: Threaded on the outside for column sizes of up to 14 inches and fitted with a cast iron ASTM A48 Class 30-column adapter of the proper size to connect to the column selected. Likewise, the suction case shall also be threaded on the O.D. and fitted with a cast iron or steel suction adapter.

D. Suction Pipe and Strainer

1. Provide a suction pipe 10' in length and of a size and weight at least equal to the outer column.
2. Provide a galvanized cone strainer having a net inlet equal to at least four times the suction pipe area with a maximum opening size not more than 75% of the minimum opening of the water passage through the bowl or impeller.

E. Shop/Factory Finish

1. Manufacturers
 - a. Porcelain Industries fused porcelain enamel
 - b. 3M Scotchkote 100% solids fusion bonded epoxy (FBE) coating 134W
 - c. Approved equal
2. Surface Preparation
 - a. Remove surface imperfections by filing or grinding smooth and free from nodules and bumps.
 - b. Remove oil and grease
 - c. Abrasive blast clean the surface to SSPC – SP10 and remove blast media dust using clean cloth or clean dry air.
3. Shop coating
 - a. Meet the requirements of AWWA C213, AWWA C550 and NSF 61

- b. Primed, applied and cured in accordance with manufacturer's instructions.
- c. Minimum 15 mils thickness
- 4. Applications
 - a. Pump bowl assemblies: Waterway areas and surfaces in contact with water shall be coated to reduce friction losses.
 - b. Pump discharge head: interior and exterior of discharge head
- 5. Field coating: After installation, coat other exterior ferrous surfaces in accordance with Section 09900.
- 6. Motors: Prime and finish coat motors with the manufacturer's standard coating system.

F. Electric Motors

Service	PW-1	PW-2 & PW-3
HP	125	100
Driver Type	Submersible	Submersible
RPM	1750	1750
Voltage	230/460 V	230/460 V
Phase	3-phase	3-phase
Hertz	60	60
Efficiency Rating	Premium Efficiency	Premium Efficiency
Motor Operation	Variable Speed (VFD)	Variable Speed (VFD)
Service Factor	1.15	1.15

- 1. Motor bearings shall be pre-lubricated, double-shielded regreaseable roller or ball bearings designed with grease relief. Bearings in vertical design motors shall be of high thrust type with bearings rated for minimum of 100,000 hours B-10 life.
- 2. One normally closed temperature device shall be installed in each phase of the motor to sense high stator winding temperature. The devices are to be bimetallic snap action heat sensing switched with rate of rise and absolute temperature actuation. Wiring shall terminate in the main terminal box.
- 3. Nameplate shall be stainless steel fastened with rivets or screws and include bearing catalog number.

G. Special Tools and Accessories

- 1. Gauges: Equip each pump with a 2 1/2" in diameter, glycerin filled pressure gauge with stainless steel casing and brass internals and a pressure range from 0 to 200 psi. Supply the gauges, each with a 3/8" NPT bronze body ball isolation/shut-off valve.
- 2. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories, required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

PART 3 - EXECUTION

3.01 Field Quality Control

- A. All equipment, tools and materials shall be disinfected prior to installation in the borehole or well in accordance with Section 02675.
- B. At all times during the progress of the Work, protect the well to effectively prevent others from tampering with the well and the entrance of foreign matter into the well.
- C. Coordinate the testing of the permanent pumps with the manufacturer's representative.
- D. An experienced, competent, and authorized representative of the pump manufacturer shall visit the site and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.
- E. The manufacturer's representative shall furnish a written report certifying the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has operated satisfactorily under full load conditions.
- F. The manufacturer's representative shall be present at the job site for a minimum of one trip for a total of one (1) eight-hour day for the purposes of starting up the systems and training Owner's operating personnel.
- G. All costs of these services, including startup and training of operating personnel, as well as all labor costs and travel and living expenses for the manufacturer's representative, shall be included in the contract price. If the equipment is not completed for proper start-up and training procedures, the representative shall schedule another visit at no additional cost to the Owner.
- H. Training will not be permitted until proper start-up and testing is completed. Provide an abstract or outline of the start-up, testing, and training procedures to the Engineer at least five days prior to the scheduled visit. Incorporate manufacturer's operation and maintenance manuals and materials in the training procedures, with emphasis on items or materials of greatest importance.
- I. Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures.

3.02 Permanent Well Pump Installation

- A. Install the permanent well pump assembly, motor, and appurtenances.
- B. Install the pumps in accordance with the manufacturer's instructions and reviewed shop drawings.

- C. Securely anchor the pump to its base.
- D. Adjust, lubricate and make certain the pumping system in is proper working condition.
- E. Provide the permanent well with a vent, an accurate depth gauge, airline, and necessary fittings for mounting, to indicate the elevation and drawdown of the static water level in the well.
 - 1. Install a gauge and strap a 1/4-inch diameter copper airline to the pump column every 10 feet, and extend to within one foot of the top of the pump bowl assembly.
 - 2. The vent shall vent the well casing to atmosphere and terminate in a downward position at or above the top of the casing in a minimum 1-1/2 inch diameter opening covered with a 24 mesh corrosion resistant screen.

3.03 Pump Site Tests

A. Pump Performance Test

- 1. The installing contractor shall conduct a 5-step pump performance test after the new pumps are installed.
- 2. Notify the Engineer not less than 24 hours before the on-site pump performance testing is to be conducted.
- 3. The new meters shall be used, and each step of the test shall have a duration of 30 minutes. The tests shall be conducted at 50%, 75%, 90% and 100% of the units rated capacity for each pump and again with each pair of pumps running.
- 4. Record the pumping water level, discharge pressure, and flow rate every 3 minutes during each rate step.
- 5. Tabulate and plot all results on a performance curve for the pump.
- 6. Submit test results within seven days of the test date. The pump will not be accepted until the Engineer approves the test results.

3.04 Disinfection

- A. After completion of well installation and testing, disinfect the well, well equipment components, and accessories in accordance with Section 02675.

-END-

SECTION 02675 - DISINFECTION

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Disinfection of all raw and potable water lines, valves, hydrants, service connections, tanks, structures, equipment, filters, and all other appurtenances which are to store, handle or carry potable water. Furnish all labor, water, chemical and equipment, including taps, corporation stops, temporary pumps and other items necessary to perform the Work.
- B. Related Sections
 - 1. Section 02102 – Material Handling and Spill Prevention Plan
 - 2. Section 02660 – Water Mains
 - 3. Section 02670 – Water Well, Pumps, and Motors

1.02 References

- A. All disinfection Work shall be acceptable to the Ohio Environmental Protection Agency. If any requirements of this section are in conflict with requirements of the authority of disinfection, those of the authority shall govern.
- B. American Water Works Association (AWWA), latest editions
 - 1. AWWA C651 – Disinfecting Water Mains
 - 2. AWWA C654 – Disinfection of Wells
- C. Ohio Plumbing Code

1.03 Submittals

- A. Quality Control Submittals
 - 1. Prior to starting any disinfection Work, furnish for the Engineer's review a detailed outline of the proposed sequence of operation, disinfection method to be used, manner of filling and flushing units, source and quality of water to be used, and disposal of heavily chlorinated water.
- B. Test Results
 - 1. Submit copies of all bacteriological and chlorine residual test results to Engineer.

1.04 Quality Assurance

- A. Perform all Work for and in connection with disinfection under the direction of an experienced supervisor.

- B. All equipment used in disinfection Work shall be in proper working condition and shall be adequate for the specified Work.

PART 2 - PRODUCTS

2.01 Materials

- A. Liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules, as identified by AWWA as acceptable disinfection materials.

PART 3 - EXECUTION

3.01 Preparation

- A. Perform pressure and leakage tests prior to disinfection when specified in related sections.
- B. Thoroughly flush all pipes to remove foreign material. The source of potable water shall be flushed prior to use to ensure that contaminants or debris are not introduced into the new pipes.
- C. Release entrapped air at high points and fill the unit with water when specified in related sections.
- D. Provide necessary corporation cocks and vent piping in the event that complete venting cannot be accomplished through available outlets.
- E. Prevent admission of contaminated water into previously disinfected units.

3.02 Application

- A. Disinfection Procedures for Water Mains, Valves, Fittings, and Appurtenances
 - 1. Disinfect by one of the two methods described in AWWA C651: continuous feed, or slug.
 - a. Continuous-Feed Method
 - 1) Perform in accordance with AWWA C651.
 - 2) Perform a preliminary flushing of the water main to eliminate air pockets and remove particulates. The flushing velocity shall be not less than 3.0 feet per second.
 - 3) Provide a water supply through a temporary connection from a backflow protected source at a constant, measured rate.
 - 4) Chlorine Solution shall be prepared based on a chlorine gas-water solution or 1 percent chlorine solution prepared with calcium hypochlorite-water or sodium hypochlorite-water mixture.
 - 5) Direct-feed chlorinators, which operate from the gas pressure in the chlorine cylinder, shall not be used for the application of liquid chlorine. Apply liquid chlorine with a solution feed, vacuum operated chlorinator and booster pump.

- 6) Hypochlorite solutions may be fed using a powered chemical feed pump designed for feeding chlorine solution.
 - 7) At a point not more than 10 feet downstream from the beginning of the new main, feed the new water main with a dose of chlorine at a constant rate such that the feed water will have not less than 25 mg/L free chlorine.
 - 8) Chlorine application shall not cease until the entire main is filled with heavily chlorinated water.
 - 9) The chlorinated water shall remain in the pipe for at least 24 hours.
 - 10) Operate valves and hydrants during this time to ensure disinfection of appurtenances.
 - 11) At the end of the retention period, the chlorine residual shall not be less than 10 mg/L.
- b. Slug Method
- 1) Perform in accordance with AWWA C651.
 - 2) Perform a preliminary flushing of the water main to eliminate air pockets and remove particulates. The flushing velocity shall be not less than 3.0 feet per second.
 - 3) Provide a water supply through a temporary connection from a backflow protected source at a constant, measured rate.
 - 4) At a point not more than 10 feet downstream from the beginning of the new main, feed the new water main with a dose of chlorine at a constant rate such that the feed water will have not less than 100 mg/L free chlorine. Measure the chlorine feed at regular intervals to verify the feed concentration.
 - 5) The free chlorine residual shall be measured in the slug as it moves through the main and shall not drop below 50 mg/L at any time during the 3-hour testing period.
 - 6) All interior surfaces shall be exposed to the heavily chlorinated water for at least 3 hours.
 - 7) Operate valves and hydrants during this time to ensure disinfection of appurtenances.
2. To prevent damage, the heavily chlorinated water shall be flushed from the system as quickly as possible following the applicable retention period. The piping system shall be flushed until the water is found to be comparable to that of the Utility or not less than 1 mg/L.
 3. Do not permit flushing water to discharge into existing water mains.
- B. Disinfection Procedures for Process Piping, Valves, Fittings and Appurtenances
1. Disinfect all valves, fittings, and other water conveying equipment that will have surfaces in contact with raw or treated water by one of the 2 methods described in AWWA C651:continuous feed, or slug.
- C. Disinfection of Wells
1. Disinfect production wells in accordance with AWWA C654.
 2. Chlorinate gravel pack material by soaking immediately before use in a 100 mg/L chlorine solution for at least 30 minutes.

3. Spray all permanent equipment and materials to be installed in the well with a solution having a chlorine residual of not less than 200 mg/L just prior to installation.
4. Following installation of permanent equipment, chlorinate well by treating water in well casing to provide an average chlorine residual of 100 mg/L, using sodium hypochlorite solution.
5. Surge well at least 3 times once chlorine has been applied. Allow chlorinated water to rest in casing for at least 12 hours, but no more than 24 hours.
6. After resting period, circulate water through casing and pump water to waste until zero chlorine residual is measured for at least 15 minutes.

D. Disinfection of Items to be Immediately Returned to Service

1. Perform in accordance with AWWA C651.
2. Apply liberal quantities of hypochlorite to open trench areas when an existing water main or service connection is opened, and the excavation is wet.
3. Disinfect pipe, fittings or appurtenances by thoroughly flushing and swabbing with a 5 percent solution of calcium hypochlorite immediately prior to assembly.
4. Following swabbing, flush the unit until replacement water in the system is proven to be comparable in quality to the water which will enter that unit or system. Flush toward the Work location from both directions. Flushing shall be started as soon as the repairs are complete and shall be continued until discolored water is eliminated.
5. Isolate the contaminated section of water main or piping, close all service connections, and perform disinfection by the slug method.
6. After appropriate procedures of disinfection and flushing have been completed, the existing main may be returned to service prior to completion of verification of disinfection in order to minimize the time customers are without water.

3.03 Verification of Disinfection

- A. After application of disinfection is complete, perform final flushing of heavily chlorinated water, unless specified otherwise.
- B. Before the system, structure or well is placed in service, obtain 2 successive water samples 24 hours apart and have them tested for bacteriological analysis by Owner's laboratory. Samples shall be drawn in accordance with the State's procedure.
- C. If samples do not prove satisfactory, the system, structure or well shall be re-chlorinated and re-sampled until 2 successive water samples taken 24 hours apart have tested satisfactory.
- D. Assume the expense of taking and testing additional samples until satisfactory samples are obtained.
- E. Assume the expense of all water for subsequent fillings of the pipelines, basins, tanks and equipment.

3.04 Disposal of Waste

- A. Properly dispose of all heavily chlorinated water by neutralization and in accordance with the regulations of the local health department, Ohio Environmental Protection Agency, and AWWA standards.
- B. Dispose of heavily chlorinated water as required by Section 02102 and AWWA C651, Appendix C.
- C. Obtain written authorization from local sewer department before discharging heavily chlorinated water to sanitary sewer system.

-END-

DIVISION 3 – CONCRETE

SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. All labor, equipment, materials, and services (including the design and detailing) required to form all cast-in-place concrete indicated on the Drawings and subsequent removal of all such Work.

B. Related Sections

1. Section 03200 - Concrete Reinforcement
2. Section 03300 - Cast-In-Place Concrete

1.02 References

- ###### **A. Work on this project shall conform to all requirements of the latest version of the specifications listed below adopted by the current building codes except as modified by these Contract Documents.**

- ###### **B. Refer to specific portions of other guides, guidelines, and manuals where referenced in the body of this specification section.**

1. ACI 117 Specification for Tolerances for Concrete Construction and Materials
2. ACI 350 Code Requirements for Environmental Engineering Concrete Structures
3. ACI 350.5 Specifications for Environmental Concrete Structures

1.03 Performance Requirements

- ###### **A. All formwork, including shoring and reshoring, shall be designed by the formwork contractor who shall be solely responsible for this Work.**

- ###### **B. Formwork for post-tensioned concrete shall be designed taking into account the possibility of the member lifting off the formwork during the stressing operation.**

1.04 Submittals

A. Shop Drawings

1. Submit under the provisions of Section 01300 and prior to starting fieldwork.
2. Submit location and detail of construction joints in elevated slabs.

3. Submit product information for forming products.

1.05 Quality Assurance

A. Qualifications of workers

1. Provide at least one experienced person to be present at all times during execution of this portion of the Work and who shall be familiar with the materials being installed, the referenced standards, and the requirements of this Work, and who shall direct all Work performed under this Section.

PART 2 - PRODUCTS

2.01 Form Materials & Accessories

A. Form Lumber

1. Unless otherwise indicated on the Drawings, provide formed concrete surfaces utilizing the following materials.
 - a. Rough Form Finish: Forms for as-cast concrete surfaces not exposed to view and not required to contain fluids – Category ESF-1.0 (ACI 350.5)
 - 1) Face Forms: Rough sawn lumber, CDX plywood, particle board BBOES plywood, MDO plywood
 - b. Smooth Form Finish: Forms for as-cast and rubbed concrete surfaces exposed to view or required to contain fluids – Category ESF-2.0 (ACI 350.5):
 - 1) Face Forms: BBOES plywood, MDO plywood
 - c. Architectural Smooth Form Finish: Forms for surfaces noted on the Drawings as as-cast architecturally exposed concrete, with formwork arranged to provide the form and tie pattern indicated on the Drawings - Category ESF-3.0 (ACI 350.5)
 - 1) Face Forms: Unless noted otherwise, High Density Overlaid Plyform Class I or II, exterior, bearing APA grade stamp on each piece. Minimum thickness: 3/4-inch.
 - 2) Phenolic surface film, plastic, or steel material where specifically noted.
2. Surfaces and lines for ESF category shall comply with ACI 117 tolerances and ACI 350.5. Surfaces produced shall require only minor dressing to arrive at true surfaces.
3. All form lumber in contact with exposed concrete shall be new or of sufficient quality to ensure an unblemished texture.

B. Steel Beam Forms

1. Steel is an acceptable material for beam formwork.
2. Steel forms shall be "like new" producing a clean, smooth, unblemished, texture for concrete exposed in the finished structure.

C. Column Forms

1. Forms for columns to remain concealed may be made of any material adequate to withstand the hydraulic pressure of the concrete being placed.
2. For square and rectangular columns with ESF-2.0, provide MDO plywood.
3. For square and rectangular columns with ESF-3.0, provide HDO plywood unless noted otherwise.
4. Forms for round columns to remain architecturally exposed shall be:
 - a. Fiberglass where exposed vertical seams are acceptable.
 - b. For seamless columns: Sonotube finish free concrete forms with strip cord stripping element, or approved equivalent.

D. Form Ties

1. Factory fabricated, adjustable length, snap-off metal form tie, designed to prevent form deflection and to prevent spalling of concrete upon removal.
 - a. The metal after breaking should be at least 1½ inches from the face of the wall.
 - b. Snap-off ties through concrete elements exposed to earth or fluid shall be provided as an assembly, with an integral waterstop and cone-shaped depression at each concrete surface, 1-inch minimum diameter and 1½ inches minimum depth, to allow for filling and patching.
2. Taper ties designed to be completely removed from the concrete element. Provide a waterstopping mechanical plug to seal hole, and fill and patch at each concrete face.
 - a. Approved mechanical plug product: X-Plug, by Greenstreek.

E. Form Release Agent

1. Non-staining, neutral, barrier type which will not cause softening or impede curing. When concrete surfaces are in contact with potable water, formwork release agents shall comply with NSF/ANSI Standard 61: Drinking Water System Components – Health Effects.
2. Standards
 - a. DUOGARD – WR Meadows
 - b. Symons MAGIC KOTE – Dayton Superior
 - c. CLEAN STRIP J1 EF - Dayton Superior

F. Falsework

1. The Contractor is responsible for the design, safety, and serviceability of falsework.

2.02 Other Materials

- A. All other materials, not specifically described but required for proper completion of concrete formwork, shall be as selected by the Contractor subject to the advance approval of the Engineer.

- B. See “Products Installed but not Furnished” in PART 1 of the Cast-in-Place Concrete specification section for additional embedded items to be coordinated with formwork installation.

PART 3 - EXECUTION

3.01 Surface Conditions

A. Inspection

1. Prior to all Work of this Section, carefully inspect the installed Work of all other trades and verify that all such Work is completed to the point where this installation may properly commence.
2. Verify that forms are constructed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved and reviewed by the Engineer.

3.02 Construction of Forms

- A. Provide substantial form construction, sufficiently tight to prevent leakage of concrete, and able to prevent excessive deflection when filled with wet concrete.

B. Layout

1. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings. Provide 3/4-inch chamfers on all exposed corners of concrete except those abutting or aligning with masonry.
2. Layout formwork to eliminate need for cutting of concrete after it is in place.
3. Make proper provisions for all openings, offsets, recesses, anchorage, blocking, and other features of the Work as shown, or required.
4. Perform all forming required for Work of other trades and do all cutting and repairing of forms required to permit such installation.
5. Carefully examine the Drawings and Specifications and consult with other trades as required relative to provisions for openings, reglets, chases, and other items in the forms.

C. Bracing

1. Properly brace and tie the formwork together to maintain position and shape and to ensure safety of workers.

- D. Construct all formwork straight, true, plumb, level and square within tolerances as specified in ACI 117, unless modified below. Use a reference point on the ground to check plumbness and elevations. Do not use a previous floor as the reference.

- E. Keep formwork sufficiently wetted to prevent joints opening up before concrete is placed.
- F. Provide holes at bottom of formwork for cleaning and inspection. Close prior to placing concrete.

3.03 Form Removal

- A. Remove formwork in an approved manner under competent supervision to avoid damage to the concrete. Use sufficient care to prevent spalling.
- B. The Contractor shall bear full responsibility for form removal. Concrete damaged by too early removal of supports shall be repaired to the satisfaction of the Engineer or replaced.
- C. Do not remove shores and other supports until concrete has attained sufficient strength to support, without objectionable deflections, its own weight plus all anticipated construction loads.
 - 1. For non-post-tensioned concrete: the concrete shall have attained, as indicated by the field-cured cylinders, at least 70 percent of its specified 28-day strength before falsework is removed.
 - 2. For post-tensioned concrete: remove forms in accordance with Post-tensioned Concrete Tanks specification.
- D. Do not remove formwork for vertical elements (walls and columns) until the day after casting of the concrete. Do not damage concrete surface during form removal.
- E. Plug tie holes flush with the surface as specified in Cast-In-Place Concrete specification.

3.04 Maintenance

- A. Clean and recondition formwork before each use. Repair damage to formwork during placing, removal, or storage. Do not use formwork with repairs or patches which would result in adverse effects to the concrete finish.
- B. Store formwork and form materials in a manner to prevent damage or distortion.

-END-

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. All labor, equipment, materials and services required for the installation of concrete reinforcement and associated items shown on the Drawings or specified herein.

B. Related Sections

1. Section 03100 - Concrete Formwork
2. Section 03300 - Cast-in-Place Concrete

1.02 References

- A. Work on this project shall conform to all requirements of the latest version of the specifications listed below adopted by the current building codes except as modified by these Contract Documents.

- B. ASTM specifications apply in their entirety where specifically referenced in the body of this section.

- C. Refer to specific portions of other guides, guidelines, and manuals where referenced in the body of this specification section.

1. ACI 117 Specification for Tolerances for Concrete Construction and Materials
2. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
3. ACI 350 Code Requirements for Environmental Engineering Concrete Structures.
4. AWS D1.4 Structural Welding Code - Reinforcing Steel.
5. CRSI Manual of Standard Practice.

1.03 Submittals

A. Shop Drawings

1. Submit the proposed Shop Drawing Submittal Schedule prior to submitting any of the shop drawings for review.
2. Prepare shop drawings giving complete details of fabrication and placement.
3. Shop Drawings will be checked by the Engineer for correct interpretation of the Drawings, but this check shall not relieve the Contractor of their primary responsibility to provide the correct number of properly detailed bars in all members.

4. Resubmitted shop drawings
 - a. All information which is correct on the original submittal will not be changed in any way on the resubmitted shop drawings.
 - b. Cloud all information changed due to a Change Order.
5. See the General Notes and Typical Details for additional reinforcing around openings, over beams, and other general information for the Detailer.
6. Prepare shop drawings in accordance with the following:
 - a. Beams and Walls: 1/4-inch scale elevations of all walls and beams shall be provided with all the reinforcing shown on the elevations, not scheduled.
 - b. Slabs and Mats: Show all reinforcing for concrete slabs on a floor plan drawn exclusively for this use. Do not schedule reinforcing in slabs. Extent of all rebar shall be clearly indicated on plan.
 - c. Slabs and Mats: A support system plan for all slabs shall be provided. Supports for slab top and bottom bars shall be shown in number and location. The maximum spacing of support bars shall be 4'-0". The maximum overhang beyond a support bar or a slab bolster shall be 1'-0".
 - d. Provide bar bending diagrams for all bent bars within a submittal in that same submittal.
 - e. Sections of walls, beams, joists, and slabs shall be provided showing clearly bar positions and clearances to forms.
 - f. Full elevations of all columns with each floor elevation indicated. Column hook orientation diagrams at tops of cast in place concrete columns.
 - g. On wall sections, indicate spacers used to maintain clearances for vertical wall steel.
 - h. Beam bolsters and joist chairs shall be indicated as to size and spacing on the sections and the elevations.
 - i. Include all details, sections, and installation instructions indicated on the structural drawings that are required by the Contractor to place the reinforcement without using the structural drawings.
 - j. Indicate grades of reinforcement on each shop drawing.
7. Submit the following regarding the mechanical tension butt splices, the end-bearing splices and the dowel bar replacement system to be used:
 - a. Shop drawings indicating fabrication and placement details per this section.
 - b. Manufacturer's literature, product samples, and certified test reports substantiating compliance with the Specification.

1.04 Quality Assurance

- A. Provide at least one experienced person present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all Work performed under this Section.

1.05 Delivery, Storage, and Handling

A. Protection

1. Use all means necessary to protect concrete reinforcement before, during, and after installation and to protect the installed Work and materials of all other trades.

2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond breaking coatings.
 3. Store reinforcing steel on wood blocking above ground over a weed barrier in an orderly manner.
 4. Use all necessary precautions to maintain identification after the bundles are broken.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 Concrete Reinforcement

- A. All concrete reinforcement materials shall comply with the following reference standards:
1. Main reinforcing Bars: ASTM A615 Grade 60.
 2. Stirrups and Column Tie Bars: ASTM A615 Grade 60.
 3. Weldable Reinforcing: ASTM A706 Grade 60
 4. Wire Reinforcement: ASTM A82
 5. Welded Wire Fabric: ASTM A185

2.02 Accessories

- A. Provide bar supports, ties, blocking, and accessories in accordance with CRSI "Manual of Standard Practice".
- B. When a face of wall or underneath side of floor is exposed and/or painted, bar supports shall be stainless steel or plastic material.
- C. Provide plastic Aztec "space wheels" or adequately secured slab bolsters to maintain clearances for vertical wall reinforcement.

2.03 Mechanical Tension Butt Splices

- A. Mechanical tension butt splices shall conform to ACI 318.
- B. Provide Cadweld butt splices or position threaded couplers for hooked bars that must be butt spliced.
- C. Standards:
1. Lenton Rebar Splicing – Erico Products, Inc.
 2. Grip Twist System – Barsplice Products, Inc.
 3. Bar Lock Series or Taper Lock Series - Dayton Superior Corporation

2.04 End-Bearing Splices (Compression Butt Splices)

- A. End-bearing compression butt splices shall conform to ACI 318.

B. Standards

1. D630 Bar Lock – Dayton Superior Corporation
2. Speed Sleeve - Erico Products, Inc.

2.05 Dowel Bar Replacement System

A. Shall conform to ACI 318.

B. Standards

1. DBDI Splice System - Dayton Superior Corporation
2. Lenton Form Saver – Erico Products, Inc.
3. BDI Bar Splicer System – Bar Splice Products, Inc.

2.06 Rebar Anchorage System

A. Shall conform to ACI 318.

B. Standards

1. Lenton Terminator - Erico
2. MRC D-158 Structural Rebar End Anchor - Dayton Superior Corporation

C. This anchorage system may be used only in places indicated on the Structural Drawings or in areas approved by the Structural Engineer.

PART 3 - EXECUTION

3.01 Fabrication

A. Fabrication, including bar bending shall comply with the requirements of ACI 318, ACI 315 and CRSI "Manual of Standard Practice".

B. Welding of all reinforcing steel shall comply with the provisions of AWS D1.4.

3.02 Surface Conditions

A. Inspection

1. Prior to installation of the Work of this Section, carefully inspect the installed Work of all other trades and verify that all such Work is complete to the point where this installation may properly commence.
2. Verify that concrete reinforcement shall be installed in strict accordance with all pertinent codes and regulations, the approved shop drawings, and the original design.

B. Discrepancies

1. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved and reviewed by the Engineer.

3.03 Installation

A. Before placing reinforcement and again before placing concrete clean reinforcing of loose rust and mill scale, dirt, ice, and other materials that reduce concrete bond.

B. Installation shall be completed in accordance with reviewed and corrected shop drawings. A set of shop drawings marked accordingly for "Field Use" shall be used during the installation.

C. All reinforcement shall be held securely in design position by wiring to supports in accordance with CRSI standards and, in addition, any other supports needed to secure every bar against displacement shall be provided. Overhanging tails shall be supported positively. All bars bent and/or displaced during concrete placement shall be straightened and repositioned before they are encased in concrete.

D. Tolerances on reinforcing placement shall conform to ACI 117, unless otherwise noted.

E. Splicing of reinforcement

1. Splicing of main reinforcement will not be permitted unless specifically identified on the Structural Drawings or approved by the Engineer.
2. Splicing of horizontal wall reinforcement in circular tanks shall be a treble-stagger lap splice.

F. Concrete protection shall comply with the requirements of ACI 350 except as modified on the Structural Drawings.

1. Except as otherwise indicated on the Drawings, provide the following minimum concrete cover for reinforcement:
 - a. Concrete cast against and permanently exposed to earth: 3 inches.
 - b. Vertical formed concrete surfaces exposed to earth, weather, or fluid surfaces: 2 inches.
 - c. Horizontal formed concrete surfaces exposed to earth, water, weather and over or in contact with wastewater: 2 inches.

G. Obstructions

1. In the event conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Engineer and obtain approval of new procedure before placing concrete.

H. Do not field bend or cut reinforcing unless specifically approved by Engineer.

- I. A mat of steel shall be considered as two layers of reinforcing bars forming a grid. When one mat of steel is to be placed in a wall or slab, place the mat in the center of the section unless specifically excepted. When two mats of steel are to be placed in a wall or slab, place one mat in each face of the section utilizing the minimum allowable clear distance.

3.04 Field Quality Control

- A. Contractor shall notify the Engineer when reinforcement for a pour is nearing completion so that reinforcing steel in place may be reviewed.
- B. Allow time for setters to adjust and make corrections so that reinforcing steel is adequately placed when concrete placement operation begins.

-END-

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Provide all materials, equipment, and labor required for placing, finishing, and curing cast-in-place concrete.
2. Installation of all specified items to be embedded in cast-in-place concrete.

B. Products Installed but Not Furnished Under this Section

1. Structural Steel - (Anchor rods and other structural steel items to be embedded in cast-in-place concrete)
2. Miscellaneous Metals

C. Related Sections

1. Section 03100 - Concrete Formwork
2. Section 03200 - Concrete Reinforcement
3. Section 05520 - Miscellaneous Metals

1.02 References

- A. Work on this project shall conform to all requirements of the current version of the specifications listed below published by the current building codes except as modified by these contract documents. ASTM specifications apply in their entirety where specifically referenced in the body of this section.

1. ACI 117 Specification for Tolerances for Concrete Construction and Materials
2. ACI 301 Specifications for Structural Concrete
3. ACI 305.1 Specification for Hot Weather Concreting
4. ACI 306.1 Specification for Cold Weather Concreting
5. ACI 318 Building Code Requirements for Structural Concrete

1.03 Submittals

A. Concrete Mix Designs

1. Submit for review a mix design for each class of concrete required for the project including:
 - a. Standard deviation analysis, required average strength and documentation of average strength verifying compliance with ACI 318
 - b. Mix proportions by weight, water-cement ratio, slump, and air content
 - c. Sieve analyses of fine and coarse aggregates
 - d. Complete list of materials specified with product information demonstrating compliance with all specified requirements

- e. Submit verification of compliance with water soluble chloride ion content limit.
- B. Shop Drawings
 - 1. Submit shop drawings for review and indicating:
 - a. Locations of construction joints
 - b. Sizes and locations of sleeves and embedments
- C. Product Information: Submit for review product information for materials specified demonstrating compliance with specified requirements.
- D. Field Quality Control Test Reports: Submit reports within 3 days after completion of the 7-day and 28-day tests.
- E. Concrete Placement Records: Submit records after completion of the concrete placement.
- F. Submit concrete delivery tickets in accordance with ASTM C94 for each batch of ready mixed concrete delivered, including total water content, batch time and batch weight on each ticket.

1.04 Quality Assurance

- A. Perform Work in accordance with ACI 301.
- B. Conduct field sampling and testing of concrete, including the making of test specimens, with personnel holding current certificates issued by the Concrete Technician Certification Committee of ACI.
- C. Attend a preconstruction meeting to discuss submittals, concrete placement, and concrete testing. A responsible representative of the concrete placing/finishing contractor, the concrete supplier, the reinforcing detailer, the rebar placement superintendent, and the testing agency shall be present.
- D. Verification of cast-in-place embedments and anchor rods.
 - 1. Verify and check elevations and locations of anchor rods and embeds to receive structural steel, miscellaneous steel, and cladding attachments. Anchor rods not placed within the AISC 303 - Code of Standard Practice for Steel Buildings and Bridges (Article 7.5) shall be specifically identified and the Engineer notified in writing.

1.05 Delivery, Storage, and Handling

- A. Deliver concrete in accordance with ASTM C94. Do not use non-agitating transporting equipment.
- B. Deliver materials and equipment in undamaged condition.

- C. Store materials and equipment in designated areas and in accordance with manufacturer's instructions.
- D. Store materials and equipment off the ground, totally protected from ground splash, mud, weather separation, intrusion of foreign materials, and other damage.

1.06 Inclement Weather Requirements

- A. Inclement Weather: Do not place concrete during rain, sleet, or snow unless adequate protection is provided.
- B. Hot Weather: Perform Work under provisions of Hot Weather Concreting article.
- C. Cold Weather: Perform Work under provisions of Cold Weather Concreting article.

PART 2 - PRODUCTS

2.01 General

- A. When products and materials are used in, or applied to, a cast-in-place concrete surface which is in contact with potable water, the products and materials shall comply with NSF/ANSI Standard 61: Drinking Water System Components – Health Effects.

2.02 Concrete Materials

- A. Portland Cement: ASTM C150, Type I or Type II
 - 1. Maximum tricalcium aluminate content of the cementitious material: 8.0 percent
- B. Flyash: ASTM C618, Class C or Class F
 - 1. Maximum loss on ignition: 3.0 percent
 - 2. Maximum amount retained when wet-sieved on No. 325 sieve: 30 percent
- C. Slag Cement: ASTM C989, Grade 100
- D. Fine Aggregate: ASTM C33
 - 1. Natural sand of clean, hard, durable particles

2. Sieve analysis to conform to the following gradation requirements:

Sieve Sizes	Percent Passing
3/8	100
No. 4	95-100
No. 6	--
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 80	--
No. 100	0-10

E. Coarse Aggregate: ASTM C33

1. 3/4" maximum aggregate size, Crushed stone or gravel of clean, sound, tough, durable particles, meeting ASTM C33, Class 4S
2. Sieve analysis to conform to the following gradation requirements:

Sieve Sizes	Percent Passing
1"	100
3/4"	75-95
1/2"	40-70
3/8"	20-50
No. 4	0-15
No. 8	0-10
No. 30	--
No. 200	--

F. Water: ASTM C94 and potable

G. Air-Entraining Admixture: ASTM C260

1. Standards
 - a. Master-Air AE 200 by BASF Construction Chemicals
 - b. Master Air AE 90 by BASF Construction Chemicals
 - c. Daravair Series by GCP Applied Technologies

H. Water-Reducing Admixture: ASTM C494, Type A

1. Standards
 - a. MasterPozzoloth 200, 210, 322 by BASF Construction Chemicals
 - b. WRDA with Hycol by GCP Applied Technologies
 - c. Eucon WR-75 by The Euclid Chemical Co.

- I. Mid-Range Water Reducing Admixture: ASTM C494, Type A
 - 1. Standards
 - a. Daracem 55 by GCP Applied Technologies
 - b. Mira Series by GCP Applied Technologies
 - c. Eucon Series by Euclid Chemical Co.

- J. High Range Water-Reducing Admixture: ASTM C494, Type F
 - 1. Standards
 - a. MasterGlenium 3030 by BASF Construction Chemicals
 - b. Daracem Series by GCP Applied Technologies
 - c. Eucon 37 by The Euclid Chemical Co.
 - 2. High range water reducing admixture shall be added to the concrete at the batch plant. Field added HRWR is allowed to correct slump non-compliance.

- K. Accelerating Admixture: ASTM C494, Type C
 - 1. Standards
 - a. MasterSet FP20 or MasterSet AC534 Accelerator by BASF Construction Chemicals
 - b. Polarset by GCP Applied Technologies
 - c. Accelguard 80 or 90 by The Euclid Chemical Co.
 - 2. The accelerator shall be non-chloride, non-corrosive. Calcium chloride, or admixtures containing more than 0.05% chloride ions, are not permitted.
 - 3. Thiocyanate based accelerators are not permitted.

- L. Water-Reducing & Retarding Admixture: ASTM C494, Type D
 - 1. Standards
 - a. MasterSet R122 or MasterSet R300 by BASF Construction Chemicals
 - b. Daratard-17 by GCP Applied Technologies
 - c. Eucon Retarder-75 by The Euclid Chemical Co.

- M. Corrosion-inhibitor Additive: Provide when specified as a requirement, or when necessary to offset chloride ion content in excess of specified limit.
 - 1. Calcium nitrite-based corrosion inhibitor
 - a. At a dosage rate of 3 gallons per cubic yard, the additive shall provide a minimum chloride protection of 9.9 pounds of chlorides per cubic yard of concrete. Dosage rate is to be in accordance with the manufacturers published instructions.
 - b. The corrosion inhibitor shall contain 30 +/- 2 percent of calcium nitrite by weight.
 - 2. Standards
 - a. DCI by GCP Applied Technologies
 - b. DCIS by GCP Applied Technologies

N. Synthetic Fibers

1. Virgin (non-recycled), nylon or polypropylene fibers
2. 3/4-inch length (unless specified otherwise)
3. When using nylon fibers, add fibers at a minimum dosage rate of 1.0 pound/cubic yard. When using fibrillated polypropylene fibers, add fibers at a minimum dosage rate of 1.5 pounds/cubic yard. Use in strict accordance with manufacturer's instructions.
4. Introduce fibers into the concrete at the batch plant and note it on all delivery tickets.
5. Standards
 - a. Nytech CG by NMW, Inc.
 - b. Fibermesh 300 by Propex Concrete Systems.
 - c. Forta Ultra-Net by Forta Corp.

2.03 Curing Materials

A. Curing Compound: ASTM C309

1. Type 1, Class B clear curing, non-yellowing under ultraviolet light
2. Sodium silicate products are not permitted.
3. Compatible with applied coatings and finishes specified for the concrete surfaces to be cured
4. Apply curing compound at the coverage rate to comply with manufacturer's instructions.

B. Moisture Retention Cover: ASTM C171

1. Polyethylene film or white burlap-polyethylene sheet

C. Absorptive Cover: AASHTO M 182

1. Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry

D. Water: Potable

2.04 Related Materials

A. Evaporation Retardant

1. Apply in accordance with manufacturer's instructions. Material that is in contact with potable water shall comply with NSF 61.
2. Standards
 - a. Confilm by BASF Construction Chemicals
 - b. EUCO-BAR by the Euclid Chemical Co.

- B. Epoxy Bonding Adhesive: Provide bonding adhesive and patching material products from a single manufacturer. Material that is in contact with potable water shall comply with NSF 61.
 - 1. Two-part structural epoxy adhesive
 - 2. Use to bond fresh, plastic concrete or patching mortar to hardened concrete.
 - 3. Standards
 - a. Planibond 3C, by Mapei
 - b. Sikadur 32, Hi-Mod by Sika Corporation
 - c. MasterEmaco ADH 1420, by BASF Construction Chemicals

- C. Bondbreaker: Liquid, paper or plastic sheet to break bond between freshly placed concrete and hardened concrete.
 - 1. Provide at isolation joints unless joint filler is indicated.

- D. Adhesive Anchor System: Use to anchor reinforcing steel into hardened concrete.
 - 1. Moisture insensitive epoxy
 - 2. Standards
 - a. Hilti HIT HY 200 by Hilti Fastening Systems
 - b. Approved equal: Submit literature including depth of embedment to develop reinforcing bars/anchor bolts and spacing requirements.
 - 3. Drilled hole size and installation procedure shall conform to manufacturer's published instructions.
 - 4. Use carbide bit drill to prevent damage to reinforcement.

- E. Patching and Repair Materials
 - 1. Provide patching and repair materials, and bonding adhesive products for all repair surfaces, from a single manufacturer.
 - 2. Patching Material: Provide stiff Portland-cement or commercial patching mortar for filling of form tie holes and other similar applications.
 - 3. Repair Material: Provide fiber-reinforced, shrinkage-compensated, polymer-modified cementitious repair mortar with integral corrosion inhibitor for repair of honeycombed and other defective concrete.
 - a. Standards
 - 1) Planitop X, by Mapei
 - 2) SikaTop 122 PLUS (horizontal surfaces) and 123 PLUS (overhead and vertical surfaces), by the Sika Corporation.
 - 3) MasterEmaco T310CI (horizontal surfaces) and N420CI (vertical and overhead surfaces) by BASF Construction Chemicals.

- F. Grout: Provide type of grout as required for the intended application.
 - 1. Type 1: Used for high-strength below equipment bases and other similar applications. Non-shrink, non-metallic grout composed of selected silica sands, modified cements, pozzolanic, plasticizing, and water reducing admixtures, and suitable for both interior and exterior applications. Grout shall be a bagged

product containing a premixed formulation, requiring only the addition of water prior to use.

a. Standards

- 1) SONOGROUT 10K, by Sonneborn-Contech
- 2) SIKAGROUT 428 FS, by Sika Corp.
- 3) MasterFlow 928, by BASF Construction Chemicals.

G. Isolation Joint Filler: ASTM D1752. Provide at joints only where indicated.

1. Isolation joint filler shall be flexible, lightweight, non-straining, polyethylene, and closed cell. It shall be a chemical-resistant, ultraviolet stable, non-absorbent, low density, compressible foam.
2. The joint filler shall have a pre-scored "removable strip" to provide a uniform sealing reservoir in the joint. This reservoir shall be used to provide a sealed joint with a flexible sealant in accordance with the Contract Documents.
3. Where joints are indicated to be sealed, provide bond breaker with removable reglet for joint sealing.
4. Standards
 - a. Deck-O-Foam Expansion Joint Filler by W.R. Meadows
 - b. Foamtech by NMW, Inc.

2.05 Proportioning Concrete Mixes

- A. Establish concrete proportions to produce homogeneous, durable mixes with the required average strength based on the appropriate amount of overdesign as required by ACI 318.
- B. Proportion concrete mixes to provide workability and consistency to permit concrete to be worked readily into the corners and angles of the forms and around reinforcement by the methods of placement and consolidation to be employed, without segregation or excessive bleeding.
- C. Include a water-reducing admixture, a mid-range water reducing admixture, or high range water-reducing admixture, used in strict accordance with manufacturer's instructions in all mix designs. Specified minimum cement contents are based on the use of such admixtures.
- D. Include an air-entraining admixture in mix designs for all concrete exposed to freezing and thawing during service, and as indicated for concrete mix classes.
- E. Base mix design on saturated surface dry aggregates. Adjust the amount of mixing water added at the batch plant for the moisture condition of the aggregates.
 1. Water-cementitious ratio shall be calculated using the total of 100% of Portland Cement weight, plus 100% of Fly ash weight, plus 100% of Slag Cement weight.

- F. Supplementary Cementitious Materials (SCM) may be used to replace a portion of the specified minimum cement content.
1. Fly ash: ASTM C618, Class C or Class F
 - a. The maximum weight of Portland Cement which is replaced by fly ash shall be 20% of the specified Minimum Cementitious Material Content for the specific concrete mix.
 2. Slag Cement: ASTM C989, Grade 100
 - a. The maximum weight of Portland Cement which is replaced by Slag Cement shall be 30% of the specified Minimum Cementitious Material Content.
 3. When Slag Cement and Fly ash are both used as Portland Cement substitutes in the same concrete mix, the maximum substitution rates shall be 10% for Fly ash and 20% for Slag Cement, for a total maximum substitution rate of 30%.
- G. Water Soluble Chloride Ion Content: Maximum percent in concrete by weight of cement:
1. Conventionally reinforced concrete: 0.10%.
 - a. For conventionally reinforced concrete, total chloride ion content may be calculated as the sum of the chloride ion contents from the individual concrete ingredients. If the total is greater than the limit, testing as described below may be conducted.
 2. For each pound of chloride ion in excess of the amount allowed, the concrete mix shall contain a corrosion inhibiting additive, at a rate of one gallon for each pound of chloride ion in excess of the amount allowed. A maximum of 1.5 pounds of chloride ion may be compensated in this matter. The minimum dosage shall be one half gallon per cubic yard.
- H. Slump
1. Mixes containing high range water-reducing admixture: 5 to 8 inches
 2. Mixes containing mid-range water-reducing admixture: 5-6 ½ inches
 3. Mixes containing water-reducing admixture: 5 inches maximum
- I. Adjustments to the approved mix designs may be requested by the Contractor when job conditions, weather, test results, drying times, or other circumstances warrant. Submit revised concrete mix designs for approval prior to their use.
- J. Concrete Mix Classes:
1. Class 3000: Concrete fill.
 - a. Compressive strength at 28 days: 3000 psi
 - b. Minimum cement content: 423 lb/cu yd.
 - c. Maximum water-cementitious ratio: 0.58
 - d. Air content: Optional.
 - e. Water-reducing admixture required.
 2. Class 4500: Concrete for foundations, slabs, walls, columns, and exterior slabs on grade, stoops, curbs, and sidewalks, unless otherwise noted.
 - a. Compressive strength at 28 days: 4500 psi.

- b. Minimum cement content: 580 lb/cu yd.
- c. Maximum water-cementitious ratio: 0.42.
- d. Air content: 6 +/- 1 percent at point of delivery, typical.
- e. High range water-reducing admixture required.
- f. Synthetic fibers required in unreinforced exterior slabs.

2.06 Batching and Mixing

- A. Batch and mix concrete in accordance with ASTM C94.
- B. Mix concrete until there is a uniform distribution of materials.
- C. Storage, handling, and mixing of commercial grout products shall meet the requirements of the manufacturer.

PART 3 - EXECUTION

3.01 Preparation

- A. Install items to be embedded in concrete. Set steel frames, angles, trench drains, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed. Position accurately and secure against displacement.
 - 1. Anchor rods shall be installed in accordance with the tolerances indicated in the AISC-303 Code of Standard Practice for Steel Buildings and Bridges, Article 7.5.
 - 2. Do not embed aluminum items in concrete.
- B. Remove wood scraps, ice, snow, frost, standing water, and debris from areas in which concrete will be placed.
- C. Before fresh concrete is placed against hardened concrete, retighten forms and clean. Use a bonding agent for bonding fresh concrete to hardened concrete.
- D. Thoroughly moisten subgrade on which concrete is to be placed. Do not place concrete on frozen subgrade.
- E. Thoroughly clean conveying and handling equipment.
- F. Clearance between items which are to be grouted shall not be less than 1 inch for each 16 inches that the grout must flow horizontally. Use forming procedures that allow proper and complete placement of fluid grout, including the use of head forms. Provide air relief openings where required to avoid entrapment of air. Support elements to be anchored so that no movement is possible. Pretreat wood surfaces that can absorb moisture with forming oils and cut back edges of concrete to be grouted which are less than 1-inch thick to form a uniform butt joint.

G. Areas to be grouted shall be clean and free of oil, grease, dirt, loose material and contaminants. All metal components to be in contact with grout shall be de-rusted and free of paint or oils.

1. Concrete surfaces which are to come into contact with Type 1 grout shall be coated with a bonding agent.

3.02 Surface Conditions

A. Before concrete is placed, inspect the installed Work of this and other Sections and verify that all such Work is complete.

B. Verify that concrete can be placed to the required lines and elevations with required cover for reinforcement.

C. Prevent groupings of conduits, pipes, and sleeves in concrete that would significantly impair the strength of the concrete.

D. Notify the Engineer when concrete placement is planned. Allow sufficient time for review of formwork, reinforcement and embedded items, and for any required corrective Work.

3.03 Placing

A. Addition of water to the concrete during transport or at the site is prohibited. Slump may be adjusted at the site by the addition of high or mid-range water reducer.

B. Convey concrete by methods and equipment capable of supplying concrete from mixer to place of final deposit without segregation and such that detectable setting of concrete does not occur before adjacent concrete is placed.

C. Use pumping equipment with sufficient design and pumping capacity to ensure a practically continuous flow of concrete at the point of discharge without segregation.

1. Do not add water or alter the mix design in any way to facilitate pumping.
2. Pumping concrete through aluminum pipe is prohibited.

D. Concrete may be placed in columns and walls by "free fall" providing a tremie is used to control concrete to fall without hitting the formwork, reinforcing, or any embedded items and segregation does not occur.

E. After concrete placing has started, provide continuous operation until placement of the section is complete. Do not place a greater section at one time than can be properly finished.

F. Deposit concrete as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.

G. Place concrete at a rate such that the concrete is at all times plastic and flows readily between reinforcement and into corners of forms without segregation.

- H. Place concrete in all slabs, mats, and beams for the full depth of the member at one time in such a way as to prevent a horizontal cold joint from occurring.
- I. All concrete shall be discharged into the structure within 90 minutes after batching.
- J. Do not place concrete that has partially hardened, been retempered, or contaminated by foreign materials.
- K. Place grout in accordance with standard grouting procedures and recommendations of ACI for placing and curing of concrete. Use chains, rods, or tamping devices to compact grout tightly, completely removing all air voids. Place grout quickly and continuously, striking off exposed areas.

3.04 Consolidation

- A. Thoroughly consolidate concrete with high frequency vibrators, working the concrete thoroughly around reinforcement and embedded items and into corners of forms.
- B. Use a sufficient number of vibrators, of appropriate size and type, to provide complete vibration throughout the concrete at the same rate it is placed.
 - 1. Provide at least one spare vibrator at the site for use in case of breakdown.
- C. Provide properly spaced vibration of duration sufficient to produce complete consolidation, but not long enough to cause segregation. Continue vibration until mortar just begins to puddle at the surface. Remove any excess free water that collects on the surface.
- D. Do not use vibrators to transport concrete within forms.
- E. Supplement internal vibration with manual consolidation methods, and external form vibration as required to produce concrete free of voids, honeycomb, and rough surfaces.
 - 1. Vibrate forms in such a way as to avoid form displacement.

3.05 Finishing Slabs

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4-inch in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high

spots, and fill low spots. Repeat float passes and restraighen until surface is left with a uniform, smooth, granular texture.

1. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4-inch.
2. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4-inch.

E. Trowel and Fine-Broom Finish: While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply immediately after float finishing.

1. Slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

G. Apply finishes to slabs as follows:

Slab Finish Table

Element	Finish
Surfaces to remain exposed, and not to be used as walkways	Float Finish
Exterior walkways and platforms	Broom Finish
Concrete stair treads, platforms, ramps, sloped walks	Broom Finish

3.06 Finishing Formed Surfaces

A. Rough Form Finish, Category ESF-1.0 (ACI 350.5): Formed surfaces not exposed to view.

1. Coordinate formwork requirements with Concrete Formwork specification.
2. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar matching the color of the surrounding concrete.

3. Patch voids greater than 1½ inches wide or 1/4-inch deep. Patch defective areas in accordance with REPAIR OF DEFECTIVE SURFACES article below.
 4. Chip or rub off fins and projections exceeding 1/2-inch in height unless otherwise noted.
- B. Smooth Form Finish, Category ESF-2.0 (ACI 350.5): Formed surfaces exposed to view.
1. Coordinate formwork requirements with Concrete Formwork specification.
 2. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar matching the color of the surrounding concrete.
 3. Patch voids greater than 3/4-inch wide or 1/4-inch deep. Patch defective areas in accordance with REPAIR OF DEFECTIVE SURFACES article below.
 4. Chip or rub off fins and projections Exceeding 1/4-inch in height unless otherwise noted.
 5. Rubbed Finish:
 - a. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

3.07 Repair of Defective Areas

- A. Remove honeycombed and other defective concrete, exposing sound concrete. Cut and chip edges straight and perpendicular to the surface or slightly undercut to a depth of 1/2-inch. Feathered edges are not permitted.
- B. Dampen areas to be repaired, and surrounding areas. Patch with repair material according to manufacturer's instructions. Submit data on repair material to Engineer for review prior to starting repair.
- C. After surface water has evaporated from the area to be patched, apply repair material to the surface.
- D. Apply curing to the repaired surface as soon as possible and maintain for a minimum of 3 days.

3.08 Curing

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301 and ACI 306 for cold-weather protection and ACI 305 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's

published instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

1. Follow methods outlined in ACI 305 if concrete is to be placed when the rate of evaporation of surface moisture from the concrete exceeds 0.18 lb/sq ft/hr (Figure 2.1.5, ACI 305).
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period. Steel side forms shall remain in place no longer than 3 days.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, as follows:
1. Moisture-Retaining-Cover Curing:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, 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.
 2. Curing Compound:
 - a. Apply uniformly in continuous operation by power spray or roller according to manufacturer's published instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 Joints

A. Construction Joints

1. Locate construction joints so as not to impair the strength of the structure.
 - a. When control joints are indicated, locate construction joints at control joint locations.
2. Continue all reinforcement across construction joints.
 - a. When a construction joint is located at a control joint location, the reinforcing through the joint shall be in accordance with the control joint detail.
3. Thoroughly clean the concrete surface at construction joints and remove laitance before placing adjoining concrete.

B. Slab on Grade Control Joints: When control joints in slab on grade are indicated, provide in accordance with any of the following methods:

1. Sawcut Control Joints

a. Conventional: Sawcut joints as soon as the blade does not dislodge aggregate and when the edges of the cut do not ravel. For slabs to remain exposed, use a blade that has a triangular arbor configuration to reduce edge leveling or dislodging aggregates. Complete saw-cutting before shrinkage stresses become sufficient to produce cracking. Sawcut joints in straight lines to avoid unsightly joints.

b. SOFF-CUT System: Saw cut control joints with SOFF-CUT System Model G-2000 or GS-1000, 1/8" wide x 1 3/16" deep joints, within (2) hours after final finish at joint location. Do not disturb final slab finish. Saw cuts shall be made with SOFF-CUT saw as manufactured by SOFF-CUT International, Corona, Calif. Equipment shall be used in accordance with manufacturer's instructions. SOFF-CUT System shall not be used for slabs greater than 6 inches thick.

2. Hand-Tooled Control Joints: Tool joints with hand groovers in straight lines to avoid unsightly joints.

3.10 Hot Weather Concreting

A. Follow the provisions of this Article and ACI 305.1 when the rate of evaporation of surface moisture from the concrete exceeds 0.18 lb/sq ft/hr (Figure 2.1.5, ACI 305.1).

B. Control concrete setting time with the use of water-reducing and retarding admixtures as required to facilitate placing and finishing operations.

C. Before placing concrete, spray the subgrade, forms and reinforcement with water to keep them cool and to prevent absorption of water from the concrete.

D. Transport, place and finish concrete as quickly as practicable. Plan concrete delivery, placing techniques, and consolidation methods to avoid cold joints.

E. Maximum temperature of concrete during placing: 90 F

F. Apply evaporation retardant to the surface of the fresh concrete after screeding and as needed during finishing.

G. Take additional precautions as necessary to prevent plastic shrinkage cracking.

H. Start curing the concrete immediately after finishing operations have been completed.

3.11 Cold Weather Concreting

A. Follow the provisions of this Article and ACI 306.1 when the average daily temperature (average of the highest and lowest temperature during the period from midnight to midnight) is less than 40 F.

- B. Control concrete setting time with the use of accelerating admixtures and water-reducing accelerating admixtures as required to facilitate placing and finishing operations.
 - 1. Do not use calcium chloride as an accelerating admixture. Only the specified accelerators shall be used.
- C. Temperature of concrete during placing: 55 F to 75 F
- D. Maintain the temperature at the concrete surface between 55 F and 75 F until the concrete reaches 70 percent of its specified compressive strength by providing heated enclosures and/or insulated blankets.
 - 1. Construct weathertight enclosures, allowing the heated air to circulate around the outer edges of the concrete.
 - 2. Provide a sufficient number of heaters to assure an even temperature within the enclosure.
 - a. Use indirect-fired heaters vented to the exterior where heat is supplied to the top of fresh concrete to prevent dusting due to carbonation.
 - 3. Add moisture to the heated air as required to maintain a minimum relative humidity of 40 percent within the enclosure. Do not allow any concrete surface to become dry during the protection period.
 - 4. Maintain enclosures for 24 hours after heating has been discontinued to allow the concrete to cool gradually.
 - 5. Lap insulating materials and cover the edges and corners of the concrete to provide complete and adequate protection.
 - 6. Wrap columns and walls with insulated blankets.
 - 7. Monitor the temperature of the concrete surface regularly with suitable thermometers throughout the protection period.
- E. Provide insulation or temporary backfill to protect all earth supported concrete from damage due to frost heaving.

3.12 Protection

- A. Protect finished concrete surfaces from damage by construction equipment, materials or methods and by rain or running water.
- B. Do not load any concrete member in such a way as to overstress the concrete.

3.13 Field Quality Control

- A. Testing Agency: Conduct testing and provide reports as outlined in this Article.
- B. Strength Tests
 - 1. During the progress of the Work, take samples of concrete for strength tests in accordance with ASTM C172.

2. Make and cure a minimum of 4 cylinders in accordance with ASTM C31 for each of the following:
 - a. Each 100 cubic yards of concrete
 - b. Each 5000 square feet of surface area for slabs and walls
 - c. Each class of concrete placed in a day's Work
3. Cylinders may be either 6 x 12 inches or 4 x 8 inches.
4. Test each group of 4 cylinders in accordance with ASTM C39 as follows:
 - a. Two field cured cylinders to be tested at 7 days or just before anticipated time of form removal
 - b. Two laboratory cured cylinders to be tested at 28 days
5. A strength test is the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.
6. The strength level of an individual class of concrete will be considered satisfactory if each strength test equals or exceeds the specified compressive strength.
7. If the strength level of an individual class of concrete is found to be unsatisfactory, conduct core testing in accordance with ASTM C42, impactometer testing or load testing on the area of concrete in question as required by the Engineer. If such additional testing does not produce acceptable results, corrective measures will be required to ensure structural adequacy.
 - a. Make appropriate adjustments to the concrete mix designs as required.

C. Slump Tests

1. Make one slump test in accordance with ASTM C143 with each group of 4 cylinders.
2. When concrete is pumped, make the slump test at the point of discharge.
3. Keep a slump cone available at the site for additional testing as required.

D. Air Content Tests: Make one air content test in accordance with ASTM C173 or ASTM C231 with each group of 4 cylinders for air-entrained concrete mixes at point of discharge.

E. Rejection of Concrete

1. Any concrete that does not meet the specified requirements for air-entrainment, concrete temperature, or slump shall not be placed until corrective measures have been taken, and the concrete has been re-tested to indicate compliance.

F. Field Quality Control Test Reports

1. Include the following information in test reports:
 - a. Project identification and portion of structure represented
 - b. Concrete mix class and specified compressive strength requirements
 - c. Weather conditions and air temperature
 - d. Concrete temperature, slump and air content test results
 - e. Dates of placing and testing

- f. Method of curing (field or laboratory)
- g. Strength test results
- h. Technician's name, certification number with expiration date

-END-

DIVISION 5 - METALS

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. All labor, materials, services, connection design, and equipment necessary for the complete fabrication and erection of all structural steel as detailed on the Structural Drawings and as specified herein.

B. Related Sections

1. Section 09900 – Protective Coatings

1.02 References

- ###### A. Work on this project shall conform to all requirements of the latest version of the specifications listed below adopted by the current building codes except as modified by these Contract Documents.

- ###### B. ASTM specifications apply in their entirety where specifically referenced in the body of this section.

1. ASTM A36 - Standard Specification for Carbon Structural Steel
2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products
3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
4. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts
5. ASTM A992 - Standard Specification for Structural Steel Shapes
6. ASTM C1107- Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

- ###### C. Refer to specific portions of other guides, guidelines, and manuals where referenced in the body of this specification section.

1. AC 193 - Mechanical Anchors in Concrete Elements
2. AC 308 - Post-installed Adhesive Anchors in Concrete Elements
3. AISC 201 -- Certification Program for Structural Steel Fabricators - Standard for Steel Building Structures
4. AISC 206 - Certification Program for Structural Steel Erectors – Standard for Structural Steel Erectors
5. AISC 360 - Specification for Structural Steel Buildings

6. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges (Sections 3.3 and 4.4 are excluded.)
7. AWS D1.1 - Structural Welding Code – Steel
8. AWS E70 - Welding Electrodes
9. RCSC - Specification for Structural Joints Using High-Strength Bolts
10. SSPC - The Society for Protective Coatings Standards

1.03 Submittals

A. Submit with Bid

1. Documentation indicating compliance with required fabricator and erector qualifications.

B. Submit Shop Drawings to the Engineer for review in accordance with Section 01300 and the following.

1. Shop drawings shall be submitted to the Engineer for review. Shop Drawings shall include erection plans and framing elevations, all shop and erection details including copes, connections, threaded fasteners, and welds.
2. Erection plans shall clearly denote locations of all connections which require field welds or slip critical bolts, if specified.
3. Use standard AWS symbols for welds, indicating size, length and type. Distinguish between shop and field welds. Provide prequalified weld designations and appropriate details including root opening dimensions, bevel properties and access hole dimensions for complete penetration and partial joint penetration groove welds.
4. Provide setting drawings, templates, and directions for installation of anchor rods and other devices.
5. Shop drawings shall include the grade of steel, connection bolt and anchor rod material types, and the type of welding rods.

C. Product Information

1. Submit product information for products specified in Part 2 of this specification section under the provisions of Division 1 and demonstrating compliance with specified requirements.

D. Certifications

1. Provide certification for all welders used in field and shop Work for review by the Owner's Testing and Inspection Agency.
2. Submit Welding Procedure Specifications (WPS) in accordance with AWS D1.1 for all welded joints for review by the Owner's Testing and Inspection Agency.

E. Test Reports

1. Submit current ES Reports, by ICC Evaluation Service, Inc. for all non-standard post installed anchors. See Part 2 of this specification section for standard post installed anchors.

1.04 Quality Assurance

A. Fabricator Qualifications

1. No less than five projects experience of comparable complexity with a record of successful performance in fabrication of structural steel with scope similar to this project.
2. AISC 201 Certification required. No portions of the Work shall be subcontracted to non-certified facilities.

B. Erector Qualifications

1. No less than five projects experience with a record of successful in-service performance in erection of structural steel buildings of type and scope similar to this project.
2. Provide continuous erection supervision, by superintendent with no less than ten years of experience in erection of structural steel buildings of type and scope similar to this project.
3. AISC 206 Certification required.

C. Welding

1. All welders both in the shop and field shall be certified under AWS D1.1 for the types of welding being performed and shall have been continuously engaged in such welding.
2. Certification shall remain in effect for the duration of the Work.
3. Certification of welding personnel is subject to verification by the Testing and Inspection Agency.

- D. Engineer of Record's submittal review does not relieve the Contractor of their responsibility for any errors in detailing, fabrication, erection and fit up.

1.05 Delivery, Storage, and Handling

- A. Exercise care in handling, storing and erection of structural steel to avoid damage to pieces, welds, joints, and coatings. Secure pieces against displacement in transit.
- B. Structural steel members, which are stored at the job site, shall be stored above ground on platforms, skids, or other supports. Protect with weatherproof cover held in place.
- C. Clean members which have become soiled before erecting.

- 1.06 Sequencing
- A. Do not remove temporary shoring or bracing until all framing that makes up the completed structural system has been installed and connected. This includes all framing and connections.
- 1.07 The erector and General Contractor are responsible for the stability and safety of the partially erected structure.

PART 2 - PRODUCTS

- 2.01 Materials and Products
- A. W-Shapes: ASTM A992, Grade 50
- B. S-Shapes: ASTM A992, Grade 50
- C. Channel-Shapes: ASTM A992, Grade 50
- D. Angles, Plates and Bars: ASTM A572, Grade 50
- E. Rectangular and Square HSS: ASTM A500, Grade C, $F_y = 50$ ksi
- F. Connection bolts: ASTM F3125 Grade A325 Type 1.
- G. Fabricator shall review material test reports for materials taken from stock (fabricators shop or warehouse) and verify conformance to the above specifications. Stock materials purchased under no particular specification, or under a specification that is less rigorous than applicable ASTM specifications shall not be used.
- H. Welding rods
1. AWS E70XX for A36 steel
 2. AWS E70XX low hydrogen for Grade 50 steel
- I. Nuts: ASTM A563 or ASTM A194: All nuts shall have a minimum Rockwell core hardness of C25 for Grade A325 bolts.
- J. Washers: ASTM F436, ASTM A36 plate washers where indicated
- K. Post Installed Expansion Anchors
1. Expansion anchor shall have an ES Report demonstrating the anchor has met the requirements of AC 193 for mechanical anchors as specified by the International Code Council (ICC).
 2. Use stainless steel anchors for conditions subject to exterior exposure.
 3. Standard
 - a. Hilti Kwik Bolt TZ by Hilti Fastening Systems

4. Information shown on Structural Drawings
 - a. Diameter
 - b. Finish
 - c. Material
 - d. Minimum embedment in concrete

L. Post Installed Adhesive Anchors

1. Adhesive anchors shall have an ES Report demonstrating the anchor had met the requirements of AC 308 for adhesive anchors as specified by ICC.
2. Use stainless steel rods for conditions subject to exterior exposure.
3. Standards for fastening to concrete
 - a. Hilti HY-200 by Hilti Fastening Systems
4. Standards for fastening to masonry
 - a. Hilti HY-70 by Hilti Fastening Systems
5. Information shown on drawings
 - a. Diameter
 - b. Finish
 - c. Material
 - d. Minimum embedment in concrete

M. Non-Shrink Grout

1. Prepackaged requiring only the addition of potable water
2. Must not contain metallic substances or aluminum powder
3. Compressive strengths per ASTM C1107
4. Meet the dimensional stability requirements of ASTM C1107, Grade C, when prepared according to the manufacturer's instructions and tested at 40°F and 90°F
5. Capable of maintaining a flowable consistency for a minimum of 45 minutes at 70°F
6. Do not retemper grout after initial mixing.
7. Standards
 - a. Five Star Grout: Five Star Products, Inc.
 - b. Master Flow by BASF

2.02 Fabrication

- A. Fabricate structural steel in accordance with AISC 360 and AISC 303 except where modified or amended in this Section.
- B. Connections: welded or bolted as shown on the Drawings in the shop where practical.
- C. Manual welding
 1. Use shielded arc electrodes of E70XX series or the strength equivalent of flux cored arc weld.
 2. Submerged arc process welding shall be grade SAW-2.

3. Welding shall be accomplished by welders certified for weld types and positions involved according to the AWS D1.1.

D. Connections

1. Contractor is responsible to ensure proper fit up of all connections.
2. Penetrations, copes, and weld access holes
 - a. Cut, drill, or punch holes perpendicular to surface.
 - b. Do not flame cut or enlarge holes by burning.
 - c. Drill holes in bearing plates and base plates.
 - d. Holes shall be clean cut without torn or ragged edges and meet the surface requirements of Chapter M of AISC 360.
3. Splicing of members in the shop or in the field is prohibited without prior approval of the Engineer.

- E. Shop bolting and welds shall be tested and inspected as outlined in Part 3, Testing and Inspection paragraph of this specification section, as part of the fabricators internal Quality Assurance program. Correction of faulty welds shall be in accordance with AWS D1.1.

2.03 Shop Galvanizing

- A. Shop hot-dip galvanize structural steel listed below in accordance with ASTM A123
1. All structural steel and miscellaneous metals.
 2. All anchor rods, nuts, and washers
- B. Surface Preparation: SSPC – SP6 Commercial Blast Cleaning

PART 3 - EXECUTION

3.01 Erection

- A. Erect in accordance with the AISC 360 and AISC 303 except where modified below.

3.02 Install members to proper alignment with finished building within allowable AISC 303 tolerances. Make necessary adjustments to framing due to discrepancies in elevations and alignment before permanently fastening.

- A. The erector shall acquaint themselves with all conditions at the site, which can affect their methods and sequence of operations. Abide by Owner's regulations concerning traffic, parking, and construction material delivery.
- B. Prior to the erection of any steel, verify the location, elevation and plumbness of all anchor rods and concrete surfaces. Immediately report to the Engineer in writing any condition which is found unacceptable or that would prevent erection of the structural steel within AISC tolerance for plumbness and elevation. The Contractor

shall be responsible for all corrections, and all corrections shall be made in a manner acceptable to the Engineer.

- C. Observe all federal, state, and local laws and area trade rules in the erection and handling of structural steel. Erector is responsible for meeting OSHA rules. Notify Engineer immediately if modifications to design are required to meet OSHA rules. Contractor is responsible for the cost of such modifications.
- D. Make field connections using high strength bolts, bearing type, except where welded connections or where pre-tensioned and slip critical type bolts are indicated on the Structural Drawings.
 - 1. Where slip critical bolts are indicated on the Structural Drawings, the faying surfaces shall be left unpainted, unless a Class A or B primer is used.
- E. Field welds shall be accomplished by welders certified for the weld types and positions involved according to AWS D1.1. Use only shielded arc electrodes; E70xx, structural type.
 - 1. Store low hydrogen electrodes in strict accordance with the provisions of AWS D1.1.
- F. Welding procedure for galvanized steel
 - 1. Remove galvanizing from area to be welded.
 - 2. Protect units from damage by use of non-combustible shields as required.
 - 3. Weld.
 - 4. Remove weld slag.
 - 5. Touch-up area with galvanized compound such as ZRC.
- G. Post Installed Anchor Installation
 - 1. Install all anchors in accordance with the manufacturer's requirements including:
 - a. Diameter of hole and method of drilling hole
 - b. Condition of hole including moisture, dust, and side roughness
 - c. Temperature during installation
 - 2. Manufacturer's representative shall meet with Contractor's anchor installer prior to installation to review procedures for anchor installation.
 - 3. When installing expansion anchors or adhesive anchors, locate the reinforcement within the concrete or CMU to avoid damaging the reinforcement during the anchor installation process. Locate post-installed anchors as shown on the Drawings. Any changes of anchor location shall be approved by the Engineer.
- H. Report all misfits to the Engineer for resolution. Burning of new or unfair holes or cutting with a torch will not be permitted without the approval of the Engineer. Reamers, twist drills, and saws shall be employed where burning is prohibited. Finish any field drilled or cut surfaces equal to a sheared surface and in accordance with AISC 360 Section M2.2.

- I. Any member that has assumed a bend or buckle in its final position due to forced fit shall have one or both ends, and any intermediate connections, unbolted and re-drilled or reamed to relieve such bowing to the satisfaction of the Engineer.
- J. No piece that has been bent, broken, twisted, or otherwise damaged shall be incorporated into the Work. Repair or correct such pieces on the ground to the satisfaction of the Engineer or replaced with a new piece. Failure to observe this will be cause for rejection of the piece in place.
- K. Remove primer or any coating from the area to be welded prior to field welding.
- L. Field touch up by Contractor
 - 1. Field bolts, field welds, and abrasions to the shop coat shall be repaired and recoated by the structural steel erector using the same coating and care as for the shop coat.
 - 2. Wash all such surfaces with a suitable degreasing solvent.
 - 3. Remove all accumulations of mud, clay, rust, scale, grease, etc. that have been acquired during shipment, storage, and erection and restore the shop coat to its original condition.

3.03 Grouting

- A. Erector shall take care to ensure that load transmitted through anchor rods, shims, nuts, and washers in temporary condition prior to grouting does not exceed their strength.
- B. Concrete surfaces and baseplates shall be clean and free from rust, grease, oil, and other debris.
- C. Place a watertight form around the area to be grouted. Design formwork to ensure free flow of the grout under the baseplate and to prevent the creation of air pockets. The height of the formwork should be sufficient to allow for complete gravity fill under the plate.
- D. Saturate the area to be grouted with water until uniformly damp. Remove excess water just before placing the grout.
- E. To avoid air pockets and ensure complete filling of the cavity between the baseplate and concrete, place the grout from one side only. Placement shall be completed without interruption.
- F. Dry packing or damp packing is not allowed.
- G. See manufacturer's printed instructions for additional information regarding preparation, mixing, placing, and curing of the grout.

3.04 Cleaning Up

- A. Upon completion of erection, promptly remove all tools, equipment, and rubbish caused by or resulting from the erection Work.
- B. Coordinate the need for any temporary bracing to remain in place after the steel frame is complete but before the structural lateral system is complete with the General Contractor.

3.05 Testing and Inspection

- A. Conduct testing and write reports as outlined in this Article under provisions of Section 01400.
- B. Prior to testing bolts and welds in the field, visually inspect all field assembled connections. The inspector shall:
 1. Be provided, and become familiar with, the Engineer-reviewed shop drawings and Engineer-reviewed field changes made to connections prior to inspection.
 2. Verify that bolts, field welds, field added plates and stiffeners agree with the Engineer-reviewed field connection detail on the shop drawings.
 3. Verify weld lengths, that faying bolt surfaces have been brought into contact, and connected member alignment is true.
- C. Test shop and field welds as indicated below (Shop welds may be tested by fabricator's internal QA process if AISC Certified):
 1. All complete penetration welds: 100% of the total weld length using ultrasonic testing apparatus.
 2. All partial penetration welds: 50% of the total weld length using the magnetic particle method.
 3. All welds shall be visually inspected in accordance with AWS D1.1 table 6.1.
- D. Inspect and test bolted connections.
 1. For connections where slip critical bolts are indicated on the Structural Drawings, testing and inspection methods shall conform to the "Specification for Structural Joints Using High-Strength Bolts" for slip critical bolts.
 2. The testing shall include the inspector observing the "pre-installation testing" of each combination of grade, diameter, length, and production lot of bolts and nuts to be used on the project.
 - a. The "pre-installation testing" shall include bolt crews installing three sample bolts of each combination, in a device that directly reads tension in the bolt. (e.g., Skidmore - Wilhelm Machine)
 - b. Bolt crews shall demonstrate to the inspector the ability to install bolts to the tensions given in table 8.1 of "Specification for Structural Joints Using High-Strength Bolts".
 - c. The inspector shall observe bolt installation practices in the field to verify procedures used during the "pre-installation testing" are being properly applied.

- E. Resolve any disputes that arise concerning the tension in the bolts with methods set forth in section 10 of "Specification for Structural Joints Using High-Strength Bolts": Arbitration.
 - 1. For all other connections, visual inspection to ensure that the plies of the connected elements have been brought into snug contact is required.
- F. Inspect field cut shapes and/or holes surfaces for compliance with Paragraph M2.2 of AISC 360 and AWS D1.1 commentary C4 1-72 sample 2.
- G. Verify number and spacing of headed anchor studs agree with the construction documents. Visually inspect all headed anchor stud welds.
- H. Inspect shop coating for conformance to specifications.
- I. Test reports shall be prepared by the testing agency and include the following:
 - 1. The type and location of test conducted
 - 2. The test results
 - 3. Interpretation of the test results stating whether they comply with the Specification requirements
 - 4. Procedure taken if the test results are not acceptable
 - 5. Test results of re-tests after corrective measures have been completed. The cost of all re-testing shall be borne by the Contractor.
- J. Testing and Inspection program shall not be considered a substitute for Contractor's internal Quality Assurance Program and does not relieve the Contractor of their responsibility to perform the Work in accordance with the Contract Documents.

-END-

SECTION 05520 - MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Miscellaneous metal and appurtenances necessary to complete Work shown or specified including, but not limited to:
 - a. Ladders
 - b. Handrails
 - c. Grating
 - d. Anchor Bolts and Fasteners
 - e. Miscellaneous Supports

B. Related Sections

1. Section 03300 – Cast-in-Place Concrete
2. Section 05120 – Structural Steel
3. Section 09900 – Protective Coatings

1.02 References

A. Codes, specifications, and standards referred to by number or title shall form a part of this Specification to the extent required by the references thereto. Latest revisions shall apply in all cases.

B. ASTM specifications apply in their entirety where specifically referenced in the body of this section.

1. ASTM A36 - Standard Specification for Carbon Structural Steel
2. ASTM A47 - Standard Specification for Ferritic Malleable Iron Casings
3. ASTM A48 - Standard Specification for Gray Iron Castings
4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products
5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes
7. ASTM A283 – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
8. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
9. ASTM A325 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength
10. ASTM A385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)

11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
12. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
13. ASTM A992 - Standard Specification for Structural Steel Shapes
14. ASTM F3125 -Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength
15. ASTM F2329 -Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

C. Comply with provisions of the following, except as otherwise indicated.

1. AISC "Code of Standard Practice for Steel Buildings and Bridges." Paragraph 4.2.1 of this code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including "Commentary" and Supplements thereto as issued.
3. AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts," approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
4. ANSI 14.3 Fixed Ladders
5. American Welding Society (AWS) D1.1 "Structural Welding Code – Steel".
6. Aluminum Association Specification (AA)

1.03 Submittals

A. Provide all submittals, including the following, as specified in Section 01300.

1. Certified copies of factory test reports required by the applicable standards.
2. Shop drawings with performance data and physical characteristics for miscellaneous metals fabrication.
 - a. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 - b. Provide setting drawings, templates, and directions for the installation of anchor bolts and other anchorages to be installed by others.
 - c. Shop drawings and literature on all ladders, safety devices, grating, handrails, anchor bolts, fastenings, and miscellaneous supports.
 - d. Manufacturer's loading tests for handrails
3. Welding certification as specified in this Section.

1.04 Quality Assurance

- A. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
 - 1. Provide certification that welders to be employed in Work have satisfactorily passed AWS qualification tests. If recertification of welders is required, retesting will be Contractor's responsibility.
- B. Finish metalwork straight, smooth, even, free from defects and to the sizes specified and required for proper fitting of the Work.
- C. Provide all angles, brackets, metal inserts, anchor bolts, frames, adjusting screws, bolt gaskets and other items necessary to properly secure metal Work to concrete, masonry, structural steel framing, or other parts of the structure. Rivets are not allowed.
- D. Welding for steel, anodized aluminum, and stainless steel, shall be neat, symmetrical, clean, and unobtrusive in appearance.
- E. Construct all Work in accordance with the Indiana Building Code.

1.05 Delivery, Storage, and Handling

- A. Prominently mark all metal fabrications for identification in assembly either by painting or attach tag.
- B. Handle and store metals in such manner as to prevent damage, corrosion, or deterioration of paint finishes.
- C. Pack and ship all aluminum pipe and elbows in individual plastic film to protect the anodized finish.

PART 2 - PRODUCTS

2.01 Materials

- A. Structural Steel: Structural steel shall meet ASTM A992, Grade 50, except angles and plates shall conform to the requirements of ASTM A572, Grade 50.
 - 1. Steel HSS shall conform to the requirements of ASTM A500, Grade C.
- B. Miscellaneous Steel:
 - 1. Steel grating bearing bars, cross bars, and bent connecting bars shall be of welding quality steel conforming to ASTM A1011.
 - 2. Tie rods shall conform to the requirements of ASTM A36.
 - 3. All bolts for connection of steel members shall conform to requirements of ASTM A325, unless otherwise indicated.

- C. Aluminum structural shapes and plates shall conform to requirements of ASTM 6061-T6 alloy.
 - 1. Filler alloy for welding shall be 4043 alloy.
 - 2. Extrusions and drawn tubing shall be 6063-T5, unless otherwise indicated.
 - 3. Handrails and associated posts and fitting-assembly spacers shall be fabricated from 6063-T6 extruded aluminum pipe of 1.90 inches O.D. and 0.145-inch wall thickness. All other aluminum handrail parts shall be of 6063 or 6061 extruded aluminum or 214-F or F514.0 aluminum castings.
 - a. All handrail components shall be a one-piece solid extrusion.
 - b. Unexposed parts shall be No. 300 stainless steel.
 - c. Plug screws or blind rivets shall be No. 305 stainless steel.
 - d. Kick plates shall be fabricated from 6063 extruded aluminum.

- D. Stainless steel shapes, plates, and anchor bolts shall conform to requirements of ASTM A276.
 - 1. Exterior and Submerged Use – A276, Type 316.
 - 2. Industrial Uses – A276, Type 316.
 - 3. Interior and Architectural Use – A276, Type 302/304 or Type 316.
 - 4. Anchor Bolts – A276, Type 316.

- E. Zinc Coatings (Galvanizing) on fabricated or assembled steel products shall conform to the requirements of ASTM A123.
 - 1. Zinc coatings on iron and steel hardware shall conform to the requirements of ASTM A153, except that bolts, screws, and other fasteners 1/4 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM B633, Type RS, or ASTM B766, Type TS, unless otherwise specified.
 - 2. Galvanized bolts to be used only where specifically indicated shall conform to the requirements of ASTM A307, A153, Class A or B.

- F. Rung Ladders: Rungs for individual rung ladders shall be of aluminum or other approved non-corrosive material and located as shown on the Drawings. Provide slip-resistant surface on top surface of rungs.

2.02 Design

- A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.
 - 1. Structural steel design shall be in conformance with the American Institute of Steel Construction (AISC).
 - 2. Structural aluminum design shall be in accordance with the Aluminum Association "Specifications for Aluminum Structures."

3. Welding shall be in accordance with AWS D1.1.
- B. Provide for anchorage of type indicated, coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable irons or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- C. All handrailing systems as shown on the Drawings shall be aluminum, unless specifically indicated otherwise.
1. Spacing of vertical posts for aluminum handrails shall not exceed 4 feet 6 inches center-to-center.
 2. Horizontal deflection of the top of vertical posts shall not exceed 2 inches with a 200-pound force applied in any direction at the top of the post.
 3. Deflection in any direction of top rails shall not exceed one (1) inch relative to the vertical posts with a 200-pound force applied in any direction at any point on the handrail system.
 4. Anchors shall be capable of withstanding the forces created by a 200-pound force applied in any direction at any point on the handrail system.
 5. Where the Drawings call for removable handrail, provisions shall be made such that the railing will meet all aforementioned criteria but that it can be removed with hand tools.
- D. Treads of Stairs: Capable of withstanding a uniform load of 100 lbf. per square foot or a concentrated load of 300 lbf. on an area of 4 square inches located in the center of the tread, whichever produces the greater stress.
- E. Platforms of Stairs: Capable of withstanding a uniform load of 100 lbs. per square foot.
- F. Ladder rungs shall be designed to withstand a concentrated live load of 250 pounds with a maximum deflection of 1/8 inch.
- G. Grating: Design of aluminum grating shall be in accordance with the NAAMM Specifications.
1. Gratings shall be designed to support a uniform load of not less than 100 pounds per square foot with a maximum deflection of ¼ inch. See requirements identified within the Structural General Notes, Sheet 1S1.
- H. Expansion bolts, where shown on the Drawings, shall be of the size shown and of a sufficient length to develop the full capacity of the bolt within the safe allowable limits of the bolt and the material into which the bolt is to be anchored.
1. Expansion bolts shall not be substituted for specified anchor bolts without the approval of the Engineer.

2.03 Fabrication

- A. Structural steel shall be fabricated in accordance with the AISC Code.
- B. Structural aluminum shall be fabricated in accordance with the Aluminum Association Specification.
- C. All welding shall be in accordance with AWS D1.1.
- D. Galvanizing shall be applied in conformance with ASTM A385.
 - 1. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.
- E. Handrail
 - 1. General: Railings shall be fabricated in as long sections as practicable, and joints between sections shall be made as inconspicuous as possible.
 - a. Posts shall be a single, unspliced pipe length. Lower rails shall be a single, unspliced length between posts.
 - b. Top rails shall be continuous whenever possible, and a single, unspliced length shall be attached to a minimum of three posts, except where total railing length does not require three posts.
 - c. Distance from upper surface on top rail to top of mounting surface shall be 42 inches.
 - d. Stair railings shall have a distance of 34 inches from the upper surface of the top rail to the top of the step measured in line with the face of the riser at the forward edge of the tread.
 - e. Vertical posts shall be anchored by either top mounted flanges or side mounted brackets, except all exterior handrail which shall be side mounted, unless noted on Drawings. Minimum flange or bracket thickness shall be 1/4 inch.
 - f. Kick plates shall be required on all walkways of tanks, channels, platforms, and areas covered by Federal, State, Local OSHA Requirements and where indicated on the Drawings and of the same material as the handrail. Plates shall be suitably attached to the vertical posts and shall be 1/4-inch x 3-3/4-inch plate. The plate shall be continuous the full length of the handrail. The plate shall be mounted on the walking side of the handrail and shall be mounted to have a 1/4-inch gap between the bottom of the plate and the top of the mounting surface.
 - g. Chain for use with railings shall be 1/4-inch welded stainless steel chain having 12 links per foot and with shoulder stainless eyebolt and brass swivel-eye snap hook.
 - 2. Aluminum Handrail: All pipe cuts shall be square and accurate for minimum joint gap. Cuts shall be clean and straight, free of burrs and nicks. All holes shall be drilled and counter-sunk for the proper size, as required for a tight, flush fit of hook bolts, fitting-assembly screws, and all other component parts.
 - a. All fastenings and fasteners shall be as recommended or furnished by manufacturer and drawn up tight with a hand wrench or screw driver so that

completed railing is rigid and completely free of play at all joints and attachments. All hook bolts shall be tightened to torque per manufacturer's instructions.

- b. Shop welded joints shall be acceptable, in lieu of the mechanical fastening system specified. All welds shall be ground smooth before the finish is applied to the railing. No field welding will be acceptable.
- c. All aluminum railing components shall have an AA M32-C22-A41 finish on all exposed surfaces.

F. Framed Stairs

1. General: Construct stairs to conform to sizes and arrangements indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
 - a. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements are indicated.
 - b. Commercial class, unless otherwise indicated.
2. Stair Framing: Fabricate stringers of structural channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural channel headers and miscellaneous framing members as indicated. Bolt or weld headers to strings, newels, and framing members to strings and headers; fabricate and join.
3. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this Section.

G. Ladders

1. General: Fabricate aluminum ladders for the locations shown, with dimensions, spacing, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
2. Siderails: Continuous flat bars, 1/2-inch x 2-1/2 inches, with eased edges, spaced 18 inches apart.
3. Bar Rungs: Round bars, 3/4-inch diameter, spaced 12 inches o.c.
4. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
5. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. by means of welded or bolted brackets.
 - a. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - b. Extend side rails 42 inches above top rung and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
6. Provide slip-resistant surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

7. Provide Ladder Safety Posts
 - a. LadderUp Safety Post manufactured by The Bilco Company.
- H. Gratings shall be fabricated of the material and to the span shown on Drawings. Gratings shall be made in sections not exceeding 10 feet in length.
 1. All sides and all openings cut in the grating sections shall be banded.
 2. Minimum thickness of any grating shall be one and one-quarter (1 1/4) inch.
- I. Rough Hardware: Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
- J. Metal Pipe Bollards: Provide bollard type as shown on Drawings.
- K. Pipe Bollard Covers
 1. Fabricate from high density polyethylene with solid color throughout and ultra violet light stabilizers.
 - a. Provide domed top design.
 2. Size bollard cover to fit pipe size indicated in Drawings.
 - a. Provide cover that allows attachment and removal of cover.
 3. Color: Safety yellow unless otherwise indicated.
 4. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Omega Industrial Products: "HDPE Bollard Covers." 800-521-8272
 - b. TAPCO: "Reflective Bollard Guard." 800-236-0112
 - c. Sureguard Security Products: "Sureguard Shield." 800-756-3537
- L. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 2. Material: Galvanized steel complying with ASTM A653, structural steel, Grade 33(Grade 230), with G90(Z275) coating; 0.108-inch nominal thickness.

PART 3 - EXECUTION

3.01 Installation

- A. Erect miscellaneous structural steel items in accordance with the AISC Code.
- B. Erect structural aluminum items in accordance with the Aluminum Association Specifications.
- C. All field-welding shall be in accordance with AWS D1.1.
- D. Pipe railing shall be set plumb, straight, and true.

- E. Where dissimilar metals are in contact, or when aluminum is in contact with concrete, mortar, masonry, or pressure treated wood, protect dissimilar surfaces.
- F. Field assembly shall meet the following requirements:
 - 1. Frames shall be accurately assembled to the lines and elevations indicated.
 - 2. The various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.

3.02 Construction Protection

- A. The Contractor shall use all precautions necessary to protect finishes from scratches, nicks, gouges, dents, etc., during assembly and installation. Damaged material shall be replaced at no additional cost to the Owner.

3.03 Field Painting

- A. Touch up galvanized surfaces with galvanized repair paint.
- B. All Structural steel and miscellaneous metals are to be hot-dipped galvanized in accordance with ASTM A123.

-END-

DIVISION 8 – DOORS AND WINDOWS

SECTION 08310 – ALUMINUM FLOOR ACCESS HATCHES

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Providing aluminum floor access hatches, safety grating, safety posts, and other appurtenances necessary to complete the Work as shown on the Drawings and specified herein.
- B. Related Sections
 - 1. Section 03300 – Cast-In-Place Concrete

1.02 References

- A. Codes and standards referred to in this Section are:
 - 1. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 2. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
 - 3. ASTM B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
 - 4. ASTM B632 - Standard Specification for Aluminum-Alloy Rolled Tread Plate

1.03 Submittals

- A. Provide all submittals, including the following, as specified in Section 01300.
 - 1. Catalog cuts for each model of access hatch being supplied
 - 2. Dimensioned drawings of each access hatch
 - 3. Installation instructions for access hatches and appurtenances
 - 4. Samples: Upon request, manufacturer to provide a sample sized to represent the material adequately.

1.04 Delivery, Storage, and Handling

- A. Store products off the ground and protect from the elements, or store in weatherproof enclosures until installed.

1.05 Warranty

- A. Access hatches shall be guaranteed against defects in material and/or workmanship for a period of 10 years.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 - 1. Drainable Access Hatches
 - a. Bilco Company Type J-AL or JD-AL
 - b. Halliday Products Type W1S or W2S
 - c. Babcock-Davis Type BFDDPA

2.02 Flush-Mounted Access Hatches

- A. Provide flush-mounted access hatches unless otherwise indicated. When closed, doors shall not protrude above the operating surface in which they are installed.
- B. Door: 1/4-inch aluminum diamond tread plate with mill finish
 - 1. Designed for a minimum live load of 300 psf with maximum deflection of 1/150th of the span.
 - 2. 6061-T6 aluminum complying with ASTM B632 or 5086-H34 aluminum complying with ASTM B209
- C. Frame: 1/4-inch extruded aluminum conforming to ASTM B210 and ASTM B308 with a continuous 1-1/2" anchor flange.
- D. Bars, angles and extrusions: manufactured from 6060-T6, 6061-T6, or 6005-T5 aluminum
- E. Fabricate access hatches for use in off street locations where subjected to infrequent, off road traffic to withstand H20 wheel loadings.
- F. Reinforce access hatch doors designed for H-20 wheel loads with extruded aluminum stiffener plates or members. Fit the frames that are to be set in concrete with bend down anchor tabs around the perimeter.
- G. Provide access hatches with doors that operate smoothly and easily over the range of temperatures that they can be expected to be exposed to with controlled operation throughout the entire arc of opening and closing.
- H. Coat surfaces of access hatches that will be in contact with concrete with a bituminous coating.

2.03 Door Hardware

- A. Hinges: Fasten the door to the frames with heavy-duty Type 316 stainless steel hinges using tamperproof Type 316 stainless steel carriage bolts and lock nuts.
- B. Lifting mechanisms: Provide the required number and size of compression spring operators enclosed in telescopic tubes to provide a smooth, easy and controlled door

operation through the entire arc of opening and to act as a check in retarding downward motion of the door when closing.

- C. Hold-open Arms: Equip each hatch door with an aluminum or Type 316 stainless steel positive hold-open arm that automatically locks the door open in the 90 degree position. Each hold open arm shall have a red vinyl grip handle. Hold open arm shall be fastened to frame with 1/2-inch 316 stainless steel bolt.
- D. Latches and Handles: Fit each access door with a Type 316 stainless steel slam latch with inside lever handle and outside removable key wrench or turn and lift handle. If the key wrench is not of the turn and lift type provide a flush lifting handle on the outside of the door. Protect the latch release with a flush, gasketed, removable screw plug.
- E. A snap lock with removable handle shall be provided on each door.
- F. Provide two key wrenches or turn and lift handles with each door.
- G. Each door shall have exposed padlock clip and an aluminum lift handle which is flush with top of diamond plate. Slam locks are not required.
- H. Provide one (1) Masterlock padlock with two (2) keys for each access hatch. All padlocks shall be of the same series such that keys are interchangeable.

PART 3 - EXECUTION

3.01 Installation

- A. Install access hatches and accessories in accordance with manufacturer's instructions and as specified in this Section.
- B. Cast flush-mounted access hatches into concrete slabs.
- C. Uniformly support access hatches. Install doors to operate smoothly without binding.
- D. Install flush-mounted access hatches such that when closed the frame and door will not protrude above the surface in which they are installed, unless otherwise indicated.
- E. Field locate and drill the mounting holes on surface-mounted access hatches. Use Type 316 stainless steel mounting hardware. Where surface-mounted access hatches are installed on exterior surfaces exposed to the elements, secure the frames up off of the surface at least one inch and fill the space below the frame with non-shrink grout.
- F. Install 1-inch PVC piping on drainable access hatches plumbed from the drain coupling on the frame to the surface, the outside face of the structure on the side where the discharges will drain away from the structure, or to the nearest floor or area drain, wet well, or other structure as shown on the Drawings.

3.02 Adjusting

- A. Operate doors and appurtenances after installation and adjust movable parts to operate easily, free from warp, twist, and distortion.

3.03 Cleaning

- A. Clean joints and hardware. Clean exposed surfaces in accordance with the manufacturer's written instructions. Touch up damaged metal coatings.

-END-

DIVISION 9 - FINISHES

SECTION 09900 – PROTECTIVE COATINGS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Surface preparation, coating systems, and coating procedures for metal, plastic, and concrete surfaces.

1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus
2. ASTM D1653 – Standard Test Methods for Water Vapor Transmission of Organic Coating Films
3. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
4. ASTM D4259 – Standard Practice for Abrading Concrete
5. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
6. ASTM D4585 – Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation

B. The Society for Protective Coatings (SSPC), latest editions

1. Complete all Work in accordance with the following requirements.
 - a. Steel Structures Painting Manual, Volume 1, Good Painting Practice, including Appendices
 - b. SSPC Painting Manual, Volume 2, Systems and Specifications, including Commentaries and Guides
 - c. SSPC-AB 1 - Mineral and Slag Abrasives
 - d. SSPC-AB 2 - Specifications for Cleanliness of Recycled Ferrous Metallic Abrasives
 - e. SSPC-AB 3 - Newly Manufactured or Re-Manufactured Steel Abrasives
 - f. SSPC-VIS 1 - Visual Standard for Abrasive Blast Cleaned Steel
 - g. SSPC-VIS 3 - Visual Standard for Power- and Hand-Tool Cleaned Steel
 - h. SSPC-VIS 5 - Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Cleaning
 - i. SSPC-Guide 6 -(CON) Guide for Containing Debris Generated During Paint Removal Operations
 - j. SSPC-PA 2 - Measurement of Dry Paint Thickness with Magnetic Gages
 - k. SSPC-PA Guide 3 - A Guide to Safety in Paint Application

- l. SSPC-SP 1 - Solvent Cleaning
- m. SSPC-SP 2 - Hand Tool Cleaning
- n. SSPC-SP 3 – Power Tool Cleaning
- o. SSPC-SP 6 - Commercial Blast Cleaning
- p. SSPC-SP 10 - Near-White Blast Cleaning
- q. SSPC-SP 11 - Near-White Power Tool Cleaning
- r. SSPC-SP 13 - Surface Preparation of Concrete
- s. SSPC-SP 15 - Commercial Grade Power Tool Cleaning

C. Other References

- 1. AWWA D102 - Standard for Coating Steel Water Storage Tanks
- 2. ANSI/NSF Standard 61 “Drinking Water System Components-Health Effects”
- 3. International Concrete Repair Institute (ICRI) CSP-Concrete Surface Profiles
- 4. NFPA Bulletin No. 101 – Life Safety Code

1.03 Definitions

A. Abbreviations

- 1. TCC – The Carboline Company
- 2. SW – The Sherwin Williams Paint Company
- 3. DFT – Dry film thickness
- 4. DMT – Dry mil thickness

B. Coating: The term coating includes emulsions, enamels, paints, stains, varnishes, sealers, emulsion filler, and other coating materials whether used as prime, intermediate, or finish coats.

C. Spatter: Drops and droplets of coating and spilled or splashed coatings on surfaces not specified to be coated or surfaces previously finish coated.

1.04 Submittals

A. Provide all submittals, including the following, as specified in Section 01300.

- 1. Technical product data sheets for all products used
- 2. Material Safety Data Sheets (MSDS)
- 3. Color charts and samples
- 4. Samples of slip-resistant adhesive tape, if used
- 5. List of surfaces indicating coating system and colors
- 6. Manufacturer’s application instructions
- 7. Abrasive: manufacturer’s published product data sheets for type of abrasive, grade, and the resulting profile of the abrasive
- 8. Verification letter from coating manufacturer that the resulting profile from the abrasive is acceptable for their coating product

B. Product Data

1. Equivalent materials of manufacturers other than those listed herein may be substituted on written approval of the Engineer.
2. Requests for substitution shall include coatings manufacturer's literature for each product giving the name, generic type, descriptive literature, directions for use and non-volatile content by volume. No request for substitution will be considered which decreases the film thickness designated, or which offers a change from the generic type of coating specified.
3. Include the following performance data as certified by a qualified testing laboratory:
 - a. ASTM D4541 Adhesion
 - b. ASTM B117 Salt Spray
 - c. ASTM D1653 Permeability
 - d. ASTM D4060 Abrasion
 - e. ASTM D4585 Humidity
 - f. Galvanic Protection Conductivity

1.05 Quality Assurance

A. Qualifications

1. Complete all coating and surface preparation using a qualified painting contractor with a minimum of five (5) years' experience in applying protective coatings to industrial and municipal water and wastewater treatment facilities specific to the product and manufacturer's application procedures.

B. Regulatory Requirements

1. Perform all coating Work in strict accordance with the coating manufacturer's most recent published product data and instructions. Any deviations must be changed in writing by the manufacturer and approved by the Engineer.
2. Provide materials that are the product of or related material for the product authorized by the coating manufacturer.
3. Provide suitable materials for the service intended. Use no products that may have ingredients which might react detrimentally with adjacent fluids or gases.
4. Should vents, holes, rigging attachments, or any other modification, cutting, or welding be required to meet safety standards or otherwise accomplish the Work, they may be accomplished at the expense of the Contractor upon submitting of details in writing to, and with subsequent permission by the Owner or Engineer. The Contractor assumes all responsibility for use of any existing or added attachments. Remove any such attachments at the completion of the Work and repair any damage caused by the removal.
5. Comply with safe working practices for abrasive blasting, cleaning, burning, welding, and handling and disposal of lead-based and nonlead-based coatings, and all health and safety regulations and requirements of OSHA, state and local health regulatory agencies, MSDS, SSPC-PA Guide 3, and the paint and abrasive manufacturers. Compliance shall be without supervision from the Owner, Engineer, Resident Project Representative or

other direct or indirect agents of the Owner. Contractor shall be responsible for enforcing compliance with OSHA, USEPA and other regulations with his employees.

6. Comply with local, state and federal regulations concerning emissions, transportation or disposal of solid, particulate, liquid, or gaseous matter as a result of the cleaning, painting or other operations for the Work. Compliance shall be without supervision from the Owner, Engineer, Resident Project Representative or other direct or indirect agents of the Owner.
7. All shielding, abrasive retrieval, or other methods of using precautions required by the regulating agencies shall be accomplished at no additional cost to the Owner.
8. Any fines or damages imposed on the Owner, Engineer, or Resident Project Representative by any regulatory agency or court as a result of the Contractor's noncompliance with environmental or nuisance regulations or any other applicable standard shall be paid or reimbursed by the Contractor.
9. The Contractor shall indemnify the Owner, Engineer, and their representatives from any and all losses, costs and expenses, including fines, judgments, and attorney's fees incurred by the Owner, Engineer, and their representatives by reason of negligence on the part of the Contractor in exposing his employees, Owner personnel, Engineer personnel, their representatives, visitors, or other persons, and/or in the proper or accepted procedures dealing with lead abatement/removal and/or violation of such laws, ordinances, regulations and directives (federal, state and local) which are currently in effect, by the Contractor, his Subcontractors, or materialmen.

1.06 Delivery, Storage, and Handling

- A. Coatings and thinners shall be delivered from the coating manufacturer to the project site in the original factory sealed containers which are clearly and properly labeled by the coating manufacturer showing the manufacturer's name, product number, type of coating, batch number and expiration date.
- B. Store, handle and use all coating materials on the project site consistent with the manufacturer's published product data and MSDS. Provide adequate storage facilities.
- C. Store products within minimum and maximum ambient temperatures in accordance with the manufacturer's instructions.
- D. Take all safety precautions in accordance with NFPA Bulletin No. 101.
- E. Promptly remove damaged or deteriorated products from the project site, including products which have exceeded their shelf life. Replace damaged products with undamaged and undeteriorated products.
- F. Store abrasives on skids or in a covered container. Protect abrasives from water and weather. Do not allow abrasive to rest directly in contact with the ground.

1.07 Project/Site Conditions

A. Environmental Requirements

1. Perform coating Work in strict conformance with coatings manufacturer's printed instructions as to environmental conditions under which coating and coating systems can be applied.
2. Do not apply finish in areas where dust is being generated.
3. During the coating Work, adequately ventilate the coated spaces to ensure there will be no concentration of noxious odors, hazardous fumes, or flammable vapors.
4. Provide heating and enclosures when necessary to maintain specified temperature during application and curing of coatings.
5. Provide forced air circulation in enclosed areas during the application and curing period.
6. Bear all costs associated with providing and maintaining the required environmental conditions.

B. Protection

1. Protect all finish Work of other trades and surfaces not being coated. Furnish suitable coverings as required. Remove coating spatter from all finished surfaces and restore finishes of affected items to their original conditions at no additional cost to the Owner.
2. Post "Wet Paint" notices, as required, to protect newly coated surfaces.
3. Keep oily rags and waste in Underwriters' Laboratories labeled metal containers. Do not allow oily rags and waste to accumulate in buildings.
4. Cover or otherwise protect all finished Work or other trades and surfaces not being painted.
5. Place impervious drip pans or double layers of plastic sheeting (each at least 6 mils thick) under any compressor, generator, paint pumps, mixers, welding machines, etc. to prevent oils, solvents, organic compounds, or other contaminants from leaching into the soil or onto the floor.
6. Place fuel storage tanks, thinners, and other potentially hazardous materials inside secondary containment structures to contain spills. Immediately remove and clean up any oils, solvents, organic compounds, or contaminants spilled during the process of the Work.
7. Refer to and comply with Section 02102 regarding further material handling and spill prevention measures.

C. Project Site Conference

1. Arrange and conduct a project site conference between the coating manufacturer's representative, the Owner's representative, and the personnel assigned this Work prior to any field surface preparation or coating application.

1.08 Warranty

- A. Provide a 1-year warranty on the Work in this Section. Perform a First Anniversary Inspection per Section 5.2 of AWWA D102-11. Perform the following duties at the First Anniversary Inspection:
 - 1. Furnish an experienced foreman, laborer, and any rigging for the inspection.
 - 2. Be prepared to perform minor touch-up Work.
 - 3. Make spot repairs before returning components to service. Repairs requiring extensive Work may be delayed until a time mutually agreeable to the Owner and Contractor.
 - 4. Include all costs associated with the First Anniversary Inspection, including coating touch-up in the Bid price.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. Except as otherwise specified, materials shall be the products of the following manufacturers or approved equal:
 - 1. The Carboline Company, Inc. (TCC)
 - 2. The Sherwin Williams Company (SW)

2.02 Materials

- A. General
 - 1. Minimum requirements for materials are included in this Section. These requirements are intended to establish standards of quality. Products of manufacturers which meet all minimum requirements as herein established are acceptable. Obtain written acceptance of the materials to be used prior to surface preparation or application.
 - 2. Provide new coatings and thinners. Only use thinners and solvents approved by the coating manufacturer.
 - 3. Provide materials selected for coating systems for each type surface that are the product of a single manufacturer, unless otherwise acceptable to the Owner.
 - 4. Provide shop applied primers and undercoats that ensure compatibility of total coating systems and are of the same manufacturer as the finish coats for each system as specified hereafter. Provide barrier coats over incompatible primers or remove and reprime as required.
 - 5. Assign all materials listed herein a designation number for ease of reference.

2.03 Abrasive

- A. Commercially available, non-metallic, expendable abrasive
 - 1. Furnished new abrasive.

2. Meet the minimum requirements of SSPC-AB 1
3. Silica content: Class A of SSPC-AB 1 – crystalline silica less than 1% by weight before blasting
4. Grit size: to produce a 1.5 – 2.5 mil profile
 - a. If the specified profile is exceeded, increase the coating dry mil thickness by the difference between the actual profile and the specified profile to prevent the peaks in the profile from rusting.
 - b. Do not exceed the maximum coating thickness per the coating manufacturer's recommendations.
5. Free from contaminants, including but not limited to excessive fine particles, paint, earth, regulated heavy metals, moisture, oil, or chlorides, which can cause premature failure of the coating.

2.04 Coating Systems

- A. New Non-Submerged Interior Metals, Machinery and Piping (unless otherwise specified in this Part 2.04)
 1. Prime Coat (Shop Coated or Field Coated): Organic Zinc-Rich Primer, 1 coat, 3.0-4.0 mils DFT
 - a. TCC: Carbozinc 859
 - b. SW: Corothane I GalvaPac, B65 Series
 2. Finish Coat: Epoxy, 2 coats, 4.0-6.0 mils DFT per coat
 - a. TCC: Carboguard 60
 - b. SW: Macropoxy 646, B58 Series
 3. Minimum of 3 coats and a minimum total finished DMT of 11.0
- B. New Non-Submerged Exterior Metals, Machinery and Piping (unless otherwise specified in this Part 2.04)
 1. Prime Coat (Shop Coated or Field Coated): Organic Zinc-Rich Primer, 1 coat, 3.0-4.0 mils DFT
 - a. TCC: Carbozinc 859
 - b. SW: Corothane I GalvaPac, B65 Series
 2. Intermediate Coat: Epoxy, 1 coat, 4.0-6.0 mils DFT
 - a. TCC: Carboguard 60
 - b. SW: Macropoxy 646, B58 Series
 3. Finish Coat: Aliphatic Acrylic Polyurethane, 1 coat, 3.0-5.0 mils DFT
 - a. TCC: Carbothane 134 HG
 - b. SW: Acrolon 218 HS, B65 W650 Series
 4. Minimum of 3 coats and a minimum total finished DMT of 10.0
- C. New Submerged Metals, Machinery and Piping
 1. Submersible Well Pumps: Refer to Section 02670 for surface preparation and coating system to be applied by manufacturer.

D. Submerged Concrete Slabs, Walls and Ceilings – Potable Water

1. Prime Coat: Epoxy, 1 coat, 4.0-6.0 mils DFT, roll or backroll the prime coat
 - a. TCC: Carboguard 61
 - b. SW: Macropoxy, 646 PW, B58 Series
 2. Finish Coat: Epoxy, 2 coats, 4.0-6.0 mils DFT per coat
 - a. TCC: Carboguard 61
 - b. SW: Macropoxy 646 PW, B58 Series
 3. Minimum of 3 coats and a minimum total finished DMT of 12.0
- E. Exterior Concrete Slabs, Stoops, Sidewalks, Ramps, Equipment Pads; Interior Concrete Equipment Pads, Pipe Cradles, Pump Bases and Miscellaneous
1. VOC of Sealing Compounds for both interior and exterior should be less than 400g/L and meet ASTM C309.
 2. Interior: Concrete Sealing Compound
 - a. Impervious, non-bituminous, liquid, compatible with floor finish
 - b. Manufacturers:
 - 1) Sonneborn – "Kure-N-Seal",
 - 2) Toch Bros. – "Sealkure"
 - 3) Grace – "Horn Clear Seal"
 - 4) Approved equal.
 3. Exterior: Concrete Sealing Compound
 - a. White pigmented, wax resin base membrane type
 - b. Manufacturers:
 - 1) Grace – "Horncue 40W"
 - 2) Toch Bros. – "Torkure"
 - 3) Sonneborn – "Hydrocide Curing Compound"
 - 4) Approved equal

F. Notes:

1. Verify the total dry mil thickness is in accordance with the manufacturer's coating system requirements in accordance with the method of application.
2. Coating applications for submerged surfaces apply to water. Verify coating systems and application procedures with manufacturer where acids or other highly corrosive materials will be present.

2.05 Colors

- A. Comply with OSHA requirements concerning color coding and safety marking.
- B. Color code all exposed piping shown on Drawings. Color code equipment associated with piping, unless otherwise shown or specified. Whenever banding is listed for color coding, apply bands 6 inches wide spaced along the pipe at 5-foot intervals.

- C. Color coding shall be generally as follows. Specific colors for each type of service will be selected by the Owner after submittal of color charts:

<u>Application</u>	<u>Color</u>
Dangerous Machine Parts & Energized Equipment	Safety Orange
Traffic Operations and Housekeeping Marking	White
Fire Protection Equipment & Flammable Materials	Safety Red
Water Lines – Raw or Recycle	Olive Green
Water Lines – Finished or Potable	Dark Blue
Water Lines – Unfiltered	Aqua
Wastewater Lines	Light Brown
Sewer (Sanitary or Other)	Dark Gray
Chlorine (Gas or Solution)	Yellow
Chemical Lines not specified elsewhere	As Selected by Owner
Fire Protection Equipment and Flammable Materials	Safety Red
Walls, Ceilings, and Floors	As Selected by Owner
Gas	Red
Vents	Light Gray
Structural Steel Platforms	As Selected by Owner

2.06 Mixing and Tinting

- A. Deliver coatings, except two part epoxies, to the job site premixed.
- B. Job tinting will not be acceptable, except as approved by the Engineer.
- C. Perform all mixing in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pans.

PART 3 - EXECUTION

3.01 Examination

- A. Inspect all surfaces on which paint is to be applied, and notify the Owner of any defects considered detrimental to the application of materials specified.
- B. Provide all scaffolding, staging, and other temporary facilities required for the proper execution of the Work. Place scaffolding so it will not interfere with the Work of others. Should it be necessary for the progress of the Work on the project in general, move, relocate, or arrange scaffolds, ladders, or coverings to permit the Owner or other crafts to proceed with their Work without delay and without extra cost to the Owner.

3.02 Preparation

A. General

- 1. Remove or otherwise protect hardware, hardware accessories, machined surfaces, plates, light fixtures, cover plates, and similar items in place and not to be painted, prior to surface preparation and painting operations.
 - a. Remove items as necessary for the complete painting of the items and adjacent surfaces.
 - b. Following completion of painting of each space, reinstall removed items. Such removal and reinstalling shall be done by workmen skilled in the trades involved.
- 2. Apply coating to walls, ceilings, or floors prior to the installation of equipment or items such as panels or cabinets which will prevent a portion of the walls, ceilings or floors from receiving the specified coating.
- 3. Prepare all surfaces to be coated in a workman-like manner with the objective of obtaining a clean and dry surface. Do not apply any coatings until the prepared surfaces are observed by the Engineer.
- 4. Perform all preparation and cleaning procedures in strict accordance with the coating manufacturer's printed instructions and as specified in this Section for each particular substrate condition.
- 5. Clean surfaces to be coated before applying coating or surface treatments. Remove all dirt, dust scale, oil, grease, salts, mill scale, rust and other foreign substances.
- 6. Remove oil and grease with clean cloths and cleaning solvents in accordance with SSPC-SP 1 prior to mechanical cleaning. Clean surfaces of galvanized metals, fiberglass and PVC with water soluble detergents prior to etching. Cleaning solvents shall be low toxicity and shall have a flash point more than 115°F.
- 7. If any dirty, rusty, scaly, greasy, damp, scuffed surfaces or conditions otherwise detrimental to the formation of a durable paint film are painted over, both remove the paint and repaint the affected area without additional cost to the Owner
- 8. Provide, operate, and maintain adequate dust collection during the project to achieve adequate air flow within the areas being painted. Operate the dust

collection equipment during all abrasive blast cleaning until the area is clean enough for coating application.

9. Isolate and provide dust collection in the buildings to avoid dust exposure to Owner's employees, equipment, etc. in adjacent areas of the building.
10. Coordinate cleaning and painting so dust and other contaminants from the cleaning process do not fall in wet, newly coated surfaces.

B. Metals

1. Remove all surface imperfections that will induce premature coating system failure. Chip or scrape off weld splatter and weld slag. Grind down sharp and rough edges of corners and weld seams to create a smooth transition.
2. Ferrous metals (Shop and Field): Prepare surfaces to achieve a profile ranging from 1.0 to 2.0 mils or as instructed by coating manufacturer.
 - a. New Non-Submerged Interior and Exterior Metals, Machinery and Piping (Non-immersion exposure): Commercial blast cleaning per SSPC-SP 6
 - b. Existing Non-submerged Interior and Exterior Metals, Machinery, and Piping (Non-immersion exposure):
 - 1) Scrub with ADD H2O Hyper Concentrate, Extra Muscle Cleaner or equivalent to remove surface contaminants.
 - 2) Power tool cleaning per SSPC-SP 3.
 - c. New and Existing Submerged Metals, Machinery and Piping (Immersion exposure): Near-white blast cleaning per SSPC-SP 10
 - d. Abraded or corroded spots on shop coated surfaces: Commercial power tool cleaned per SSPC-SP 15 and touch up with primer specified in this Section.
 - e. Store shop coated ferrous surfaces out of contact with the ground in such manner and location as will minimize the formation of water-holding pockets, soiling, contamination, and deterioration of the coating film.
3. Non-ferrous metals and galvanized surfaces (Shop and Field): Solvent clean per SSPC-SP 1 prior to the application of a vinyl-phosphoric wash and/or primer.
4. Apply two coats of titanium pigmented alcohol-soluble resin before applying primer and colored finished coat on any piping scheduled for a coating which is supplied with a bituminous coating.
5. Coat all new exterior and interior metal electrical conduits.
6. Existing metals to remain which are to be recoated:
 - a. Non-submerged existing pipe, pipe supports, metal structural members, and miscellaneous metal items to remain which are to be recoated:
 - 1) Remove all loose and poorly adhered existing coating with hand tool cleaning to provide a surface preparation per SSPC-SP 2 or SSPC-SP 3.
 - b. Submerged existing metal items to remain and to be recoated:
 - 1) Prepare in accordance with SSPC-SP 10 or SSPC-SP 11 to remove existing coating to bare metal.
 - c. Prior to applying new coating, clean existing metals and piping with water-soluble degreasers or solvent per SSPC-SP 1.
7. Verify surface cleanliness in accordance with SSPC-VIS 1.
8. Prime or pretreat cleaned metal immediately after cleaning to prevent new rusting.

9. Touch-up all damaged portions and imperfections in shop-primed and finished items. Use the same paint as used for the shop prime and finish. Prepare the surface prior to touch-up by wire brushing and sanding to remove rust, scale, and loose paint.

C. Concrete

1. Concrete surfaces to be coated
 - a. Allow new concrete surfaces to cure a minimum of 28 days at 75 degrees before coating is applied and longer if necessary. Concrete must be clean and dry before coating is applied. Do not apply coating to concrete where the moisture content exceeds that permitted in the coating manufacturer's written instructions. Perform calcium chloride testing to determine moisture vapor emission escape from concrete floors.
 - b. Perform concrete surface preparation to remove laitance, open bug holes, voids and other foreign material that would interfere with the adhesion of the coating. Abrade concrete on the surface without removing the surface or exposing the underlying aggregate.
 - c. Provide putty and ICRI visual comparator to test surface preparation prior to application of coating.
 - d. Fill in voids, holes, pits, cavities and cracks with filler or surfacer per instructions by coating manufacturer.
 - e. Concrete Submerged (Potable): - check literature from SSPC conference
 - 1) Surface clean per SSPC-SP 13 to achieve a surface profile of ICRI CSP 2 or 3.
 - f. Other concrete surfaces:
 - 1) Abrasive blast clean in accordance with SSPC-SP 13 to achieve a surface profile of ICRI CSP 3 to 5.

3.03 Application

A. General

1. Complete painting in a workman-like manner. Remove and repair all sags, runs, dry spray, pinholes, craters, roller nap and other irregularities.
2. Do not exceed the manufacturer's maximum allowable dry film thickness limit of an individual coat or of the total coating system.
3. Do not add mils in a succeeding coat of a different generic type or formulation to make up for thin preceding coat(s).
4. Adhere to curing times and ventilation requirements of the paint manufacturer.
5. Provide application equipment (including air and airless sprayers, rollers and brushes) of good quality, in good condition and as instructed by the coating manufacturer. Use techniques which will not allow coating droplets, etc. to contaminate existing adjacent equipment and structures.

B. Mixing

1. Ensure the temperature of the coating prior to and during mixing is within the range stated in the manufacturer's published product data.

2. Thoroughly mix each component on-site with a power agitator to ensure no solids or settle material remains on the bottom of the container before combining the components together. Carefully measure each component by volume into a clean container in accordance with the manufacturer's published project data.
3. Thoroughly mix the combined material with a power agitator to achieve a uniform consistency. Adhere to proper induction times for the combined coating material in accordance with the manufacturer's published product data. Do not apply coating until the minimum induction time has been reached.

C. Environment

1. Follow all temperature and humidity requirements of the coating manufacturer's published product data.
2. Do not paint when:
 - a. the relative humidity is greater than 85%, or
 - b. the temperature of the steel is, or is expected to be, less than 5 degrees F above the dew point temperature during the application and until the coating has cured, or
 - c. the ambient or steel temperature is below 35 degrees F, or is expected to drop below 35 degrees F, during the initial cure of the coating.
3. Take and record readings at the beginning and end of each painting session and at no less than 2-hour intervals.
 - a. Provide and retain wet bulb-dry bulb measuring equipment and steel temperature measuring equipment on the project site at all times.

D. Ventilation

1. At a minimum, provide ventilation in accordance with AWWA D102.
2. Provide equipment necessary for forced ventilation to the interior of buildings and tanks for a period of time equal to the coating manufacturers' written recoat time for the coating and for a continuous period of at least 48 hours after the final coat has been applied.
3. Maintain ventilation as required for solvent release and coating cure.
4. If supplementary heating or dehumidification is required to effect curing, provide and operate the equipment necessary to perform the supplementary heating or dehumidification at no additional cost to the Owner.

E. Coating Thickness

1. Apply each coat of material at the rate specified by the manufacturer to achieve the minimum dry mil thickness specified. Verify dry film thickness in accordance with SSPC-PA 2. Furnish a dry mil thickness gauge and conduct field testing and measuring of film thickness in the presence of the Resident Project Representative.
 - a. If material has thickened or must be diluted for application by spray gun, build the coating up to the same film thickness achieved with undiluted material.

- b. One gallon of unthinned material as originally furnished by the manufacturer must not cover a greater square foot area when applied by spray gun than when applied unthinned by brush.
2. Coatings in submersible applications shall be pinhole-free.
3. Correct deficiencies or excesses in film thickness by the application or removal of an additional coat(s) of material.

F. Application to Specified Skid-Resistant Areas

1. Follow same procedures as concrete floors, with one of the following additions:
 - a. Apply third coat containing an adequate amount of silica sand or manufacturer's standard skid-resistant coating on the top surface of all steps and landings or in areas specified to be skid resistant to provide a skid-resistant surface; or
 - b. For stairs only, provide skid resistant adhesive tape on the surface of all steps and the edges of landings in sufficient amount to cover the outer 6-inches of each step or landing.
 - c. Other areas to receive skid-resistant coating such as around pumps and other water-prone areas will be specifically noted on the Coating List if skid-resistant coating is desired.

G. Cure Time

1. Cure time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because coating must be done in confined spaces, longer drying times will be necessary. Do not apply additional coats of material, nor return to service any units until coatings are thoroughly dry.
2. Perform solvent rub tests, pencil hardness tests, or other testing procedures as instructed by the coating manufacturer to determine the coatings have cured prior to filling tanks.

3.04 Protective Coating of Non-Ferrous and Galvanized Metals

- A. Where non-ferrous metals such as aluminum, copper, and galvanized metal come in contact with concrete or dissimilar metals, a protective coating must be applied. In the case of galvanize, obtain instructions from coating manufacturer.
- B. A vinyl gasket may be used in lieu of the protective coating.
- C. Coat bottom of aluminum railing posts and aluminum clip angles with an aluminum impregnated caulking compound (Alumilastic, or equal) prior to erection.
- D. After erection and alignment, seal openings between non-ferrous metal surfaces and the concrete in a watertight manner with the proper caulking compound, relative to and in accordance with the opening width demand.

3.05 Testing

A. Holiday Testing

1. Provide a low voltage wet sponge instrument for checking film continuity.
2. Check all interior coatings, including those above the top capacity level, with a holiday detector in accordance with Section 5 of AWWA D102 and NACE SP0188 in the presence of the Resident Project Representative.
3. Repair any voids by applying more of the coating by brush or roller.
4. Retest repaired areas after the proper curing time.
5. The coating system must pass the holiday test regardless of the mil thickness existing.

3.06 Cleaning

- A. Touch-up coatings and restore finish where damaged or defaced by construction activities.
- B. Remove coating spatter from all finished surfaces and restore affected finishes.
- C. Remove excess materials, scaffolding, staging, drop cloths, equipment, and rubbish from the job site.

3.07 Coating List

- A. The items indicated on the Drawings and as listed in the Coating List are to have the surfaces coated. Colors are to be selected by the Owner after submittal of the color chart. Color schemes are to match existing facilities unless otherwise indicated by the Engineer.
- B. While an effort has been made to include as many items as possible, particularly major items, the coating list is not a guaranteed complete listing of all items requiring coating. Any additional items requiring coating for corrosion protection, aesthetics, or for color coding that are not listed shall be coated based upon the specific application of that item.

COATING LIST

(Do not coat stainless steel or bronze)

- A. All new construction and rehabilitation Work shall be coated unless otherwise noted.
- B. All (new or modified) exposed piping, fittings, valves, and accessories
 - 1. All ferrous piping, valves and electrical conduit
 - 2. All non-ferrous metals and PVC pipe and conduit
- C. All (new or modified) submerged and non-submerged interior and exterior metals and machinery
- D. All concrete floors and equipment pads
- E. All exposed wood shall be painted or stained as solely determined by Owner preference

-END-

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13400 – MEASUREMENT AND CONTROL INSTRUMENTATION

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Requirements for the integration of process and other instruments and equipment into a functioning control system.
2. Descriptions of unit process system functions and operations.
3. Requirements for integrated controls between individual unit process systems.
4. Requirements for planning, implementation, adjustment, testing, start-up, commissioning, and training for the instrumentation and control (I&C) systems required for the Project.

B. Related Sections

1. Section 13420 – Field-Mounted Instruments
2. Section 13431 – Control Panel Design and Construction
3. Section 13441 – Miscellaneous Control Panel Components
4. Section 13450 – Modular Programmable Logic Controllers
5. Section 13455 – SCADA Local Area Network (LAN) Equipment
6. Section 13456 – Uninterruptable Power Supply (UPS)
7. Section 13482 – SCADA and Control Systems - IO List
8. Section 13491 – SCADA System - Configuration Services
9. Section 13492 – SCADA System - Testing and Commissioning
10. Section 13494 – SCADA System – Training
11. Section 16780 – Video Surveillance Systems

1.02 Definitions

A. General Definitions

1. I/O – Inputs/Outputs
2. HMI – Human Machine Interface
3. PLC – Programmable Logic Controller
4. SCADA – Supervisory Control and Data Acquisition System
5. SCADA CSI – SCADA Control System Integrator – Entity that brings together the control sub-systems and ensures that they function together.
6. SCADA CSP – SCADA Control System Programmer – Entity that provides the programming for the following:
 - a. PLC-W2
 - b. RIO-W1
 - c. RIO-W3
7. VFD – Variable Frequency Drive

B. Location Definitions

1. LOCAL - A location at the respective equipment local panel.
2. REMOTE - A location somewhere other than the equipment local panel. This may be a remote-control station, switch, PLC, or the SCADA System.

C. Mode Definitions

1. LOCAL – In LOCAL mode, the equipment shall be controlled locally at the equipment regardless of a REMOTE signal. <<HIM Module>>
2. OFF – In OFF mode, the equipment shall remain OFF regardless of a REMOTE signal
3. REMOTE – In REMOTE mode, the equipment shall be controlled remotely, either by a REMOTE LOR selector switch, PLC, or by SCADA.
4. PC MANUAL – In PC MANUAL mode, the equipment shall be controlled by the Operator at a SCADA device, using a start/stop command, and controlling the speed for associated devices in Hz.
5. PC AUTO – In PC AUTO mode, control of the equipment utilizes lead/lag well selection with speed commands and max speed (in Hz) set by a SCADA device.

1.03 System Description

A. AECOM will serve as the SCADA Control System Programmer (SCADA CSP) and provide these services at the Owner's request.

B. AECOM contact information:

1. Aaron Rognon
AECOM
Aaron.rognon@aecom.com
(614) 325-4174

C. All work and materials specified herein with the exception of the programming shall be furnished by a single Systems Integrator (SI). The SI shall be one of the following, as directed by the Owner:

1. Dublin Technical Systems, Inc.
 - a. Shadi Motasem, (614) 766-1166 EXT. 117
2. Dmytryka Jacobs Engineers, Inc.
 - a. Brad Anderson, (419) 380-4900

D. The core components of the new SCADA System are the new PLC located in the new control panel at Well PW-2 and the remote I/O adapters mounted in the new control panels at Well PW-1 and PW-2. Refer to the Control One-line Diagram (Sheet 5E3) for an overview of the system components.

1. One PLC Control Panel and two remote I/O Control Panels shall be utilized to extend monitoring and control to following areas.
 - a. CP-W1 shall be located on the Well PW-1 platform.

- b. CP-W2 shall be located on the Well PW-2 platform.
- c. CP-W3 shall be located on the Well PW-3 platform.
- 2. Three cameras shall be provided per Section 16780 – Video Surveillance Systems to monitor each well platform.
- 3. Requirements for the control panels are detailed in Section 13431 – Control Panel Design and Construction.
- 4. A CompactLogix PLC with Remote I/O adapters shall be provided per Section 13450 – Modular Programmable Logic Controllers. Development software version for this device shall be Rockwell Software Studio 5000, version 35, no substitutes.
- 5. Control panels shall utilize Ethernet over fiber-optic cable communication.
 - a. Network switches with F/O ports shall be included within the PLC control panel and the remote I/O panels.
 - b. Refer to Section 13455 – SCADA Local Area Network (LAN) Equipment for additional details and requirements.

E. Instrumentation shall be provided as detailed in Section 13420 – Field-Mounted Instruments.

1.04 Codes, specifications, and standards referred to by number of title shall form a part of this specification to the extent required by the references thereto.

1.05 Pre-Construction Submittals

A. Provide all submittals, including the following, as specified in Section 01300.

- 1. Project schedule, which shall represent the best projections of when activities listed below will occur. Update project schedules at the Engineer's request when major changes in the schedule occur. The activities shall include, but not be limited to, the following:
 - a. Coordination meetings
 - b. Shop drawing submittals for each group of equipment
 - c. Shop drawing approvals for each group of equipment
 - d. Equipment manufacturing/ fabrication
 - e. Equipment delivery
 - f. Equipment installation
 - g. System testing and calibration
 - h. Operational testing and demonstration.
 - i. As-built submittals
 - j. Operation and Maintenance Manual submittals
 - k. Operator training
 - l. Follow-up Operator training at six months after substantial completion.
- 2. Manufacturer's certification of compliance with the referenced specifications and standards.
- 3. Certified copies of reports of factory tests specified herein and required by the referenced standards.
- 4. Shop drawings, indicating performance and physical data of the equipment specified herein.
- 5. Manufacturer's installation instructions.
- 6. Provide mounting details for field mounted equipment.

7. Manufacturer's operation and maintenance instructions.
8. If available, DVD or CD ROM media produced by the equipment manufacturer, which contain demonstrations of operation and maintenance procedures for the equipment specified herein.

B. Physical requirements of submittals shall be as follows:

1. Submit in three-ring binders.
2. Organize and divide into logical division by means of tagged manila dividers. Each type of equipment shall be given a separate division.
3. Provide index sheets.
4. Drawings: 8-1/2 by 11 inches minimum. Fold drawings larger than 11 by 17 inches and put into a three-hole plastic pocket.
5. All text material shall be typewritten. Handwritten material is not acceptable.
6. Telecopied (FAX) documents or photocopies of faxed documents are not acceptable and will be rejected and returned immediately.

C. Shop Drawings:

1. Instrument index, including instrument tag numbers, instrument description and instrument calibrated ranges.
2. Typewritten specification sheets, including manufacturer's names and complete catalog numbers.
3. Detailed calculations including, but not limited to:
 - a. Power supply sizing calculations
 - b. Thermal loading (heat dissipation) calculations
4. Cut sheets and catalog information, including equipment specifications, dimensions, wiring and piping drawings, and installation and mounting details.
5. Loop drawings, containing, but not limited to, the following information:
 - a. Loop numbers and instrument tag numbers
 - b. Individual loop component locations
 - c. Actual equipment wiring terminal designations, point to point wiring, and cable shield terminations
 - d. Wire type, size and identification number
 - e. Signal types (e.g., 120 Volt AC, 4-20 Ma DC, pulse frequency, 3-15 psig, etc.)
 - f. Contact orientations (e.g., normally open, normally closed, etc.)
 - g. Equipment grounding requirements
 - h. Sources of loop power, or power supply identifications
 - i. Signal boosters, interposing relays and shunt resistors
 - j. For each loop, present a tabular summary of the following:
 - 1) Load impedance capability of each transmitting instrument output
 - 2) Input impedance of each receiving instrument
 - 3) Calculated loop wiring impedance, based on wire sizes and lengths
 - 4) Total loop impedance
 - 5) Reserve output capacity
6. Instrument panel layout drawings, including, but not limited to:
 - a. Bill of materials
 - b. Front panel layout drawings
 - c. Internal panel layout drawings

- d. Internal wiring diagrams, including wire type, size and identification number
- e. Terminal block layout drawings
- f. Nameplate lists
- g. Color schedules and samples
- 7. Elementary control diagrams.
- 8. Other descriptive information that will assist the Engineer with review.

1.06 Record Drawings (As-Built)

- A. Submit record drawings as specified in Section 01720 to the Engineer, including, but not limited to:
 - 1. One set of corrected contract documents. All corrections recorded throughout the construction phase of the project shall be incorporated into the "As-Built" set utilizing the development software used to create the drawings. Handwritten or digital redlined markups shall be finalized utilizing the development software (i.e. AutoCAD or equivalent), and submitted as a completed set. Handwritten or digital redlines on this set will not be accepted.
 - 2. One set to the Engineer and one set to the Owner: printer outputs of the final configuration or programs of all programmable controller based equipment.
 - 3. Where applicable, submit to the Owner standard storage devices, such as CD/DVD disks, of all programmable controller based equipment and all software and programs.
 - 4. Submit original licensed copies and original documentation for all software. All software licenses shall be in Owner's name.
 - 5. Where applicable, submit to the Owner two sets of pre-configured Read-only Memory Modules, such as EEPROMs or UVROMs, of all programmable microprocessor based equipment. Submit each memory module in an anti-static zippered poly-bag, clearly labeled and identified.

1.07 Operation and Maintenance Manuals

- A. Prepare and furnish Operation and Maintenance Manuals of the system, which shall be submitted to the Engineer prior to operator training described below in accordance with Section 01300.
- B. The Operation and Maintenance Manuals shall include, but not be limited to, the following:
 - 1. Approved shop drawings amended by approved change orders and as-built conditions.
 - 2. Manufacturer supplied operating and installation manuals.
 - 3. Detailed procedures and instructions on the operation, removal, installation, adjustment, calibration, and maintenance of each component provided under this contract.
 - 4. As-built control panel and enclosure drawings, including termination drawings, PLC input/output (I/O) wiring diagrams, and panel bill of materials.
 - 5. List of recommended spare parts, which shall include complete catalog numbers
 - 6. List of local or the nearest manufacturer approved repair and service centers.

1.08 Operator Training

- A. Provide operation and maintenance training of the Owner's personnel per Section 13494, SCADA System - Training.

1.09 Quality Assurance

- A. Contractor, Electrical Subcontractor, and Control System Integrator are responsible for the requirements of this Section.
 - 1. Provide all electrical, instrumentation, and control related work.
 - 2. Prepare and submit shop drawings, diagrams, schedules, certifications, reports, manuals, as-builts, test results, and warranties.
 - 3. Install new hardware. This includes grounding rods, providing connections and conduit etc. to provide all signals listed on Drawings.
 - 4. Provide signal converters, buffer amplifiers, and isolation devices to make signal levels, reference to ground, etc. compatible between devices specified in this Section and existing equipment.
 - 5. Provide any temporary wiring necessary during construction and careful removal of existing unneeded control panels.
 - 6. Examine the existing equipment and control system in order to understand control strategies of the existing system in order to maintain the overall integrity of the existing system and proposed upgrades specified in this Section.
 - 7. Investigate and confirm details of operation of the existing system and system components and program screens for monitoring and control of the entire system accordingly. The new system shall interface with existing signals as specified.
 - 8. Plan, schedule and coordinate with Owner or Owner's representative for the integration of the plant equipment and instruments into a control system.
- B. The SCADA CSI shall be an experienced and reputable firm, which has been engaged in the business of providing instrumentation and control systems for water and wastewater treatment facilities for at least five years.
- C. Drawings and specifications shown are intended to convey information required for a complete functioning system for the purposes specified. The SCADA CSI shall be responsible for all details which may be necessary to properly install, adjust, and place in operation a complete and working system, including all final wiring diagrams, connections, and the final layout, sizes and quantities of conduit and wiring communicated to the Contractor and Electrical Subcontractor.
- D. In order to achieve standardization in appearance, operation, maintenance, and spare parts, similar equipment provided shall be the end products of a single manufacturer.
- E. The SCADA CSI shall provide all materials and work necessary for a complete and functioning I&C system and shall have full coordination responsibility for the electrical, mechanical, and structural work associated with the I&C system, as

specified herein and as shown on the drawings, including conveying all conduit and wiring information to the Contractor and Electrical Subcontractor.

1.10 Sequencing

- A. Determine the sequencing of work necessary.

1.11 Coordination

- A. Coordination and control loop review meetings shall be attended by representatives of the Contractor and the Owner. The meetings shall be held periodically during the course of the project. The purpose of these meetings shall be to document the compatibility of the mechanical and electrical work as described above.
- B. For bidding purposes, the Contractor and the SCADA CSI shall include cost for participation in no less than TWO (2) coordination and control loop review meetings. Each meeting shall require at least one working day.

1.12 Delivery, Storage and Handling

- A. Deliver materials and equipment to the job site a maximum of ten days prior to installation and not before.
- B. Store all instruments containing electronics components off the ground in weathertight enclosures. Keep dry at all times. All plug-in equipment which can be removed from panels without the necessity of disconnecting any wire terminations shall be removed from its panel before shipping. Ship in separate shipping containers.
- C. Ship all equipment in a thoroughly clean condition, free from sand, oil, grit or grease (except when required for lubrication), weld splatter, or other foreign materials. All panel openings shall be capped.

1.13 Warranty

- A. The Contractor shall guarantee the Functional Control System to be free from defective material and workmanship for a period of **one year** from the date of acceptance of the equipment by the Owner. The Contractor shall replace any defective materials, components, or workmanship during this time, including but not limited to all materials, labor, shipping, and transportation, at no additional cost to the Owner. Any repair work performed during this one-year period shall also be guaranteed to be free from defective material or workmanship for a period of one year from the date the repair work is complete and shall be addressed in the same manner at no additional cost to the Owner.
- B. During the warranty period adjust, recalibrate, repair, replace and otherwise place back into service any instrument and any item(s) that may require service, including software, at no additional cost to the Owner for any reason.

- C. During the warranty service, provide unlimited on-site software and operation support, at no additional cost to the Owner for any reason.
- D. Respond to a call for service within 24 hours.

1.14 System Startup

- A. Sequence start-up and testing so that they can be coordinated with the plant control system start-up and testing.

1.15 Commissioning

- A. Refer to 13492, Testing and Commissioning for documentation and procedures related to system testing, start-up, and commissioning.

PART 2 - PROCESS CONTROL DESCRIPTION

2.01 SCADA PLCs and the SCADA System Software will be programmed by the SCADA Control System Programmer as defined above in Section 1.03. The following Process Control Descriptions are included for reference only, and to understand how hard-wired interlock and other signals support the overall control methodology.

2.02 Groundwater Wells

A. Process Overview

1. Each of the three (3) groundwater wells at the Middletown Junction Wellfield supplies water to the Owner's water distribution system.
2. Variable frequency drives (VFDs) are being added to the well motors and will need to be programmed for the Owner to operate the speed of the motors over a range of flow and pressure conditions to optimize the process conditions. The Controls System Integrator shall coordinate the details of this operation with the Owner prior to software development.

B. Control Equipment

1. Well Pump PW-1 VFD [VFD-W1]
2. Well PW-1 Level Transmitter [LT-0100]
3. Well PW-1 Flow Meter [FIT-0101]
4. Well PW-1 Pressure Transmitter [PIT-0102]
5. Well PW-1 Control Panel Intrusion Switch [ZSC-0103]
6. Well PW-1 VFD Enclosure Intrusion Switch [ZSC-0104]
7. Well PW-1 VFD Enclosure Temperature Switch [TSL-0105]
8. Well Pump PW-2 VFD [VFD-W2]
9. Well PW-2 Level Transmitter [LT-0200]
10. Well PW-2 Flow Meter [FIT-0201]
11. Well PW-2 Pressure Transmitter [PIT-0202]
12. Water Main Pressure Transmitter [PIT-0203]
13. Well PW-2 Control Panel Intrusion Switch [ZSC-0204]
14. Well PW-2 VFD Enclosure Intrusion Switch [ZSC-0205]

15. Well PW-2 Power Panel Intrusion Switch [ZSC-0206]
16. Well PW-2 VFD Enclosure Temperature Switch [TSL-0207]
17. Well Pump PW-3 VFD [VFD-W3]
18. Well PW-3 Level Transmitter [LT-0300]
19. Well PW-3 Flow Meter [FIT-0301]
20. Well PW-3 Pressure Transmitter [PIT-0302]
21. Well PW-3 Control Panel Intrusion Switch [ZSC-0303]
22. Well PW-3 VFD Enclosure Intrusion Switch [ZSC-0304]
23. Well PW-3 VFD Enclosure Temperature Switch [TSL-0305]

C. SCADA Interaction and Alarming:

1. The following shall be monitored in SCADA:

- a. Well Pump PW-1 Runtime
- b. Well PW-1 Level
- c. Well PW-1 Flow
- d. Well PW-1 Pressure
- e. Well PW-1 Speed Command
- f. Well PW-1 Speed Feedback
- g. Well PW-1 Max Speed (in Hz)
- h. Well PW-1 Motor Voltage (V)
- i. Well PW-1 Motor Current (A)
- j. Well PW-1 In Remote
- k. Well Pump PW-2 Runtime
- l. Well PW-2 Level
- m. Well PW-2 Flow
- n. Well PW-2 Pressure
- o. Well PW-2 Speed Command
- p. Well PW-2 Speed Feedback
- q. Well PW-2 Max Speed (in Hz)
- r. Well PW-2 Motor Voltage (V)
- s. Well PW-2 Motor Current (A)
- t. Well PW-2 In Remote
- u. Water Main Pressure
- v. Well Pump PW-3 Runtime
- w. Well PW-3 Level
- x. Well PW-3 Flow
- y. Well PW-3 Pressure
- z. Well PW-3 Speed Command
- aa. Well PW-3 Speed Feedback
- bb. Well PW-3 Max Speed (in Hz)
- cc. Well PW-3 Motor Voltage (V)
- dd. Well PW-3 Motor Current (A)
- ee. Well PW-3 In Remote

2. The following alarms shall be generated in SCADA:

- a. Well Pump PW-1 Failed
- b. Well Pump PW-1 Not In Remote
- c. Well PW-1 Low Level
- d. Well PW-1 Pressure High

- e. Well PW-1 Control Panel Intrusion
- f. Well PW-1 VFD Enclosure Intrusion
- g. Well PW-1 VFD Enclosure Temperature Low
- h. Well Pump PW-2 Failed
- i. Well Pump PW-2 Not In Remote
- j. Well PW-2 Low Level
- k. Well PW-2 Pressure High
- l. Water Main Pressure High
- m. Well PW-2 Control Panel Intrusion
- n. Well PW-2 VFD Enclosure Intrusion
- o. Well PW-2 Power Panel Intrusion
- p. Well PW-2 VFD Enclosure Temperature Low
- q. Well Pump PW-3 Failed
- r. Well Pump PW-3 Not In Remote
- s. Well PW-3 Low Level
- t. Well PW-3 Pressure High
- u. Well PW-3 Control Panel Intrusion
- v. Well PW-3 VFD Enclosure Intrusion
- w. Well PW-3 VFD Enclosure Temperature Low

2.03 Generator & ATS

A. Process Overview

1. Generator runs all three wells' equipment in the event of lost power.

B. Control Equipment

1. Generator [GEN-W2]
2. Automatic Transfer Switch [ATS-W2]

C. SCADA Interaction and Alarming

1. The following shall be monitored in SCADA:
 - a. Generator Running
 - b. ATS Normal
2. The following alarms shall be generated in SCADA:
 - a. Generator Failed
 - b. Generator Leak Detected
 - c. Generator Low Fuel
 - d. ATS Emergency

2.04 Additional SCADA Requirements

A. General

1. Color coding for the SCADA system screens shall be consistent with existing SCADA system.

PART 3 - EXECUTION

3.01 Installers

- A. Provide all materials and work necessary for a complete and functioning I&C system and shall have full coordination responsibility of the electrical, mechanical, and structural work as specified herein and as shown on the drawings. Ensure that the instrumentation and control systems work is properly interfaced with equipment and other work furnished under other divisions of the contract documents.
- B. Install, make final connections to, adjust, test, and start-up the complete instrumentation and control system utilizing the technical service and advice of the systems supplier.

3.02 Installation

A. General

1. Installation shall be in strict compliance with individual equipment manufacturer's instructions. The Contractor shall assume full responsibility for additional costs which may result from unauthorized deviation from the equipment manufacturer's instructions.
2. All gages and indicators shall be mounted in the upright position.
3. Provide sufficient space around the equipment for maintenance and removal.
4. Cover front panels, gages and indicators, during construction for protection from weld and paint splatter.
5. Unless otherwise impractical, support instruments independent of process piping.

B. Installation Hardware

1. All nuts and bolts shall be stainless steel.
2. Support channels shall be stainless steel unistrut channels with stainless steel hardware.
3. Do not mount equipment directly to masonry or concrete walls. Provide unistrut channels on wall.
4. All equipment mounting plates shall be of 0.25-inch thick minimum stainless steel.
5. All contact surfaces between dissimilar metals shall be gasketed to prevent galvanic reaction.

C. Equipment Identification and Tag Numbers

1. All apparatus, control equipment, and instruments, both panel and field mounted, shall be plainly identified, using the following methods:
 - a. Pipe-mounted instruments shall be provided with embossed stainless-steel tags, which shall be attached to the instruments by means of stainless steel wire or tie wrap.
 - b. Wall, plate, or panel mounted instruments shall be provided with engraved laminated plastic tags, which shall be mounted above, or below

instruments. The plastic tags shall be mounted at eye level and shall be visible from a minimum distance of 20 feet. Lettering shall be black on white background.

2. Tag numbers and engraved or embossed text shall be as shown on the drawings, or as approved by the Engineer during shop drawing approval.
3. Tag numbers shall conform to the current Instrument Society of America (ISA) Standards, which shall consist of a multi-character prefix, followed by a loop number. Tag numbers shall be as indicated on the drawings.

3.03 Field Quality Control

A. Site Tests

1. Test all analog loop zeroes and spans by disconnecting wiring at each transmitter and substituting an approved 4-20madc generator. Adjust the indicators and receiving instruments to indicate the correct value, correlated to the simulated current signal.
2. Test all annunciator points by placing jumpers across normally open contact Inputs, or by disconnecting wiring on normally closed contact inputs.
3. Submit testing and calibration reports for all instruments to the Engineer.

-END-

SECTION 13420 – FIELD-MOUNTED INSTRUMENTS

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: Provisioning, installation, start-up, testing and calibration of all field-mounted instruments required for this project.
- B. This section covers field-mounted instruments provided separately from a manufactured system or process equipment package, to be used on the various portions of the project, and the Contractor shall meet the requirements of these Specifications wherever applicable.

1.02 System Description

- A. The types of field-mounted instruments required for this project include the following:
 - 1. Pressure Transmitters (Gauge, Indicating, Diaphragm Element)
 - 2. Level Transmitters (Submersible Hydrostatic)
 - 3. Flow Meters (Magnetic)
 - 4. Process Indicator Displays
 - 5. Magnetic Door/Window Switches
- B. For each field-mounted instrument, provide a complete assembly with all required components, enclosures suitable for the environment and location, fittings, mounting brackets, and other components and accessories as needed to form a complete system.
- C. In-line process probes and instruments shall be provided with a ball valve and retraction assembly suitable for each sensor. Sensors mounted in process pipes, tanks, and other in-line settings shall be removable under normal process conditions, without stopping the process or draining the tank.
- D. Provide conduit, raceway accessories, wiring and connections necessary to place the instruments into service and necessary to interface the instruments to other equipment control panels, programmable controllers, SCADA system, and similar installations as required for the project.
- E. Include TVSS units as specified per specification 13400.

1.03 Submittals

- A. Prepare and submit information in accordance with Section 01300.
- B. Provide ISA-TR20.00.01-2007 Specification Forms for Process Measurement and Control Instruments or forms with identical data. Complete forms with all known data and dash out the inapplicable fields.

1.04 Quality Assurance

- A. Manufacturers: Firms regularly engaged in manufacture of field-mounted instruments and systems of types and sizes required, whose products have been in satisfactory use in similar service, and whose products meet all requirements specified herein.
- B. Installer: Qualified with successful installation experience on projects with field-instrument work similar to that required for this project.
 - 1. It is intended that an experienced electronic systems/instrumentation and control systems subcontractor shall be in responsible charge of all field instrument work.
- C. All products used in potable water applications shall meet NSF Standard 61 and either NSF Standard 61 – Annex G or NSF Standard 372 and shall be clearly marked as being in compliance with these standards.
- D. ISA Compliance: Comply with applicable Standards and Practices for Instrumentation published by the Instrument Society of America pertaining to field-mounted instruments and related installations.
- E. UL Compliance and Labeling: Comply with provisions of UL safety standards pertaining to electrical systems. Provide products and components which have been UL-listed and labeled whenever such UL listed products are available.
- F. NEC Compliance: Comply with requirements as applicable to construction and installation of field-mounted instruments and installations.

1.05 Delivery, Storage and Handling

- A. Deliver, store, and handle equipment and materials in accordance with Section 01600.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 - 1. Pressure Transmitters (Gauge, Indicating, Diaphragm Element)
 - a. Vega – VEGABAR 28 with VEGADIS 82
 - b. No Substitutes
 - 2. Level Transmitters (Submersible Hydrostatic)
 - a. Vega – VEGAWELL 52
 - b. No Substitutes
 - 3. Flow Meters (Magnetic)
 - a. Endress+Hauser, Promag W 400 (Polyurethane Liner)
 - b. No Substitutes

4. Process Indicator Displays
 - a. By Instrument Manufacturer (for Integral or Remote mounted display)
 - b. Precision Digital ProVu Series (for auxiliary or panel-mounted displays)
 - c. Or Equal
5. Magnetic Door/Window Switches
 - a. Hoffman, Model ALFSWD
 - b. Or Equal

2.02 Pressure Transmitters (Gauge, Indicating, Ceramic Element)

A. Manufactured Units (Pressure Element)

1. Two wire 4 – 20mA pressure sensor with ceramic measuring cell
2. Measuring ranges -1...+60bar/-100...+6000kPa (-14.5...+870 psig)
3. Deviation < 0.3 %
4. Output Signal: 4...20mA
5. Process Temperature -40...+130°C (-40...+266°F)
6. Bluetooth Standard: Bluetooth 5.0
7. Operating Voltage: 12...35VDC
8. Wetted Parts made of 316L, PCDF, duplex steel, PEEK or sapphire-ceramic.
9. Process Seal made of FKM, EPDM or FFKM.

B. Manufactured Units (Pressure Indicating Transmitter)

1. External Display and Adjustment Unit for 4 – 20mA/HART sensors
2. Indication: LC display in dot matrix
3. Adjustment Elements: 4 keys
4. Weight: 0.35 kg (0.772 lbs)
5. Ambient Temperature: -20...+70°C (-4...+158°F)

C. Accessories

1. Units mounted in vaults or anywhere else where the transmitter could experience flooded conditions shall be provided with a molded electrical connection with an integrated atmospheric pressure compensation vent tube incorporated into the manufacturers provided cable. Any potentially submerged units that do not provide for pressure compensation via a vent tube will not be accepted.

D. Source Quality Control

1. Factory calibrate each pressure transmitter at a facility that is traceable to the National Institute of Standards and Technology (NIST).

2.03 Level Transmitters (Submersible Hydrostatic)

A. Manufactured Units

1. Submersible Pressure Transmitter with ceramic measuring cell.
2. Measuring Range: +0.1...+60bar/+10...+6000 kPa (+1.45...+870.2 psig)
3. Deviation in characteristics: 0.1%
4. Process Temperature: -20...+80°C (-4...+176°F)
5. Operating Voltage: 8...35 VDC
6. The transmitter shall be loop-powered hydrostatic pressure sensor for submerged level measurement.
7. The transmitter shall consist of variable capacitance, pressure sensing assembly enclosed in submersible type 316 stainless steel housing with aluminum oxide ceramic sensor.
8. The sensor shall measure the depth of water by comparing the pressure on the submerged ceramic cell to atmospheric pressure through a vented capillary tube which is protected from moisture intrusion by a filter.
9. The sensor shall be aluminum oxide with EPDM or FKM Viton seal; body is 316 SS; cable material is polyethylene (PE), polyurethane (PUR) or fluorinated ethylene propylene (FEP) over shielded copper twisted pair and vent tube. Sensor cable length shall be sized appropriately for application.
10. The process temperature rating shall be +14 deg to 158 deg F.
11. The factory calibrated measuring cells shall range from 0-3' to 0-600'
12. The accuracy shall be $\pm 0.2\%$ of the set span including hysteresis and non-repeatability; Long-term stability: $\pm 0.1\%$ of Upper Range Limit (URL) per year and must be capable of platinum accuracy of $\pm 0.1\%$ of the set span.
13. For water level measurement in wells the outside diameter of the transmitter shall not exceed 0.9 inches.

B. Accessories

1. IP 66 weatherproof terminal box with Filter.

C. Source Quality Control and Calibration

1. Factory calibrate each transmitter at a facility that is traceable to the National Institute of Standards and Technology (NIST).
2. A real-time computer generated printout of the actual calibration data indicating apparent and actual pressures shall be supplied with the hydrostatic measurement system.
3. Provide complete documentation covering the traceability of all calibration instruments.

D. Safety

1. All electrical equipment shall meet the requirements of ATEX/Europe, CSA/Canada, FM/USA.

- E. Sensor housing/probe shall conform to IP68 classification. The Terminal Box shall conform to IP66. See contract Drawings for terminal box location (if used).

2.04 Flow Meters (Magnetic)

- A. Operation Principle: Magnetic Flow meters shall operate on Faraday's Law.

- B. Physical Arrangement: The primary flow element (FE) shall be in the form of a flanged pipe spool. The signal converter, local flow indicator, totalizer, and transmitter (FIT) shall be separately mounted as indicated on the drawings, or near the flow meter primary element if not specified elsewhere. Connection between the FIT and the FE shall be by manufacturer furnished or approved cables of sufficient length, without splices.

- C. Primary Element Specifications

1. Provide grounding rings, orifices, or electrodes.
2. Coils shall be potted.
3. Electrodes shall be flush with the inner liner.
4. Conduit and cable entries shall be watertight.
5. Conductivity: >5 micro-ohms
6. Temperature: -4°F to 194°F
7. Pressures: 0 to 20 psig
8. Spool Housing: Carbon Steel
9. Liner Material: Polyurethane (W 400)
10. Electrode Type: 316 Stainless Steel

- D. Converter and FIT Specifications

1. Enclosure shall be NEMA 4X standard, or NEMA 7 Class I, Div. 2 as indicated in the schedule at the end of this Section.
2. Microprocessor based, capable of bi-directional flow, field configurable.
3. Zero Return: Yes
4. Enclosure Class: NEMA 4X, unless otherwise noted on drawings
5. Configurable data shall include the following:
 - a. Flowmeter size.
 - b. Forward and reverse ranges.
 - c. Forward and reverse pulse weight.
 - d. Forward and reverse pulse width.
 - e. Low-flow cut-off point.
 - f. Noise rejection or reduction.
 - g. Response time.
 - h. Damping coefficient.
 - i. Engineering units.
6. The indicator shall be capable of the following indications:
 - a. Flow in direct engineering unit.
 - b. Flow in percent of full scale.
 - c. Total flow in direct engineering unit.
 - d. Flow direction.

7. Data memory shall be nonvolatile EEPROM, without need for battery backup.
 8. The converter shall have empty pipe detection that will drive analog and digital output signals to zero when the electrodes are uncovered.
 9. The converter shall be provided with positive zero return input which shall accept either normally open or normally closed contacts and shall drive the analog and digital output signals to zero when the contacts change state. The converter shall return to normal operation when the contacts return to normal state.
 10. The flow device shall have Bluetooth wireless technology interface and can be operated and configured via this interface using the SmartBlue app. The Bluetooth shall have both encrypted communication and password encryption for security purposes. The Bluetooth wireless technology interface can be deactivated. The flow transmitter may be capable of being configured with 4-20mA/Hart or Bluetooth as options.
- E. Input Power shall be 120VAC, with surge protector furnished integral to the unit.
- F. Signal output shall be 4-20mADC, into 800 ohms, proportional to flow.
- G. Include TVSS unit at the instrument, see Section 13400.
- H. Include local 120V disconnect and 120V TVSS, see Section 13400.
- I. Input for positive zero return shall be by dry contact.
- J. System Performance
1. Excitation type: Bi-Polar DC coil excitation with automatic zeroing.
 2. Zero Stability: Absolute.
 3. System Accuracy: +/- 0.5% of flow rate, over a 10 to 1 turndown. Accuracy shall be verified by calibration of each flowmeter in a flow laboratory traceable to the U. S. National Bureau of Standards.
 4. Each system shall be factory calibrated before shipment. No realignment shall be necessary.
 5. Repeatability: 0.1% of full scale.
 6. Rangeability: 100 to 1.
 7. Minimum conductivity requirements: 5 microsiemens per centimeter.
 8. Operating temperature limits:
 - a. Ambient: -40° to +60° Celsius
 - b. Process: 0° to +80° Celsius (W 400 – Normal Temp)

2.05 Process Indicator Displays

- A. All analog process instruments shall be provided with integral or separately mounted process indicator displays. Separately mounted indicators shall be used in instances where the instrument is installed in an out of view location such as on a ceiling or low to the floor, or in congested areas where the viewing of the indicator is difficult.

- B. All indicators shall be scaled in engineering units and units shall have integral scaling factors for displaying engineering units. Nameplates shall indicate range for the instrument.
- C. Enclosures: Provide enclosures as specified below and as noted on the Drawings.
 - 1. Provide NEMA 4X type 316 stainless steel or non-metallic enclosures for instruments installed in corrosive environments, in outdoor locations.
 - 2. Provide NEMA 1 or NEMA 12 enclosures for instruments installed indoors, in dry, de-humidified (air conditioned), non-corrosive locations.
 - 3. Provide NEMA 4X enclosures for instruments installed in indoor damp, wet, and corrosive locations.
 - 4. Provide NEMA 7 explosion-proof enclosures and intrinsic safety barriers for instruments installed in Class I, Div. 1 and Class I, Div. 2 rated hazard locations.
- D. Level indicators and level indicating transmitters shall have the local elevation of the zero depth (i.e. 0'-0" = 800'-0" USGS elevation) engraved or otherwise permanently indicated on the indicator nameplate.
- E. Displays shall have 4.5 digits, minimum 0.5" high, and shall be high intensity LED or backlighted LCD. Outdoor units shall be Sunlight Readable model.
- F. Indicators may be loop powered or operate on 120VAC, as indicated on the Drawings. Provide integral power supplies.
- G. Provide output relays with contacts rated 2 amperes at 250VAC, form C or as required, with 0% to 100% adjustable deadband and selectable for automatic or manual reset.
- H. Provide isolated 4-20mADC analog outputs capable of driving a loop of 800-ohm maximum resistance.
- I. Flow indicators shall be combination rate and totalizer type units (FQIT) and shall have 6 digits and shall indicate current flow rate and accumulated flow totals.
- J. All setup, scaling, and totalizer values shall be stored in nonvolatile memory without need for battery backup.
- K. Mounting: See drawings.

2.06 Magnetic Door/Window Switch

- A. General:
 - 1. Monitors the open or closed position of moveable assemblies such as doors, windows, or machinery safety barriers.
 - 2. Shall be defeat-resistant to external magnetic tampering.
 - 3. Shall include tamper switch to notify of removal.
 - 4. Shall be suitable for Indoor/Outdoor use.
 - 5. Shall be epoxy sealed for protection from moisture and corrosion.

6. Internal circuitry shall provide 2400 VDC of surge protection

B. Specifications:

- | | |
|----------------------|-----------------|
| 1. Switch Type: | Form C (SPDT) |
| 2. Contact Rating: | 25mA @ 24 VDC |
| 3. Tamper Rating: | 1 A @ 24 VDC |
| 4. Gap: | 7/16 in. (11mm) |
| 5. Surge Protection: | Up to 2400 VDC |

PART 3 - EXECUTION

3.01 Installation

A. Each instrument or system shall be installed, wired, and calibrated in strict compliance with the manufacturer's instructions and recommendations.

B. Installation Hardware

1. All nuts and bolts shall be stainless steel.
2. Support channels mount externally, or mounted in a corrosive atmosphere, shall be stainless steel unistrut channels.
3. Do not mount equipment directly to masonry or concrete walls. Provide unistrut channels on wall.
4. All equipment mounting plates shall be of 0.25-inch thick minimum 316 stainless steel.
5. All contact surfaces between dissimilar metals shall be gasketed to prevent galvanic reaction.

C. All test instruments used for field calibrations shall have a minimum accuracy of 3 times greater than that of the instrument being calibrated. Test instruments shall have been calibrated to National Bureau of Standards requirements within 6 months of their use on this project. Provide evidence of such calibration upon request by the Owner of Engineer.

D. Final conduit connection to the instruments shall be through watertight flexible conduit. Where noted, final connection shall be by extra hard service cable rated for wet location. Use explosion-proof or liquid-tight flexible conduit where required.

E. Line powered units shall receive 120 volt AC supply through a disconnect switch and surge protector.

1. 120 volt AC power to each field-mounted instrument shall be provided with a disconnect switch and a surge protector, which shall be enclosed in a NEMA 4X box and labeled.
 - a. Disconnect switch – Hubbell HBLDS3 or equal
 - b. TVSS – APT TE series (include NEMA 4X enclosure), Liebert LTAC series.
2. All analog signal wiring shall be provided with surge protection at both the transmitting end and at the receiving end.
 - a. At the instrument – TP48 by Telematic, Liebert FLW series.

b. At PLC – SD Series by MTL Surge Technologies or equal.

F. Environmental Protection

1. Transmitters and similar items located outdoors or in unheated or untreated spaces must be manufactured for the environment to be encountered. If not suitable for the environment where located, the Contractor shall provide a heated and insulated and exhaust fan ventilated or air conditioned enclosure suitable for the environment, to protect the transmitter or instrument.
2. All instruments shall be rated for operation from –30 to 140 degrees F, with a relative humidity of 0% to 90% noncondensing, unless noted otherwise.
3. All externally located instruments, indicators, totalizers, control panels and control stations shall be mounted on a panel or mounting plate, which shall be provided with an aluminum or stainless steel weather shield to protect the instruments from direct exposure to the sun and weather. This weather shield shall be 3” wider at each end and have a 6” overhang in front of the instrument. All edges shall be smooth and rounded.
4. Unless noted otherwise or impractical, all externally located instruments shall be installed to face north.

G. Process Indicator Displays

1. Indicators shall be installed at a minimum of 60 inches above grade or finished floor and a maximum of 72 inches.
2. Scale units as required for the engineering units being displayed. Note all calibration factors on the instrument data sheet and include with O & M Manuals.
3. Provide nameplate for each unit.

H. Magnetic Flowmeters

1. Install grounding orifices per manufacturer’s instructions. Secure grounding jumpers, such that continuous grounding path is achieved between the metal process piping and the grounding orifices.
2. Where magnetic flowmeters are installed in areas subject to flooding, use extra hard service cords for connections between the meter and its flow converter.

3.02 Calibration

A. In addition to the above requirements, calibrate each system as follows:

1. Each system, including its complete instrument loop, shall be calibrated. Reading on the remote receiving instruments shall be equal to reading at the converter indicator.
2. Provide a written loop-calibration report for each system, which shall include but shall not be limited to the following:
 - a. Date & time the final calibration was completed.
 - b. Atmospheric conditions when the final calibration was performed.
 - c. Comparison of readings at the converter with readings at the remote receiving instruments.

- d. Provide a table showing calculated and measured values at 0%, 25%, 50%, 75% & 100%.
- e. Verification of accuracy of the outputs, including those at the receiving instruments.
- f. Verification of operation of all contact outputs, including those at the receiving instruments.
- g. Description of method of calibration.
- h. The names and signatures of personnel performing the calibration. Provide room for 2 names.
- i. The names and signatures of engineer's field representatives. Provide room for 2 names.
- j. Special comments or notes, including "as left" conditions.

SCHEDULE A – PRESSURE DEVICES (ANALOG)

Tag(s)	Name / (Location)	Type	Operating Range	Transmitter/ Display	Provided Under
PIT-0102	Well PW-1 Pressure Transmitter	Gauge Pressure	0 – 150 psi	Remote	Div 13
PIT-0202	Well PW-2 Pressure Transmitter	Gauge Pressure	0 – 150 psi	Remote	Div 13
PIT-0203	Water Main Pressure Transmitter	Gauge Pressure	0 – 150 psi	Remote	Div 13
PIT-0302	Well PW-3 Pressure Transmitter	Gauge Pressure	0 – 150 psi	Remote	Div 13

SCHEDULE B – LEVEL DEVICES (ANALOG)

Tag(s)	Name / (Location)	Type	Operating Range	Transmitter/ Display	Provided Under
LE/LT-0100	Well PW-1 Level Transmitter	Submersible Hydrostatic	0 – 100 ft	N/A	Div 13
LE/LT-0200	Well PW-2 Level Transmitter	Submersible Hydrostatic	0 – 100 ft	N/A	Div 13
LE/LT-0300	Well PW-3 Level Transmitter	Submersible Hydrostatic	0 – 100 ft	N/A	Div 13

SCHEDULE C – FLOW DEVICES (ANALOG)

Tag(s)	Name / (Location)	Type	Operating Range	Size / Detail	Transmitter/ Display	Provided Under
FE/FIT-0101	Well PW-1 Flow Meter	Mag FM	0 – 1050 gpm	8"	Remote Transmitter	Div 13
FE/FIT-0201	Well PW-2 Flow Meter	Mag FM	0 – 1050 gpm	8"	Remote Transmitter	Div 13
FE/FIT-0301	Well PW-3 Flow Meter	Mag FM	0 – 1050 gpm	8"	Remote Transmitter	Div 13

SCHEDULE D – SWITCHES AND OTHER DISCRETE DEVICES

Tag(s)	Name / (Location)	Type	Operating Range	Provided Under
ZSC-0103	Well PW-1 Control Panel Intrusion Switch	Door SW	Type N.C.	Div 13
ZSC-0104	Well PW-1 VFD Enclosure Intrusion Switch	Door SW	Type N.C.	Div 13
TSL-0105	Well PW-1 VFD Enclosure Temperature Switch	Temp SW	Type N.C.	Div 16
ZSC-0204	Well PW-2 Control Panel Intrusion Switch	Door SW	Type N.C.	Div 13
ZSC-0205	Well PW-2 VFD Enclosure Intrusion Switch	Door SW	Type N.C.	Div 13
ZSC-0206	Well PW-2 Power Panel Intrusion Switch	Door SW	Type N.C.	Div 13
TSL-0207	Well PW-2 VFD Enclosure Temperature Switch	Temp SW	Type N.C.	Div 16
ZSC-0303	Well PW-3 Control Panel Intrusion Switch	Door SW	Type N.C.	Div 13
ZSC-0304	Well PW-3 VFD Enclosure Intrusion Switch	Door SW	Type N.C.	Div 13
TSL-0305	Well PW-3 VFD Enclosure Temperature Switch	Temp SW	Type N.C.	Div 16

-END-

SECTION 13431 – CONTROL PANEL DESIGN AND CONSTRUCTION

PART 1 - GENERAL

1.01 Summary

- A. Work under this section is subject to the requirements of the contract documents.
- B. This section covers the technical requirements for the fabrication, engineering, wiring and installation for instrument panels and enclosures.
- C. Industrial Control Panels (ICPs) shall be designed and manufactured in accordance with ANSI/UL 508A for use in Ordinary (Unclassified) locations, or ANSI/UL 698A for panels relating to Hazardous (Classified) locations. Each Industrial Control Panel (ICP) shall be identified as an “Enclosed Industrial Control Panel” with the associated UL Listing Mark label affixed within.
- D. Related Sections:
 - 1. Section 13441 – Miscellaneous Control Panel Components
 - 2. Section 13450 – Modular Programmable Logic Controllers
 - 3. Section 13455 – SCADA Local Area Network (LAN) Equipment

1.02 References

- A. IEC: International Electrotechnical Commission
- B. ISA: International Society of Automation
- C. NEC: National Electric Code
- D. NEIS: National Electrical Installation Standards
- E. NFPA 70: National Fire Protection Association
- F. NRTL: Nationally Recognized Testing Laboratory
- G. OSHA: Occupational Safety and Health Administration
- H. UL: Underwriters Laboratories

1.03 Submittals

- A. Submittals shall comply with the Contract Documents. Shop drawings and descriptive data shall be submitted complete, in a single submittal.
- B. Submit in accordance with the following specification sections:
 - 1. Section 01300: Submittals
 - 2. Section 13400: Measurement and Control Instrumentation

C. Product Data:

1. Catalog literature and product specifications for submitted hardware.
2. Dimensional data of panel and enclosure equipment.

D. Shop Drawings shall include the following:

1. Wiring Diagrams: Show control connections and distinguish between factory-installed and field-installed wiring.
 - a. All Instrument ranges must be shown next to instrument symbol on wiring diagrams and/or IO card terminations.
2. Installation and assembly drawings and specifically prepared technical data for panels and enclosures submitted.
3. Detailed calculations, including power supply sizing calculation.
4. Other descriptive information that will assist the Engineer with assessment of the shop drawings.
5. Interface terminations and cable data for all components.
6. Detailed bill of materials with manufacturer's part numbers for all components.

E. See Section 13450 for additional submittal requirements for panels and enclosures that include programmable logic controllers.

F. Operation and Maintenance (O&M) Data:

1. Provide in accordance with Section 01300.
2. Operating instructions and maintenance data for materials and products for inclusion in O&M Manual.
3. Manufacturer's written instructions for periodic replacement of any backup batteries used on equipment including estimated battery replacement calendar dates.

1.04 Quality Assurance

A. Manufacturer Qualifications: Firms experienced in manufacturing panels and enclosures of types and materials indicated that have record of successful in-service performance. Manufacturers of Industrial Control Panels (ICPs) shall be authorized by Underwriters Laboratories to apply the UL Mark to completed, custom-built ICPs per ANSI/UL Standard 508A or 698A.

B. Manufactured panels provided under this Section shall be listed or labeled by Underwriters Laboratories Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7.
2. Terms "listed" and "labeled" shall be as defined in National Electrical Code (NEC), Article 100.

C. Panels for use in Ordinary (Unclassified) locations

1. Industrial Control Panels (ICPs) for use in Ordinary (Unclassified) locations shall be designed and manufactured in accordance with ANSI/UL 508A.
 - a. Each ICP shall be identified as an “Enclosed Industrial Control Panel” with the associated UL Listing Mark label affixed within.
 - 1) An enclosed industrial control panel is comprised of the enclosure, all components located within the enclosure, and all components mounted to the walls or cover of the enclosure.
 - 2) The construction of the entire unit shall be investigated, including its ability to safely function within the specified marked voltage, current and short circuit current ratings.

D. Panels Relating to Hazardous (Classified) Locations

1. Industrial Control Panels (ICPs) installed in Ordinary (Unclassified) locations with intrinsically safe circuit extensions into Class I, II, and III, Division 1 and 2 Hazardous (Classified) locations shall be designed and manufactured in accordance with ANSI/UL 698A.
2. Panels relating to hazardous locations require the use of UL Listed barriers to make the circuit extensions intrinsically safe.

E. In-Factory Inspection – see Section 13492

1. Verify following in accordance with approved submittals:
 - a. Panel dimensions
 - b. Equipment layout
 - c. Wiring
 - d. Wire and terminal identification
 - e. Device identification
2. Verify proper access to equipment for maintenance
3. Verify proper access to field wire and network cable/fiber termination points
4. Inspect for neatness of wiring and wire harness construction

1.05 Delivery, Storage, and Handling

- A. Deliver panels and enclosures to their final locations in protective wrappings, containers, and other protection that will exclude dirt, moisture and prevent damage from construction operations. Remove protection only after equipment is made safe from such hazards and is ready for immediate installation.
- B. Store panels and enclosures in clean, dry location.

1.06 Maintenance

A. Extra Materials:

1. Furnish extra materials matching products installed, as described below packaged with protective covering for storage, dated and identified with labels describing contents.
 - a. Provide minimum quantity of 5 or 10% of total, whichever is greater, of each type fuse used on project.
 - b. Provide minimum quantity of 5 or 10% of total, whichever is greater, of each type relay used on project.
 - c. Provide minimum quantity of 5 or 10% of total, whichever is greater, of each type pilot light replacement bulb used on project.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. Hoffman
- B. Saginaw
- C. Hammond
- D. Wiegmann
- E. Rittal
- F. Or Equal

2.02 General

- A. The instrument panels and enclosures shall be as follows:
 1. NEMA 4X – type 316 stainless steel for indoor enclosures in wet or corrosive environments and for all outdoor enclosures.
 2. NEMA 4X – type 316 stainless steel with observation window for all enclosures containing indicating transmitters.
- B. Conduit knockouts on the enclosure shall be made prior to installation of any equipment within the enclosure. The size and the number of conduit knockouts shall be as required. Provide malleable iron water tight conduit hubs for all NEMA 4X enclosures.
- C. Conduit knockouts shall be only on the bottom of all panels, side or top penetrations will not be permitted.
- D. All enclosures exposed to weather conditions shall be provided with sun shields to protect the enclosure from direct exposure from the sun and rain.

- E. Size to adequately dissipate heat generated by equipment mounted in or on panel.
- F. Equip enclosures in non-temperature-controlled areas and all outdoor enclosures with thermostatically controlled heaters capable of maintaining an internal panel temperature of 50°F. Use ambient temperature of -20°F with 20mph wind for outdoor calculations.
 - 1. 120V AC, 60Hz power
 - 2. Forced air type
 - 3. Integral thermostat control

2.03 Panel Construction

A. General

- 1. Panels shall be constructed using factory-fabricated enclosures.
- 2. Incorporate stiffening members for strength and stiffness as required.
- 3. Seamless welded construction.
- 4. Exposed seams continuously welded and ground smooth.
- 5. Lifting rings for panels in excess of 100 pounds.
- 6. Padlocking handle or padlocking latch kit.
- 7. Provided subpanels must be easy to remove and install.
- 8. Provide subpanels with white powder coated surface or with 2 coats if white enamel paint.
- 9. Include print pockets on the inside of each door.

B. NEMA 4X Enclosures

- 1. Fabricated from minimum 12-gauge type 316 stainless steel or better.
- 2. Enclosure door shall be provided with neoprene gasket, which shall be attached to the enclosure with oil-resistant adhesive and held in place with stainless steel retaining strips.
- 3. Door clamps on three sides of the enclosure door.
- 4. Include breather drains and corrosion inhibitors inside the panel.
- 5. Equip outdoor enclosures with hinged dead-front inner doors and rubber-gasketed, continuous metal hinged outer weather doors. Equip weather doors with toggle style door clamps.
- 6. Do not paint stainless steel surface.
- 7. Sandblast, roughen, or chemically etch surface to reduce gloss, reflections, and glare.

C. NEMA 4X Enclosures (with Observation Window)

- 1. Fabricated from minimum 16 ga type 304 Stainless Steel or better.
- 2. Clear polycarbonate window
- 3. Window pre-mounted in door of enclosure.
- 4. External formed 90-degree body flange
- 5. Type 316 stainless steel hidden hinges
- 6. Quarter Turn latches furnished with flush slotted insert
- 7. Seamless foam-in-place gasket

8. Self-grounding latch system with double seal

2.04 Fabrication

- A. Follow PLC manufacturer's written installation requirements for layout of PLC-specific panels.
- B. Provide a minimum of 25% free back panel space for future expansion unhindered by current devices, wiring, etc.
- C. Provide a minimum of 25% free terminal blocks of each type used in each panel. This is in addition to planned spare wiring terminations. Show spares on panel drawings.
- D. Arrange panel to allow all conduits to enter the panel enclosure from the bottom. Side or top panel penetrations are not permitted.
- E. Install instruments and devices, plumb, and wire panels at panel shop or other facility prior to shipment to job-site.
- F. Standard Signal Interfaces:
 - 1. Unless otherwise specified, discrete input and output signals shall conform to the following:
 - a. Isolated non-powered (dry) contact closure.
 - b. Dry contacts shall be powered from panel or device receiving signal.
 - c. PLC based outputs shall be provided with an interposing relay when any of the following conditions apply:
 - 1) Potential in-rush current exceeds 75% of rated capacity of the I/O Module.
 - 2) The current requirement of the driven device is insufficient to fully engage the output module consistently.
 - 3) The voltage required to drive the output is incompatible with the output module.
 - 2. Prior to final fabrication of panels, verify layout of front-of-panel devices with respect to rear-of-panel devices. Maintain a 3-inch minimum clearance between door and sub-panel mounted devices.
 - 3. Unless otherwise specified, analog input and output signals shall conform to the following:
 - a. 4-20 mA DC.
 - b. For 2-wire, loop-powered transmitters, provide regulated, fused, and isolated 24V DC power supply at panel for driving of devices. Size power supply for 50% minimum spare capacity minimum. The enclosure vendor shall submit power supply load calculations with the panel shop drawings.
 - c. Where isolation is required for interfacing with equipment supplied, provide necessary I/I converters. Provide I/I converters where impedance capabilities of new or existing signal transmitter will be exceeded by addition of PLC input.

G. Panel Grounding

1. Where noted or specified, provide a ground bus tied to the facility grounding system.
 - a. The ground busbars shall be of nickel-plated copper, rated for at least 100 amperes.
 - b. The busbar shall be provided with a sufficient quantity of termination points of the required size for the application, including future additional components.

H. Wiring:

1. In addition to NEC and NEMA requirements, wiring shall conform to following:
 - a. Power: 12 AWG stranded minimum, type MTW, 600V.
 - b. Control: 16 AWG stranded minimum, type MTW, 300V.
 - c. Analog Signal: Twisted pair with shield, 18 AWG, Belden 8760 or equal.
2. Wire color code:
 - a. AC neutral conductor: White.
 - b. AC hot conductor: Black.
 - c. Grounding conductor: Green.
 - d. AC control conductor, powered from within panel: Red.
 - e. AC control conductor, powered from remote source: Yellow.
 - f. DC (+) power conductor, discrete signal: Blue.
 - g. DC (-) power conductor, discrete signal: White with blue stripe.
 - h. DC control conductor, discrete signal: Blue.
 - i. Twisted pair cable (+) signal conductor, analog signal: Clear.
 - j. Twisted pair cable (-) signal conductor, analog signal: Black.
 - k. Intrinsically safe wiring: Light Blue.
3. Design control panels to keep 480V AC power, 120V AC power and discrete signals, and analog and other low voltage signals separated.
 - a. Do not run 480V AC power, 120V AC power and discrete signals, or analog or other low voltage signals in the same conduit or wire-duct.
 - b. Where 480V AC power, 120V AC power and discrete signals, or analog or other low voltage signals must cross, they shall do so at right angles.
4. Wiring Within Wire Duct:
 - a. Wherever feasible plastic wire duct with cover shall be used for routing of wire within control panel.
 - b. Size wire duct to be no more than 50% full.
 - c. Maintain 2-inch clearance between wire duct and terminals.
5. Wiring outside of wire duct:
 - a. Wiring outside of ducts shall be restrained by use of plastic wire-wrap.
 - b. Wire-ties shall not be used in direct contact with wiring within control panel.
 - c. Provide abrasion protection for wires passing through holes or across abrasive metal edges.
 - d. Wiring passing a door hinge shall be grouped and wrapped in a protective wire harness.
 - e. Adhesive type wire fasteners shall not be used. Hard screw type shall be employed.
6. Each conductor or twisted pair cable shall be labeled near its termination point.

7. Color-coded multi-conductor cable or multi-pair cable shall be labeled on overall jacket near its point of fan-out. Each pair of a multi-pair cable, when not color-coded, shall be labeled at its termination point in addition to the overall jacket.
 8. Labels shall be machine-printed, wrap-around adhesive or heat shrink type, with tag visible from front without removal of wire from termination.
 9. Wiring of PLC I/O modules may be through pre-wired cable assemblies. Cable assemblies shall have PLC I/O module-specific wiring arms on one end and cable connectors specific to terminal blocks on the other.
- I. Terminations:
1. Wiring within control panel shall be continuous and terminated only at terminal blocks or equipment terminals. Splices or butt connectors shall not be used within panel.
 2. Do not exceed manufacturer's rated number of wires on any termination point.
 3. No more than two wires shall be terminated at any one terminal even if terminal is rated for more than two.
 4. Make external connections by way of numbered terminal blocks on numbered terminal strips.
 5. When external signals are powered from within panel, fused terminal blocks or circuit breakers shall be used where conductors enter or leave panel.
 6. Provide integral bussing system on terminal block array where more than two terminations require common source or drain connection. Jumpered terminations shall not be acceptable.
 7. Equipment and signal ground wiring, as well as Neutral wiring, shall not be daisy-chained; they shall each be terminated at isolated, bussed terminal blocks.
 8. Provide knife disconnect-type terminal blocks with test sockets for all analog loops.
 9. Include provisions for grounding of shields on shielded twisted pair cables entering or leaving panel. Cable shields shall be grounded at terminal block end only. Shields shall run entire length of cable within panels. Running of twisted pairs without shields within panels is not permissible.
 10. Provide separate terminal strips for each of the following types of signals.
 - a. 480V AC power circuits
 - b. 120V AC power circuits
 - c. 120V AC discrete signals
 - d. 12V DC, 24V DC or 48V DC discrete signals
 - e. Analog signals
 - f. Serial or parallel digital communication signals
 - g. Intrinsically safe circuits
- J. Power Distribution:
1. Panels having 240V AC or 480V AC power supply:
 - a. Provide internal main circuit breaker to isolate power to panel.
 - b. Provide circuit breakers for all motor starters provided.
 - c. If panel includes separate 120V AC control power supply, provide auxiliary contact to isolate control power when main circuit breaker is opened.

- d. 480V AC to 120V AC control power transformer requirements:
 - 1) Both primary leads shall be fused.
 - 2) First secondary lead shall be fused.
 - 3) Second secondary lead shall be grounded.
 - 4) Provide single-phase surge suppression/line conditioner, sized for total panel loadings between secondary leads and 120V AC power distribution block.
- 2. Panels having 120V AC power supply:
 - a. Provide circuit breaker on power supply entering panel.
 - b. Provide single-phase surge suppression/line conditioner, sized for total panel loadings between circuit breaker and 120V AC power distribution block.
- 3. Provide individual circuit breakers to supply power to each major panel component.
- 4. Additional panel requirements:
 - a. Provide individual circuit breakers for panel powered devices entering panel from field. Provide separate circuit for each device.
 - 1) Solenoid actuated valves
 - 2) Loop powered transmitters
 - 3) 120V AC switched cord and receptacles
 - 4) Relays
 - b. Include digital transient surge suppressor/varistor installed in parallel with output contact at terminal strip for each PLC output signal driving an inductive load including:
 - 1) Relays
 - 2) Solenoids
 - 3) Motor starters
 - 4) Motors

K. Labels and Nameplates:

- 1. Panel Designation:
 - a. Engraved with Engineer's tag number and description shown on the Drawings and in Specifications.
 - b. Laminated white plastic with ½-in. high black characters.
 - c. Fastened with stainless steel screws.
- 2. Front of panel mounted devices.
 - a. Provide nameplate for each front of panel device with descriptive phrase using nomenclature as listed on Drawings and in Specifications.
 - b. Laminated white plastic with 3/16-in. high black characters.
 - c. Fastened with stainless steel screws.
- 3. Rear of panel mounted devices.
 - a. Provide nametag for each rear of panel device with labels used on panel drawings.
 - b. Thermo-embossed or laser printed with 1/8-in. high black characters on clear or white background or laminated white plastic with 3/16-in. high black characters.
 - c. Self-adhesive backing.
 - d. Clean area with mineral spirits prior to affixing labels.

L. Panel Finish:

1. Remove mill scale, grease, and oil.
2. Primer thickness shall be 0.8 mil., minimum.
3. Finish coat shall be two-part epoxy or baked dry powder, 3-mil., minimum dry film thickness.
4. Color: Standard manufacturer's finish.

M. Conveniences:

1. All control panels shall be provided with door-activated, internal LED panel lighting units.
 - a. One unit shall be provided for every 3 feet of panel width and shall be mounted on the inside, top of the panel.
 - b. Lighting shall be consistent for entire project.
2. Freestanding and floor mounted control panels shall be provided with 120V AC, service outlet circuits within the back-of-panel area. The circuits shall be provided with three-wire, 120V AC, 15-ampere duplex GFCI receptacles, one for every 3 feet of panel width and spaced evenly along the back-of-panel area. GFCI receptacles shall not be used for supplying power to UPS.
3. UPS receptacle – Provide simplex non-GFCI receptacle for plug in of UPS where applicable. Receptacle shall be labeled "120V AC FOR UPS ONLY".

PART 3 - EXECUTION

3.01 Installation

- A. Install and wire in accordance with equipment/instrument manufacturer's written instructions, approved submittals, applicable requirements of the NEC, NEIS, and recognized industry practices.
- B. Install control panels in locations indicated on Drawings and in accordance with manufacturer's written instructions and approved submittals.
- C. Touch up all nicks, scratches, etc. with materials as recommended by the enclosure manufacturer.
- D. All panels shall be installed level and plumb.
- E. Installation Hardware
 1. All nuts and bolts shall be stainless steel.
 2. Support channels mount externally, or mounted in a corrosive atmosphere, shall be either reinforced fiberglass or stainless steel unistrut channels. All cuts and holes on fiberglass unistrut channels shall be coated with appropriate resin coating to protect them from deterioration.
 3. Do not mount equipment directly to masonry or concrete walls. Provide unistrut channels on wall.
 4. All equipment mounting plates shall be of 0.25-inch thick minimum clear anodized aluminum.

5. All contact surfaces between dissimilar metals shall be gasketed to prevent galvanic reaction.

3.02 Identification and Name Plate Requirement

- A. Engrave Engineer tag number as listed in Specifications and on Drawings.
- B. Include required Name Plate information per NEC 409.110
 1. Manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified.
 2. Supply voltage, number of phases, frequency, and full-load current for each incoming supply circuit.
 3. Industrial control panels supplied by more than one power source such that more than one disconnecting means is required to disconnect all power within the control panel shall be marked to indicate that more than one disconnecting means is required to de-energize the equipment.
 4. Short-circuit current rating of the industrial control panel based on one of the following:
 - a. Short-circuit current rating of a listed and labeled assembly.
 - b. Short-circuit current rating established utilizing an approved method.
 5. If the industrial control panel is intended as service equipment, it shall be marked to identify it as being suitable for use as service equipment.
 6. Electrical wiring diagram or the identification number of a separate electrical wiring diagram or a designation referenced in a separate wiring diagram.
 7. An enclosure type number shall be marked on the industrial control panel enclosure.

SCHEDULE A – INDUSTRIAL CONTROL PANEL

TAG	ICP Location Classification	Enclosure NEMA Type (Material)	Form Factor	Access	Closure Type	Hinge Type	Panel Description & Additional Requirements
CP-W1	Ordinary (Unclassified)	Type 4X (316L Stainless)	Wall or Rack Mount	Single Door	3-Point Latch	Continuous Hinge	Well PW-1 Control Panel SCADA RIO-W1
CP-W2	Ordinary (Unclassified)	Type 4X (316L Stainless)	Wall or Rack Mount	Single Door	3-Point Latch	Continuous Hinge	Well PW-2 Control Panel SCADA PLC-W2
CP-W3	Ordinary (Unclassified)	Type 4X (316L Stainless)	Wall or Rack Mount	Single Door	3-Point Latch	Continuous Hinge	Well PW-3 Control Panel SCADA RIO-W3
PW-1 Indicator Panel	Ordinary (Unclassified)	Type 4X (304 Stainless, with Observation Window)	Wall or Rack Mount	Single Door	¼ Turn Latches	Hidden Hinges	Well PW-1 Instrument Indicator Panel (No Heater Req'd)
PW-2 Indicator Panel	Ordinary (Unclassified)	Type 4X (304 Stainless, with Observation Window)	Wall or Rack Mount	Single Door	¼ Turn Latches	Hidden Hinges	Well PW-2 Instrument Indicator Panel (No Heater Req'd)
PW-3 Indicator Panel	Ordinary (Unclassified)	Type 4X (304 Stainless, with Observation Window)	Wall or Rack Mount	Single Door	¼ Turn Latches	Hidden Hinges	Well PW-3 Instrument Indicator Panel (No Heater Req'd)

Note 1: Unless specified elsewhere, all ICPs are required to have a heater for freeze protection and to reduce condensation in the panel when installed outside or in an unconditioned building.

-END-

SECTION 13441 – MISCELLANEOUS CONTROL PANEL COMPONENTS

PART 1 - GENERAL

1.01 Summary

- A. This specification covers the technical requirements for control panel components for Process Instrumentation and Control Systems.
- B. Related Sections:
 - 1. Section 13431 – Control Panel Design and Construction
 - 2. Section 13450 – Modular Programmable Logic Controllers
 - 3. Section 13455 – SCADA Local Area Network (LAN) Equipment

1.02 References

- A. IEC: International Electrotechnical Commission
- B. ISA: International Society of Automation
- C. NEC: National Electric Code
- D. NEIS: National Electrical Installation Standards
- E. NFPA 70: National Fire Protection Association
- F. NRTL: Nationally Recognized Testing Laboratory
- G. OSHA: Occupational Safety and Health Administration
- H. UL: Underwriters Laboratories

1.03 Submittals

- A. Submittals shall comply with the Contract Documents. Shop drawings and descriptive data shall be submitted complete, in a single submittal.
- B. Submit in accordance with the following specification sections:
 - 1. Section 01300: Submittals
 - 2. Section 13400: Measurement and Control Instrumentation
- C. Product Data:
 - 1. Catalog literature and product specifications for submitted hardware.

- D. Shop Drawings shall include the following:
 - 1. Installation and assembly drawings and specifically prepared technical data for panels and enclosures submitted.
 - 2. Other descriptive information that will assist the Engineer with assessment of the shop drawings.
 - 3. Interface terminations and cable data for all components.
 - 4. Detailed bill of materials with manufacturer's part numbers for all components.
- E. See Section 13450 for additional submittal requirements for panels and enclosures that include programmable logic controllers.
- F. Operation and Maintenance (O&M) Data:
 - 1. Provide in accordance with Section 01300.
 - 2. Operating instructions and maintenance data for materials and products for inclusion in O&M Manual.
 - 3. Manufacturer's written instructions for periodic test/calibration/cleaning for instrumentation and controls in service.

1.04 Quality Assurance

- A. Manufacturer Qualifications: Firms experienced in manufacturing instrumentation of types and capacities indicated that have record of successful in-service performance.
- B. Devices shall be latest and most modern design at time of bidding.
- C. As much as possible devices shall be products of one manufacturer to achieve standardization for maintenance, spare parts, operation, and service.

PART 2 - PRODUCTS

2.01 General

- A. The SCADA Control System Integrator (CSI) and Control Panel Fabricator shall be responsible for all accessories, including interposing relays, analog signal isolators, terminal blocks, power distribution blocks, grounding blocks, fuse blocks and fuses, circuit breakers, duplex receptacle, heaters, exhaust fans, louvers and filters, DIN mounting rails, plastic wiring channels, hardware, wire tags, engraved nameplates, and all such accessories needed for a professional class panel fabrication.

2.02 Terminal Blocks

- A. Manufacturer:
 - 1. Phoenix Contact
 - 2. Weidmuller
 - 3. Or Equal

- B. High density modular types, constructed of nylon material.
- C. Termination type shall be tubular screw with serrated pressure plate.
- D. All current carrying parts (metal bodies) shall be made of nickel/tin-plated copper.
- E. 300 v rating for 120 v circuits and below, 600 v rating for 480 v circuits.
- F. Isolating end caps for each terminal.
- G. Identification on both terminals.
- H. Clip-mounted on DIN rail.
- I. Accepts AWG 12 to 22.
- J. Feed-through Terminals:
 - 1. 20 Amp rating
- K. Switched Terminals:
 - 1. Knife disconnect with test sockets.
 - 2. 10 Amp rating.
- L. Fused Terminals:
 - 1. Hinged fuse removal/disconnect.
 - 2. 10 Amp rating.
 - 3. Include blown fuse indication.
- M. Ground terminals shall be color coded in accordance with international standard, which shall be yellow/green.
- N. Matching jumper bridges shall be color coded to the wiring colors.

2.03 Control Relays

- A. Manufacturer
 - 1. Allen Bradley
 - 2. Potter and Brumfield
 - 3. Idec
 - 4. Magnecraft
 - 5. Square D
 - 6. Or Equal
- B. Operating Data
 - 1. Pickup Time: 13 ms maximum
 - 2. Dropout Time: 10 ms maximum

3. Operating Temperature: -45°F to 150°F

C. AC Coil

1. 120V AC.
2. Continuous rated
3. 3.5 VA inrush maximum
4. 1.2 VA sealed, maximum
5. 50-60 Hz
6. Minimum Dropout Voltage: 10% of coil rated voltage

D. DC Coil

1. 24V DC
2. Continuous rated
3. Minimum Coil Resistance:
 - a. 24V DC: 450 ohm

E. Contacts

1. Gold flashed fine silver, gold diffused for 1 amp or less resistive load
2. Silver cadmium oxide
3. 3 form C
4. 300V AC
5. 10-amp make, 1.5-amp break, (inductive)

F. Relays shall have as a minimum two pole, double throw contacts (2PDT).

G. Rated at 10 million operations minimum

H. DIN rail mountable

I. Enclosed and protected by polycarbonate cover

J. Visible indication of energized coil

K. Provide relay-retaining clips.

L. Provide at a minimum 20% spare wired control relays

M. Provide a control relay to monitor utility power (control power relay).

2.04 DC Power Supplies

A. Manufacturer:

1. Phoenix Contact
2. Sola/Hevi-Duty
3. Pulsa
4. Or Equal

B. General

1. The enclosure vendor shall be responsible for providing and sizing all instrument loop power supplies. The instrument loop power supplies shall be sized to include at least 100% spare capacity. The enclosure vendor shall submit power supply load calculations with the panel shop drawings.
2. Power supply shall be fully enclosed and provide screw terminations. All wiring points and plug connections shall be "touch safe" with no live voltages that can make contact with a misplaced finger in accordance with IEC 529. Housing shall be at IP20 or equal minimum.
3. Power Supplies shall have an efficiency of at least 80%.
4. The power shall have an MTBF (Mean Time Between Failures) greater than 500,000 hours according to IEC 1709.
5. The power supply shall be able to withstand shock of 15G in all space directions according to IEC 68-2-27 and vibration up to 2.3G 90 min. (<15hz, amplitude = +/-2.5mm/15-150hz) according to IEC 68-2-6.
6. Power supplies shall be UL listed to allow the use of the power supply at full rated output amperage with no "de-rating".

C. Equipment

1. Redundant power supplies shall be utilized.
2. Nominal current rating to be based on an operating temperature of 60°C or higher
3. Power supplies shall have a visible "DC Power OK" indicator. This indicator will flash when the output drops below 10% of the adjusted output voltage.
4. Ambient temperature range for operation shall be at least -25°C to +70°C
5. Residual ripple shall not exceed 100 mV peak to peak at nominal current values
6. Integral "fine" surge suppression shall be incorporated into the power supply
7. Power supplies shall conform to CE electromagnetic compatibility as described in EN61000-6-2 and EN50081-2.
8. Power supplies shall have means of limiting DC current in case of short circuit or an overload and shall automatically reset themselves when the fault is corrected.
9. Power supplies when wired in parallel will not require external circuitry.
10. Power supplies shall have a voltage monitoring relay contact and signaling output.
11. Input must auto-range between 85 to 264VAC and 90 to 350VDC for 1 phase power supplies with no manual intervention.

D. Mounting

1. All power supplies shall have integral metal mounting foot to attach to 35mm DIN-rail conforming to DIN EN50022.

E. Wire Connections:

1. Attach wires to the power supplies by means of a cable-clamping terminal block activated by a screw. Connections shall be gas-tight, and the terminal block shall be fabricated with non-ferrous, non-corrosive materials.

2. Wire connection for currents less than 20A shall use pluggable terminals on both input and output ends.
3. Pluggable terminals shall accept wire sizes 24 through 14 AWG.

2.05 Electronic Current Isolator

A. Manufacturer

1. Phoenix Contact Model MCR Series.
2. PR Electronics.
3. Or Equal

B. Solid state instrument to electrically isolate one instrument loop from another instrument loop. Converter to accept 4-20 mA DC input signal and provide equal but isolated and power-boostered output.

C. Mounting: DIN Rail

D. Temperature compensated, calibration-free

E. Input: 4-20 mA DC into 50 ohms

F. Output: 4-20 mA DC into output load up to 500 ohms

G. Isolation: Common mode up to 700Vac between input and output

H. Accuracy: 0.5% of span

I. Provide power supply specific to isolator

J. All analog input wiring within the same building as the control panel shall be provided with analog isolators within the control panel.

K. Provide at a minimum 20% spare wired isolators

2.06 Surge Protection Device

A. Manufacturer

1. MTL Surge Technologies SD Series
2. Citel DLA Series
3. Or Equal

B. Surge protection device that protects electronic equipment and system against surges on signal and I/O cabling.

C. Mounting: DIN Rail

D. Input: 4-20 mA DC

E. Output: 4-20 mA DC

- F. Nominal Line Voltage: 24VDC
- G. Nominal discharge current: 5kA
- H. Maximum discharge current: 20kA
- I. All analog input wiring coming into the building shall be provided with surge protection within the control panel.

2.07 Surge Protectors

A. Manufacturer

- 1. Islatrol - IE-100 series
- 2. SOLA STFE Elite Series
- 3. Allen Bradley
- 4. Or Equal

B. High frequency noise filter/surge protector to protect control panel incoming power supply.

C. Wire to protect specified microprocessor-based process control system devices including:

- 1. PLC
- 2. Ethernet Switches
- 3. HMI
- 4. Radio
- 5. All other microprocessor-based equipment located in or powered from PLC Panel

D. Input power

- 1. 120V AC
- 2. 47-63 Hz

E. Peak surge current: Minimum 10,000-amp line-neutral, line to ground, and neutral to ground.

F. Frequency response

- 1. Normal mode: 90 dB max, 100 kHz to 50 MHz
- 2. Common mode: 60 dB max, 5 MHz to 50 MHz

G. Response time

- 1. < 0.5 ns normal mode
- 2. <5 ns common mode

- H. Transient protection per IEEE C62.41
 - 1. Category A Ringwave (6kV, 200A, 100 MHz): < 60 V peak
 - 2. Category B Ringwave (6kV, 500A, 100 MHz): < 100 V peak
- I. LED status indicator
- J. Form C contact for remote status indication

PART 3 - EXECUTION

3.01 Installation

- A. Install and wire in accordance with equipment/instrument manufacturer's written instructions, approved submittals, applicable requirements of the NEC, NEIS, and recognized industry practices.

3.02 Equipment Identification and Wire Tagging

- A. All equipment and wiring identifications shall conform to and be compatible with the Owner's current labeling system and shall be completed prior to final acceptance of the work. It is the responsibility of the Contractor to coordinate with the Owner's Engineer all labeling standards and documentation.
- B. All control wiring shall be identified by means of computer-generated, heat shrink type wire marker. Wire numbers shall be as shown on the drawings.
- C. Each component mounted within the enclosure shall be provided with equipment identification. Equipment and device nameplates or identification shall be of engraved laminated plastic, with black lettering on white background. Nameplates shall be as listed herein or as shown on the project Drawings.

-END-

SECTION 13450 – MODULAR PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.01 Summary

- A. This Section describes the hardware required for a Modular Programmable Logic Controller (PLC) system.
- B. Related Sections
 - 1. Section 13431 – Control Panel Design and Construction
 - 2. Section 13455 – SCADA Local Area Network (LAN) Equipment

1.02 References

- A. IEC: International Electrotechnical Commission
- B. NEC: National Electric Code
- C. NEIS: National Electrical Installation Standards
- D. NFPA 70: National Fire Protection Association
- E. NRTL: Nationally Recognized Testing Laboratory
- F. OSHA: Occupational Safety and Health Administration
- G. UL: Underwriters Laboratories

1.03 Abbreviations

- A. DLR: Device Level Ring
- B. I/O: Input / Output
- C. PLC: Programmable Logic Controller
- D. RIO: Remote IO Device

1.04 System Description

- A. Modular PLC system including power supply, controller, I/O cards, communication cards, and all appurtenances for a complete system.

1.05 Submittals

- A. Submittals shall comply with the Contract Documents. Shop drawings and descriptive data shall be submitted complete, in a single submittal.

B. Product Data:

1. Catalog literature and product specifications for submitted hardware
2. Dimensional data of PLC equipment
3. Interface terminations and cable data for each module
4. Hardware manuals (4 sets)
5. Software manuals (4 sets)
6. Detailed bill of materials with manufacturer's part numbers for each chassis

C. Shop Drawings shall include the following:

1. Wiring Diagrams: Show control connections and distinguish between factory-installed and field-installed wiring
2. Addressing system and card layout, including special configuration rules and limitations for each rack
3. Installation and assembly drawings and specifically prepared technical data for hardware
4. Detailed calculations, including power supply sizing calculation
5. Other descriptive information that will assist the Engineer with assessment of the shop drawings

D. Operation and Maintenance (O&M) Data:

1. Provide in accordance with Section 01300
2. Operating instructions and maintenance data for materials and products for inclusion in O&M Manual
3. Manufacturer's written instructions for periodic replacement of any backup batteries used on equipment including estimated battery replacement calendar dates

1.06 Quality Assurance

- A. Items provided under this section shall be listed or labeled by Underwriters Laboratories Inc. (UL) or other Nationally Recognized Testing Laboratory (NRTL).
1. Term "NRTL" shall be as defined in Occupational Safety and Health Administration (OSHA) Regulation 1910.7
 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code (NEC), Article 100

1.07 Delivery, Storage, and Handling

- A. Deliver equipment and system components to their final location in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage. Remove protection only after equipment is made safe from such hazards and ready to install.
- B. Store items in a clean, dry, secure location.

1.08 Maintenance

- A. Extra Materials: Furnish extra materials matching products installed, as described below, packaged with protective covering for storage, dated, and identified with labels describing contents.
 - 1. Two shelf spares for each type of I/O module used on project
 - 2. One shelf spare for each type processor used on project
 - 3. One shelf spare for each type power supply used
 - 4. One shelf spare for each type nonvolatile storage device used

PART 2 - PRODUCTS

2.01 Manufacturer

- A. Rockwell Automation
- B. No Substitute Permitted
- C. Programmable Logic Controller System hardware shall be from single manufacturer unless noted otherwise

2.02 Processor

- A. 5069-L306ER / 5069-AENTR
 - 1. At minimum, provide 5069-L306ER processor for PLC-W2 location.
 - 2. At minimum, provide 5069-AENTR remote I/O for RIO-W1 and RIO-W3 locations.
- B. Characteristics (5069-L306ER):
 - 1. User Memory: 0.6 MB
 - 2. Secure Digital Memory Card: 2 GB (optional, required)
 - 3. Communication Ports: 2x Ethernet/IP ports, 1x USB
 - 4. Module expansion capacity: 8 Local I/O modules and 16 Ethernet nodes
 - 5. Memory retention: Internal energy storage (no battery)

2.03 Power Supply: integrated into 5069 PLC chassis.

2.04 I/O Modules

- A. I/O modules specifically designed for interfacing of I/O signals to PLC processor.
- B. Include sufficient I/O modules to accommodate I/O with provisions for 20% spare I/O prewired to terminal strips.
- C. Digital Input:
 - 1. 16 points per module

2. 24V DC sink/source
3. LED indication of on/off status of each point
4. 5069-IB16

D. Relay Output:

1. 4 points per module, individually isolated relay contacts
2. 2A contact rating
3. 5 - 250VAC 50/60HZ, 5-30VDC
4. LED indication of on/off status of each point
5. 5069-OW4I

E. Digital Output:

1. 16 points per module
2. 24V DC source
3. LED indication of on/off status of each point
4. 5069-OB16

F. Analog Input:

1. 8 inputs per module
2. Differential inputs
3. Accepts 0-20 mA DC, 4-20mA DC, and +/-10V DC
4. Include signal isolators in the control panel as required
5. 5069-IF8

G. Analog Output:

1. 8 outputs per module
2. Differential
3. Transmits 0-20 mA DC, 4-20 mA DC, +/- 10V DC
4. 5069-OF8

H. Address Reserve Module:

1. 45mA @ 18 – 32V DC MOD Power
2. 5069-ARM

I. Field Potential Distributor

1. 9.99 A @ 0-32V DC
2. 9.975 A @ 0-240V AC, 47-63 Hz
3. 5069-FPD

J. EtherNet/IP Adapters (Remote I/O Adapter)

1. Communication Rates: 10 Mbps, 100 Mbps, 1 Gbps
2. Linear Network and DLR Protocol Supported
3. Protected Mode Implicit
4. 5069-AENTR or 5069-AENTRK (Conformal Coated)

PART 3 - EXECUTION

3.01 Installation

- A. Install hardware and wiring in accordance with equipment manufacturer's written instructions, approved submittals, applicable requirements of the NEC, NEIS, and recognized industry practices.
- B. Analog I/O shall use specialty field terminal blocks specifically designed for 4-20mA signal wiring.
- C. Provide analog isolators for all analog inputs contained within the building.
- D. All analog signal wiring coming into the building shall be provided with surge protection at the control panel: SD Series by MTL Surge Technologies, Citel DLA Series or equal.

SCHEDULE A – PLC TYPES

Tag	Location	PLC Type	Provided Under
RIO-W1	Well PW-1 Control Panel (CP-W1)	5069-AENTR	Div 13
PLC-W2	Well PW-2 Control Panel (CP-W2)	5069-L306ER	Div 13
RIO-W3	Well PW-3 Control Panel (CP-W3)	5069-AENTR	Div 13

-END-

SECTION 13455 – SCADA LOCAL AREA NETWORK (LAN) EQUIPMENT

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

1. Requirements of Plant-Wide Industrial Control Network and associated equipment. Network Equipment to be provided within remote station control panels is also included in this section.

B. Related Sections:

1. Section 13431 Control Panel Design and Construction
2. Section 16780 Video Surveillance Systems

1.02 System Description

A. Design Requirements:

1. Industrial Control Network (ICN):
 - a. Provide high speed link between PLCs and the SCADA System to allow sharing of real-time data.
 - b. Provide expandable system to accommodate addition of future equipment as specified elsewhere.
 - c. Provide couplers, terminators, junction boxes, and other associated cable connectors.
 - d. Provide cabling suitable for conduit routing as shown elsewhere.
 - e. Automation Network between buildings shall be Fiber Optic (100Base-LX).
 - 1) Provide Fiber Optic Patch Panels (FOPPs) within Network Cabinet adjacent PLC control panels.
 - 2) For instances where Network Cabinets do not exist adjacent to PLC Control Panels, FOPPs shall be installed within the Control Panel.
 - 3) Maximum distance between building nodes (fiber) 550 meters.
 - f. Automation Network within buildings shall be CAT6 UTP, 10/100/1000 Base-T(X).
 - 1) Maximum distance between intra-building nodes (CAT6): 100 meters.
 - g. Provide ICN Ethernet switches within PLC panels or Network Cabinets as indicated in the Schedule at the end of this section.
2. Refer to Section 16780 – Video Surveillance Systems for cameras required for this installation.

1.03 Submittals

A. In addition to requirements of Section 13400, provide following:

1. Product data cut sheets and catalog literature.
2. Shop Drawings:
 - a. Cable routing drawings for the ICN.

- b. Cable termination detail drawings.
- c. Location and function of all communications module types.

1.04 Maintenance

A. Extra Materials:

- 1. Two (2) of each type of SFP module, coupler, terminator, junction box, and connector.
- 2. One (1) spare network switch of each type as detailed below.
- 3. One (1) spare Ethernet-to-Fiber Media Converter module.

PART 2 - PRODUCTS

2.01 SCADA 1Gbps Switch

A. Manufacturers:

- 1. Allen-Bradley Stratix 5200 Series
- 2. Moxa EDS-510A-3SFP Series
- 3. Or Engineer Approved Equal

B. Features:

- 1. Managed Layer 2 Industrial Ethernet Switch
 - a. Reference Model Number: 1783-CMS10DP, for 2 SFP Slots
 - b. Reference Model Number: EDS-510A-3SFP, for 3 SFP Slots
- 2. Refer to the ICN Switch Schedule at the end of this Section for port type(s), quantity, and other important parameters.
- 3. Environmental Specifications
 - a. Operating Temperature: (Refer to Schedule for switches that require Extended Temperature capability)
 - 1) Standard: -10° to 60°C
 - 2) Extended: -40° to 75°C
 - b. Rugged Industrial DIN-Rail Enclosure, IP30 Protection
- 4. Command Line Interface (CLI) for quickly configuring major managed functions
- 5. IPv6 Ready logo awarded (IPv6 Logo Committee certified)
- 6. IEEE 1588 PTP V2 (Precision Time Protocol) for precise time synchronization of networks
- 7. DHCP Option 82 for IP address assignment with different policies
- 8. Support EtherNet/IP and Modbus/TCP protocols for device management and monitoring
- 9. Turbo Ring and Turbo Chain (recovery time < 50 ms @ 250 switches), RSTP/STP, and MSTP for network redundancy
- 10. IGMP snooping and GMRP for filtering multicast traffic
- 11. Port-based VLAN, IEEE 802.1Q VLAN, and GVRP to ease network planning
- 12. QoS (IEEE 802.1p/1Q) and TOS/DiffServ to increase determinism
- 13. Port Trunking for optimum bandwidth utilization

14. TACACS+, SNMPv3, IEEE 802.1X, HTTPS, and SSH to enhance network security
15. SNMPv1/v2c/v3 for different levels of network management
16. RMON for efficient network monitoring and proactive capability
17. Bandwidth management prevents unpredictable network status
18. Lock port function for blocking unauthorized access based on MAC address
19. Port mirroring for online debugging
20. Automatic warning by exception through e-mail, relay output
21. ABC-02-USB (Automatic Backup Configurator) for system configuration backup/restore and firmware upgrade

C. Interface and Power Requirements

1. RJ45 Ports: 10/100/1000BaseT(X) auto negotiation speed, Full/Half duplex mode, and auto MDI/MDI-X connection
2. SFP Slots: Small Form-factor Pluggable Slots for SFP Modules as specified
 - a. Reference Model Number: 1783-SFP100LX
 - b. Reference Model Number: SFP-1GLXLC
3. USB Ports
 - a. USB console port (Type B connector)
 - b. USB storage port (Type A connector)
4. DIP Switches: Turbo Ring, Master, Coupler, Reserve
5. Alarm Contact: Relay output with current carrying capacity of 1 A @ 24 VDC
 - a. Digital Input: 24 VDC, max. input current: 8 mA
6. Power Requirements: 24 VDC, Redundant Dual Inputs

2.02 Small Form-factor Pluggable (SFP) Modules

A. Manufacturers:

1. Allen-Bradley 1783-SFP100LX
2. Moxa SFP-1GLXLC
3. Or as required per switch manufacturer

B. Features:

1. Fiber Optic Transceiver
2. Refer to the ICN Switch Schedule at the end of this Section for type and quantity of SFP Modules required for each switch.
3. Digital Diagnostic Monitor Function
4. IEEE 802.3z compliant
5. Differential LVPECL inputs and outputs
6. TTL signal detect indicator
7. Environmental Specifications
 - a. Operating Temperature: (Refer to Schedule for SFP modules that require Extended Temperature capability)
 - 1) Standard: 0° to 60°C
 - 2) Extended: -40° to 85°C
8. Transceiver Details
 - a. Speed: Gigabit (1 Gbps)

- b. Type: Single-Mode
- c. Wavelength: 1310nm

C. Interface

- 1. Hot pluggable LC duplex connector
- 2. Fiber Type: OS2
 - a. Core/Cladding: 125/242 μm

2.03 Camera PoE Switch

A. Manufacturers:

- 1. Linovision
 - a. POE-SWR608G for 4 SFP Slots
 - b. POE-SW508G for 2 SFP Slots
- 2. Or Engineer Approved Equal

B. Features

- 1. Network Standard: IEEE802.3bt Power over Ethernet (PoE++)
 - a. PoE++ is required at Well 1 and Well 3.
 - b. PoE++ is preferred at Well 2. However, PoE+ is acceptable.
- 2. Each port up to 30W PoE, total 180W PoE power, minimum.
- 3. Din-Rail Mountable
- 4. IP40 Metal case

C. Interface and Power Requirements

- 1. RJ45 Ports: Eight (8) 10/100/1000Base-T RJ45 auto-MDI/MDI-X ports
- 2. SFP Ports: Refer to the ICN Switch Schedule at the end of the Section for type and quantity of SFP Modules required for each switch.
- 3. Power Requirements: 48-56VDC, Power adapter included (100-240VAC Input, 48VDC, 2.5A, 120W Output)

D. Small Form-factor Pluggable (SFP) Modules

- 1. Manufacturers
 - a. Linovision, SFP-GE-LX-20
 - b. Or as required per switch manufacturer
- 2. Features
 - a. SFP Optical Transceiver
 - b. Refer to the ICN Switch Schedule at the end of this Section for type and quantity of SFP Modules required for each switch.
 - c. Digital Diagnostic Monitor Function
 - d. Environmental Specifications
 - 1) Operating Temperature: -22°F to 149°F
 - 2) Suitable for harsh working environments
 - e. Transceiver Details
 - 1) Speed: 1.25 Gbps
 - 2) Type: Single-Mode

- 3) Wavelength: 1310nm
- 3. Interface
 - a. Hot pluggable LC duplex connector
 - b. Fiber Type: OS2
 - 1) Core/Cladding: 125/242 μm

2.04 Fiber Optic Connector Assemblies

- A. All fiber optic connector assemblies shall use high quality connectors of the appropriate type to interface with provided equipment.
- B. Assemblies shall utilize a PC finish on the tip of the fiber to provide high yield during splicing, and to meet EIA and IEC standards for repeatability.
- C. All connectors that are metallic in nature shall be corrosion proof and shall withstand minimum of 0.75 microns of corrosion per year.

2.05 Fiber Termination Housings (FOPP)

- A. Fiber termination housings that can be mounted inside a PLC enclosure or Network Cabinet do not require NEMA rating.
- B. Type LC Duplex connector panels shall be supplied for all fibers that enter the termination housing.
- C. Enclosure shall be Corning, SPH-01P or equal.

2.06 Single Mode Fiber Patch Cords

- A. The fiber patch cord shall consist of buffered, graded-index fiber with a 9-micron core and a 125-micron cladding for single-mode cords. The fiber cladding shall be covered by aramid yarn and a jacket of flame-retardant PVC.
- B. Specifications:

Mated Connector Loss	$\mu = 0.3 \text{ dB}, \sigma = 0.2 \text{ dB}$
Operating temperature	-4° to 158° F (-20 to 70° C)
Cable Retention	50 lb. (220 N) minimum
Connection Repeatability	0.20 dB maximum change per 100 reconnects
Operating temperature	-4° to 158° F (-20 to 70° C)

- 1. ISO 9001 Certified Manufacturer
- 2. Lucent Technologies, Panduit, or equal
- 3. Provide a minimum number of patch cords to connect proposed network electronics to the structured cabling system plus one patch cord for each switch as spare in lengths capable of reaching the network electronics in the cabinets.

- 2.07 Fiber Optic cable for Automation Network
- A. Fiber optic cable shall be Corning Armored 12 Strand 9/125 Single-Mode OS2 or equal.
1. All fiber optic cable shall be installed in conduit.
- 2.08 Enhanced CAT6 UTP Cable
- A. 4 pair Category 6 cables to conform to TIA/EIA 568A Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and UL LAN Certification and Follow-up Program. Cables shall be marked as UL verified Category 6.
- 2.09 UTP Patch Cords for Equipment Enclosures
- A. Provide Category 6 Modular Patch Cords as follows:
1. Power sum rated.
 2. Patch cords shall not exceed 3 feet in length unless specifically required for application.
 3. Conform to the requirements of EIA/TIA 568B Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and UL LAN Certification and Follow-up Program.
 4. Equipped with molded 8 pin modular connector (RJ45, 8x8) on each end and conform to the length(s) specified on the detailed drawing.
 5. Round, and 24-AWG copper, stranded conductors, tightly twisted into individual pairs.
 6. Built-in exclusion features to prevent accidental polarity reversals and split pairs.
- B. UL Verified for EIA/TIA 568B Electrical Performance
- C. UL and c (UL) Listed for Fire Safety
- D. ISO 9001 Certified Manufacturer
- E. Austel Approved
- F. FCC Compliant
- G. Lucent Technologies, Panduit, or equal.
- 2.10 Industrial Ethernet-to-fiber media converter
- A. MOXA IMC-101-S-SC-T or equal
1. Optical Fiber: 9/125 μm , 100BaseFx, Single-Mode
 2. Interface:
 - a. RJ45 Port: 10/100BaseT(X)
 - b. Fiber Port: 100BaseFX (SC)

- c. Alarm Contact: One relay output (1 A @ 24 VDC)
- 3. Metal, DIN-rail mountable, with IP30 protection
- 4. Power: 12 to 45 VDC, redundant inputs
- 5. Operating Temperature: WIDE (-40 to 167°F)

PART 3 - EXECUTION

3.01 Installation

- A. Fiber optic patch cables to be provided as part of Division 13 per the drawings.
- B. Install and wire in accordance with SCADA CSI's and/or Equipment manufacturer's written instructions and approved submittals, applicable requirements of the NEC, NECA "Standard of Installation", and recognized industry practices.
- C. SCADA CSI to configure and setup all managed switches to provide a robust, fault tolerant, secure network. Coordinate desired functionality with Owner and Engineer.
- D. Relay warning output from switch shall be wired to PLC input for monitoring.

SCHEDULE A – INDUSTRIAL CONTROL NETWORK SWITCH

Switch Label	Location	Switch / Device Type	Ring Capable	Extended Temp.	Copper Ports		SFP Modules for SM Fiber		PoE Ports	
					100 Mbps	1 Gbps	100 Mbps	1 Gbps	PoE+	PoE++
SW-W1	CP-W1	SCADA L2 Managed	N	Y		6		2		
SW-W2	CP-W2	SCADA L2 Managed	N	Y		6		3		
SW-W3	CP-W3	SCADA L2 Managed	N	Y		6		2		
SW-CAM1	CP-W1	Camera PoE	N	Y				2		4
SW-CAM2 (Note 1)	CP-W2	Camera PoE	N	Y				3	4	
SW-CAM3	CP-W3	Camera PoE	N	Y				2		4

Note 1: PoE++ is preferred, however, PoE+ is acceptable.

-END-

SECTION 13456 – UNINTERRUPTIBLE POWER SUPPLY (UPS)

PART 1 - GENERAL

1.01 Summary

- A. Section Includes: UPS equipment
- B. Items specified in this section shall conform to general requirements of Section 13400.
- C. All Industrial Control Panels (Enclosures) that house a PLC, HMI, and/or Radio equipment shall include a UPS as specified in this Section.
- D. All SCADA computers, HMIs, and network hardware devices shall be protected by a UPS as specified in this Section.

1.02 Submittals

- A. In addition to submittal requirements of Section 13400, provide:
 - 1. Load sizing data for equipment connected to UPS for each installation
 - 2. Descriptive literature and catalog cut sheets
 - 3. Installation details

1.03 Project/Site Conditions

- A. Input power: 120VAC utility grade power

PART 2 - PRODUCTS

2.01 UPS Equipment

- A. Manufacturer
 - 1. Vertiv Liebert
 - 2. APC by Schneider Electric
 - 3. Alpha Technologies
 - 4. MGE Pulsar Evolution
 - 5. CyberPower
 - 6. Or Equal.

2.02 Equipment

- A. This Specification details requirements for Uninterruptible Power Supplies with three distinct form factors. Physical location and type of load being protected determine which UPS form factor shall be provided.
1. Control Panel UPS
 - a. Located within industrial control panels
 - b. Protected loads are PLCs and associated equipment, or other critical equipment in control panels
 - c. Vertiv Liebert, model number GXT5-500LVRT2UXL
 2. Desktop Computer UPS
 - a. Located adjacent to protected equipment, usually not in an enclosure
 - b. Protected loads are desktop computers, printers, or other appurtenances
 - c. APC Back-UPS Pro, model number BR1000MS, BR1350MS
 3. Rackmount Equipment UPS
 - a. Located within networking equipment cabinet (typ. 19" rack mount)
 - b. Protected loads are rack mount computers and/or network switches and other rack mounted equipment
 - c. APC Smart UPS, SMT1500RM2UC
- B. Requirements common to all three UPS form factors
1. Provided UPS must be Line Interactive and provide a True Sine Wave output.
 2. Maintain output frequency at 60Hz +/- 3 Hz
 3. Output Voltage Distortion (Full Load)
 - a. Less than 2% for 100% linear loads
 - b. Less than 8% for 100% non-linear loads
 4. UPS shall supply power to PLC, HMI, Ethernet Switches, DC power supplies, field instruments, and other low voltage control devices as specified and as shown on Drawings and Plans.
 5. Size for 75% of connected electrical load or "Minimum Output Capacity" as indicated in the schedule below, whichever is greater.
 6. UPS shall have enough capacity to power devices after the utility power has failed for a period of time indicated in the schedule below. Provide with extended battery module(s) if needed to meet this requirement.
- C. Additional requirements for the Control Panel UPS form factor
1. Operating Temperature
 - a. For indoor enclosures in an air conditioned area, the standard battery is acceptable (-S SKUs): +32 to 104 Deg. F
 - b. For all outdoor enclosures, indoor enclosures that are NOT in an air conditioned area, or enclosures where the interior temperature is calculated to rise above 100 Deg. F, the high temperature battery option is required (-H SKUs): +32 to 122Deg. F.

PART 3 - EXECUTION

3.01 Preparation

- A. Condition power as required to provide stable process control system operation.

3.02 Installation

- A. Install and wire in accordance with SCADA Control System Integrator's and/or Equipment Manufacturer's written instructions.

- B. Install internal to PLC Panel or adjacent to equipment that is being protected.

- 1. Control Panel UPS can be installed in one of the following configurations:
 - a. Preferred UPS installation will be mounted to the control panel backplane.
 - b. UPS can be mounted to the bottom of the control panel. This should not impede access to wire trays, conduit penetrations, or any devices below or behind the UPS.
 - c. UPS can be mounted to the enclosure door, so that when the door is opened the UPS is not in the way. Do not exceed load bearing limit of the enclosure door or door hinges. (not preferred, but is acceptable if no other option exists)
- 2. UPS must not block access to components on the backpanel.
- 3. Conduits for wiring typically enter enclosures from the bottom of the enclosure. If the UPS sits on the bottom of the enclosure, ensure there is enough panel depth for conduits to enter.
- 4. Final installations that have the UPS sitting on top of wiring or conduit entry points will not be accepted.

- C. Protect UPS from the environment at a level equal to or greater than equipment being protected.

- 1. Do not place UPS on top of PLC enclosure.
- 2. If the PLC is in a Type 4X enclosure, UPS shall be in same enclosure or separate enclosure of the same rating.
- 3. In offices where UPS is providing backup power for computers and computers are not in enclosures, it is acceptable for UPSs to be in the open as well.

SCHEDULE A – UPS

TAG	Location	Form Factor	Minimum Runtime	Minimum Output Capacity	Additional Requirements
UPS-W1	Well PW-1 Control Panel (CP-W1)	Control Panel	20 min.	500 VA	
UPS-W2	Well PW-2 Control Panel (CP-W2)	Control Panel	20 min.	500 VA	
UPS-W3	Well PW-3 Control Panel (CP-W3)	Control Panel	20 min.	500 VA	

-END-

SECTION 13482 – SCADA AND CONTROL SYSTEMS - I/O LIST

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. SCADA System hard-wired PLC I/O and programming parameters.
2. I/O Listings for SCADA PLCs.

B. Related Sections

1. Section 13400, Measurement and Control Instrumentation
2. Section 13491, SCADA System - Configuration Services

C. Abbreviations and References

1. I/O: Inputs/Outputs
2. PLC: Programmable Logic Controller

PART 2 - SERVICES

2.01 I/O List Definitions

A. TYPE is defined as one of following:

1. DI Designates Discrete (Digital) Input
2. DO Designates Discrete (Digital) or Relay Output
3. AI Designates Analog Input
4. AO Designates Analog Output

B. INSTRUMENT TAG # is the field tagname given to the I/O point as designated on the Drawings.

1. This list is not to be considered a comprehensive list of tag names.

C. EQUIPMENT ID # describes associated equipment.

1. Shop Submittals for PLC Drawings shall have Instrument Tag Names and Equipment ID numbers as described on Process and Instrumentation Diagram (P&ID) Drawings.

Schedule 1 – RIO-W1

The following table lists I/O details for the SCADA Well PW-1 Remote I/O.

Equipment Tag #	Instrument Tag #	Equipment Signal	DI	DO	AI	AO	Signal Detail
	LT-0100	Well PW-1 Level Transmitter			1		Level
	FIT-0101	Well PW-1 Flow Meter			1		Flow
	PIT-0102	Well PW-1 Pressure Transmitter			1		Pressure
	ZSC-0103	Well PW-1 Control Panel Intrusion Switch	1				Intrusion
	ZSC-0104	Well PW-1 VFD Enclosure Intrusion Switch	1				Intrusion
	TSL-0105	Well PW-1 VFD Enclosure Temperature Switch	1				Temp Low
VFD-W1		Well Pump PW-1 VFD	3	1	1	1	Running, Fail, In Remote, Run Command, Speed Command, Speed Feedback
		Control Panel Power	1				Power OK
SW-W1		Ethernet Switch	1				Alarm

Schedule 2 – PLC-W2

The following table lists I/O details for the SCADA Well PW-2 PLC.

Equipment Tag #	Instrument Tag #	Equipment Signal	DI	DO	AI	AO	Signal Detail
	LT-0200	Well PW-2 Level Transmitter			1		Level
	FIT-0201	Well PW-2 Flow Meter			1		Flow
	PIT-0202	Well PW-2 Pressure Transmitter			1		Pressure
	PIT-0203	Water Main Pressure Transmitter			1		Pressure
	ZSC-0204	Well PW-2 Control Panel Intrusion Switch	1				Intrusion
	ZSC-0205	Well PW-2 VFD Enclosure Intrusion Switch	1				Intrusion
	ZSC-0206	Well PW-2 Power Panel Intrusion Switch	1				Intrusion
	TSL-0207	Well PW-2 VFD Enclosure Temperature Switch	1				Temp Low
VFD-W2		Well Pump PW-2 VFD	3	1	1	1	Running, Fail, In Remote, Run Command, Speed Command, Speed Feedback
GEN-W2		Wells Generator	4				Running, Fail, Fuel Leak Detected, Fuel Low
ATS-W2		Automatic Transfer Switch	2	1			Emergency, Normal, Remote Start and Stop
		Control Panel Power	1				Power OK
SW-W2		Ethernet Switch	1				Alarm

Schedule 3 – RIO-W3

The following table lists I/O details for the SCADA Well PW-3 Remote I/O.

Equipment Tag #	Instrument Tag #	Equipment Signal	DI	DO	AI	AO	Signal Detail
	LT-0300	Well PW-3 Level Transmitter			1		Level
	FIT-0301	Well PW-3 Flow Meter			1		Flow
	PIT-0302	Well PW-3 Pressure Transmitter			1		Pressure
	ZSC-0303	Well PW-3 Control Panel Intrusion Switch	1				Intrusion
	ZSC-0304	Well PW-3 VFD Enclosure Intrusion Switch	1				Intrusion
	TSL-0305	Well PW-3 VFD Enclosure Temperature Switch	1				Temp Low
VFD-W3		Well Pump PW-3 VFD	3	1	1	1	Running, Fail, In Remote, Run Command, Speed Command, Speed Feedback
		Control Panel Power	1				Power OK
SW-W3		Ethernet Switch	1				Alarm

PART 3 - EXECUTION

Not Used.

-END-

SECTION 13491 – SCADA SYSTEM - CONFIGURATION SERVICES

PART 1 - GENERAL

1.01 Summary

- A. Configuration of SCADA System.
- B. Related Sections
 - 1. Section 13400 – Measurement and Control Instrumentation
 - 2. Section 13482 – SCADA and Control Systems – I/O List

1.02 References

- A. *The High Performance HMI Handbook*, by Hollifield, Oliver, Nimmo, and Habibi.
- B. *ASM Consortium Guidelines, Effective Operator Display Design*.

PART 2 - SERVICES

2.01 General

- A. Provide configuration services for SCADA System Servers and Control Panel PLCs.
- B. Graphic displays (screens) shall be formatted as schematic or symbolic representations of equipment shown on drawings.
- C. Provide, as a minimum, one graphic display per major piece of process equipment.
- D. All SCADA System screens shall be developed to maintain consistency with the existing SCADA System.

2.02 Responsibilities

- A. Configuration Services for SCADA Systems shall be provided by the SCADA Control System Integrator (CSI).
 - 1. PLC programming shall utilize Studio 5000 Logix Designer programming software version 35, no substitutes.

2.03 PLC Programming Guidelines

- A. Set-points, alarm values, timer values, control loop tuning parameters, and other numeric values used within PLC and HMI programs shall be part of continuous common data table within program. Parameter changes shall not require modification to instructions within program. Parameter changes shall be adjustable by changing data table through operator input via HMI.

- B. Unless specified otherwise, procedure for control power fail Restart for equipment shall be as follows:
 - 1. Equipment shall shut down on loss of control power.
 - 2. Upon restoration of power, previously running equipment shall be restarted using same sequence of startup used for "Auto" control.
 - 3. Prior to Restart, Auxiliary equipment shall be placed in "Off" position.
 - 4. Equipment Restart shall be sequenced through use of timer functions to prevent simultaneous restart.
- C. PLC shall not be enabled to control equipment unless respective field Hand/Off/Auto, Local/Remote, On/Off/Remote or Open/Close/Remote selector switch is in "Remote" or "Auto" position. Equipment status monitoring/ displaying and process parameter logging/ trending shall continue in all modes of control.
- D. Determination of high (low) Off-Normal conditions shall be by comparing an analog input value to Operator entered set-point values. Off-Normal status bit shall be set when rising (falling) input value is equal or greater (less) than entered set-point value. Off-Normal status bit shall be reset when falling (rising) input value is equal or less (greater) than entered set-point value minus (plus) entered deadband value. Operator entered high (low) set-point values are absolute values and deadband values are relative values. All values are entered through HMI.
- E. Setting of Off-Normal status bits shall cause status conditions to be displayed and/or alarmed at HMI.
- F. Resetting Off-Normal status bits shall cause status conditions displayed and/or alarmed at HMI to be cleared.
- G. Adjustable delay timers on alarm points shall prevent nuisance alarming or nuisance clearing of alarms. Timer values shall be ranged 0-30 seconds. Initial setting, unless otherwise specified in functional descriptions of Section 13400, shall be 5 sec.
- H. Motor Running status shall be monitored and displayed at HMI continuously.
- I. Setting of Motor Failed status bits:
 - 1. If motor is required to run via PLC control (control station Hand/Off/Auto selector switch in "Auto"),
 - 2. And If absence of Motor Running status causes Motor Fail watchdog timer to time out,
 - 3. Then Motor Failed status bit shall be set.
- J. Setting a Motor Failed status bit shall cause motor command output to be inhibited and shall cause Motor Failed status to be displayed and alarmed at HMI.
- K. Resetting a Motor Failed status bit shall cause motor command output to be re-enabled and shall cause Motor Failed status displayed and alarmed at HMI to be cleared.

- L. Unless specified in functional descriptions in Section 13400, the following watchdog timer values shall cause equipment fail status bits to be Set:
 - 1. Equipment fail to start: 30 sec.
 - 2. Equipment fail to stop: 30 sec.
- M. Adjustable filtering of analog inputs shall eliminate process upsets due to noise. Filtering shall be by running-average method.
- N. Integration algorithm shall be included for "Totalizing" analog flow signals.
- O. Integration algorithm shall be included for "Totalizing" Equipment Run times (Elapsed Time Meter).
- P. PLC input coils shall be configured as non-latched unless specified otherwise.
- Q. PLC output contacts shall be configured as maintained unless specified otherwise.

2.04 HMI Programming Guidelines

A. Screens:

- 1. Overview screens and reports shall be first screens configured. Coordinate layout and information requirements with Owner prior to development of screens.
- 2. Graphic screens for HMI shall be formatted to resemble P&IDs. As a minimum, one graphic display per process loop shall be provided.
- 3. Screens shall be simplified representation of process flow stream and associated equipment as shown on Drawings. Only major devices shall be shown. Non-reporting equipment (isolation valves, check valves, indicators) shall not be shown.
- 4. In addition to process related display screens, the following shall also be provided:
 - a. Main Screen: Director for all other screens. Selection of any other screens shall be by cursor pick of description for that screen or function key identifier for that screen.
 - b. Utility Screen: Equipment status, Motor Run totalizer (hours).
 - c. Alarm Screens: Screen for points in alarm as selected by alarm selection matrix and screen for equipment in off-normal state (i.e. Out of Service).
 - d. Trend Screen: Operator selected points for trending.

B. Data Input:

- 1. Data entry areas shall be provided at HMI for adjustment of process and alarm set-points. Data entry areas shall be password protected.
- 2. Upper and lower limits shall be provided for all data entry values. Entry of values outside of limits shall not be accepted and shall generate appropriate error message on screen. Upper and lower limit values shall be adjustable at HMI and shall be password protected.

3. Upper and lower limits shall be provided for all logged analog input values. Logged values outside of limits shall generate appropriate alarm. Upper and lower limit values shall be adjustable at HMI and shall be password protected.
4. Upper and lower limits shall determine range of analog input value. Value shall be scaled in standard Engineering Units.
5. All dynamic screen displays shall be updated every 2 seconds or faster.

C. Display Objects – General

1. Use graphic symbology for rendering of objects.
2. Limit the use of color to alarm, abnormal, or other important items that require the attention of the operator.
3. Use various shades of gray, contrast, and line weighting (thickness) to indicate status or for emphasis.
4. Display background color shall be light gray.

D. Display Objects – Process Lines and Inline Device Symbology

1. Where inline devices are dynamic in nature, their equipment symbols shall be formatted as Display Objects to change color (shading) based upon feedback. Recommended color use:
 - a. Off/Closed – Darker Grey or Black.
 - b. On/Open – Lighter Grey or White.
 - c. Warning – Indicator, Yellow Triangle with number 2 enclosed
 - d. Fail/Alarm – Indicator, Red Square with number 1 enclosed
2. Inline devices shall have alphanumeric tag identified near them, adjacent to associated symbol.
3. Arrow heads shall be used as pointers for flow direction at all points of entrance to equipment, at all points where process lines change direction and at points of merger.
4. Process lines entering or leaving screen shall have points of continuation identified by boxed text, indicating From/To screen. One end of box shall form arrow to show direction of flow and act as pick-field for selection of screen of continuation. Color shall be same as associated process line.
5. Process lines shall be identified with flow stream abbreviation as listed in standard symbolic table and as shown on P&IDs, where convenient.

E. Display Objects – Large Equipment Symbology

1. Symbol shape shall be simple reflection of true shape of equipment being depicted.
2. Outline color shall be Dark Grey or Black.
3. Equipment tag and description name shall be located within shape. If not practical, locate near shape. Text shall be white and enclosed in white border box. For example:
 - a. Tank levels shall be displayed within tank symbol as vertical bar representative of fluid within tank.
 - b. Tank level bar height shall be proportional to analog input value scaled from 0 to 100%. 100% shall be equal to full vertical height of symbol.

F. Display Objects – Data Fields

1. Analog process data not conducive to graphic symbology shall be formatted as rectangular Data Fields:
2. Process values (i.e., Flow, pH, D.O., Elapsed Time) shall be displayed as Data Fields near associated device symbol and shall consist of: alphanumeric tag, lower contrast blue or black; data value, bold, dark blue, right justified; engineering unit, lower contrast blue or black. Entire field shall be grouped as one block.
3. Data Fields shall be configured with high and low limits as described above.

G. Display Objects – Status Displays

1. Status Displays shall be similar to Data Fields but shall be linked to discrete data points or status bits:
2. Discrete equipment parameters (i.e., Run, Fail, On/Off, Open/Close) shall be indicated as rectangular Status Displays and shall consist of: alphanumeric tag, lower contrast blue or black; single or dual-state equipment value, bold, dark blue in color, center justified. Entire field shall be grouped as one block.
3. Displays shall be classified as Alarms or Events (see below).

H. Control Objects

1. Control Objects shall reside on graphic screens as either visible objects or as pop-up objects.
2. Visible Control Objects shall be restricted to simple functions. For example:
 - a. Single-State Pushbutton (i.e., Reset, Silence, Acknowledge, GoTo):
 - 1) Display alphanumeric tag of equipment or function to be manipulated. Function shall be independent of equipment control mode. There shall be graphic representation of one pushbutton, low contrast cyan in color with black text, center justified. Button shall act as pick-field and when selected by cursor and activated by clicking left mouse button, shall generate programmed output. Output shall not latch. Button, when activated, shall highlight with black border.
 - b. Dual-State Pushbutton (i.e., Open/Close, On/Off, Start/Stop):
 - 1) Display alphanumeric tag of equipment or function to be manipulated. Function shall be dependent upon equipment control mode. There shall be graphic representation of one pushbutton, low contrast cyan in color, with black text, center justified. Button shall act as pick-field and when selected by cursor and activated by clicking left mouse button, shall generate programmed output. Pick-field shall indicate change of state by changing text within object and/or changing color. Output shall latch, requiring mouse click to toggle back to original state. Button, when activated, shall highlight with white border.
 - c. Data Entry Field:
 - 1) Similar to Data Display Field described above. Allows operator entry of process values such as set-points.
3. Pop-up activation for dynamic control of equipment shall be by pick-fields associated with symbol of device to be controlled. Pop-up shall be small window or graphic overlay on current screen in location that will not interfere

with current operation. Pop-up will contain necessary symbolism for dynamic control and worded prompts as necessary. Examples of pop-up Control Objects:

a. PID Controller Faceplate:

- 1) Display alphanumeric tag of final element being controlled. Mode of field, Hand/Off/Auto or Open/Close/Auto selector switch shall be displayed. If in Auto, word "Auto" shall be displayed next to controller. If not in Auto, word "Hand or Off" shall be displayed – depending on field condition. Set-point, Process Variable, and Control Variable shall be displayed in vertical bar graph and digital formats. Bar graph shall be graduated scale equal to range of final element. Display bar shall be equal in length to graduated scale. Set-point and Process Variables shall be scaled in engineering units. Control Variable shall be scaled in percent of output. There shall be a graphic representation of a two-position pushbutton set (see below) labeled as “Auto-Manual” and shall act as pick-field. When selected by cursor and activated by clicking left mouse button, selector shall toggle between “Auto” and “Manual” modes of control. When selector is in “Auto”, PID controller calculates Control Variable. When selector is in “Manual”, Control Variable output shall follow setting by Operator. Control shall be available only when selector switch is in “Auto”.

b. Flow Controller Faceplate:

- 1) Display alphanumeric tag of valve being controlled. Mode of field Hand/Off/Auto or Open/Close/Auto selector switch shall be displayed. If in Auto, word "Auto" shall be displayed next to controller. If not in Auto, word "Hand or Off" shall be displayed – depending on field condition. Set-point, Process Variable, and Control Variable shall be displayed in horizontal bar graph and digital formats. Bar graph shall be graduated scale equal to range of associated flow. Display bar shall be equal in length to graduated scale. Setpoint and Process Variables shall be scaled in engineering units.
- 2) Control Variable shall be scaled in percent of valve position. There shall be a graphic representation of a two-position selector (see below) labeled as “Auto-Manual” and shall act as pick-field. When selected by cursor and activated by clicking left mouse button, selector shall toggle between “Auto” and “Manual” modes of control. When selector is in “Auto”, Flow Controller calculates Control Variable. When selector is in “Manual”, Control Variable output shall follow setting by operator. Control shall be available only when selector switch is in “Auto”.

c. 2-Position Pushbutton Set (i.e., Manual/Auto, Start/Stop, Open/Close):

- 1) Operationally the same as Dual-state Pushbutton described above. Display alphanumeric tag of equipment to be controlled. Mode of field Hand/Off/Auto or Open/Close/Auto selector switch shall be displayed. If in Auto, word "Auto" shall be displayed next to controller. If not in Auto, word "Hand or Off" or “Off” shall be displayed – depending on field condition. There shall be graphic representation of two pushbuttons, cyan in color. Buttons shall act as pick-fields and when selected by cursor and activated by clicking left mouse button, shall indicate and generate programmed output. Output shall remain latched until other button is activated. Button activated shall highlight with black

border. Pick-fields shall be available only when selector switch is in "Auto".

- d. 3-Position Switch Set (i.e., Hand/Off/Auto, Open/Stop/Close):
 - 1) Display alphanumeric tag of equipment to be controlled. Mode of field Hand/Off/Auto or Open/Close/Auto selector switch shall be displayed. If in Auto, word "Auto" shall be displayed next to controller. If not in Auto, the word "Hand or Off" or "Off" shall be displayed – depending on field condition. There shall be graphic representation of three pushbuttons, cyan in color. Buttons shall act as pick-fields and when selected by cursor and activated by clicking left mouse button, shall indicate and generate programmed output. Output shall remain latched until another button is activated. Button activated shall highlight with black border. Pick-fields shall be available only when selector switch is in "Auto".
- e. Analog Output Control (i.e., "Speed-Pot", Process Set-point Control):
 - 1) Display alphanumeric tag of equipment to be controlled. Mode of field Hand/Off/Auto or Open/Close/Auto selector switch shall be displayed. If in Auto, word "Auto" shall be displayed next to controller. If not in Auto, word "Hand or Off" shall be displayed. Analog Output Control shall be displayed in vertical (horizontal) bar graph and digital formats. Bar graph shall be graduated scale equal to range of output. Display bar shall be equal in length to graduated scale. Process Variable units shall be scaled in engineering units. Speed or Valve Position units shall be scaled in percent of output. Control shall be available only when selector switch is in "Auto".

- 4. Pop-up Control Objects shall not be continually visible. Functions become complex depending upon numbers and types of smaller objects grouped together to create them. For example, a valve control object might be created by grouping a 3-Position Pushbutton Set (Hand/Off/Auto), a 3-Position Position Pushbutton Set (Open/Stop/Close) and Status Display Objects (Open, Closed) together.

I. Alarming Requirements

- 1. Alarms and Events shall be logged to data file.
- 2. Alarms shall fall within one of following categories.
 - a. Critical: Alarms displayed and annunciated on HMI and called out on alarm notification system.
 - b. General: Alarms displayed and annunciated on HMI.
- 3. Provide alarm summary screen(s) at HMI.
- 4. Display only current alarms. Acknowledged alarms which are no longer active shall not be displayed.
- 5. Allow operator to acknowledge alarms using single keystroke or cursor pick at alarm summary screen.
- 6. Alarm Display shall include following information:
 - a. Time and date alarm initially occurred.
 - b. Alarm point identification.
 - c. Alarm value and engineering units for alarms generated from analog process points.
 - d. Description of alarm (up to 40 characters).

7. Events shall be logged to separate data file. Events shall not be displayed unless evoked and shall not be annunciated.

J. Trend Display Requirements

1. Configure HMI computer to display logged data in graphical trend format.
2. Trend Display Requirements:
 - a. Identification of process point being displayed. Use same nomenclature as used on HMI screens.
 - b. Start and end time of data being displayed.
 - c. Display shall incorporate movable vertical cursor along time axis. Parameter values at cursor date and time shall be displayed digitally.
 - d. Initial configuration of displays shall display data from present time back to 72 hours prior to present time. Provide capability for operator to enter new start time for data being displayed to view parameter trend more than 72 hours old.
 - e. Displays shall include y-axis range identification, including values and engineering units.
 - f. Configure trend displays to use maximum of computer screen area possible for purpose of increased resolution.
 - g. Trend displays shall be accessible, via single keystroke, from graphic screen displaying trended point.
3. Organize graphics screens for trend displays into categories by process:
 - a. Provide separate graphic screen within each category to display each process point trend. Provide different color for each process point.
 - b. Provide separate category for manually entered data from HMI computer.

PART 3 - EXECUTION

3.01 Performance

- A. Configure PLC's consistent with Drawings and Specifications.
- B. Refer to Section 13482 for information on ranges, signal functions, and set-points.
- C. Early in the development process, meet with Owner to present proposed PLC programming with respect to processes and equipment functionality. This will provide the Owner an opportunity to contribute to the creative process of PLC programming of the process systems.
 1. Coordinate any changes effecting wiring and/or equipment with Contractor and Engineer.

-END-

SECTION 13492 – SCADA SYSTEM - TESTING AND COMMISSIONING

PART 1 - GENERAL

1.01 Summary

- A. Testing requirements of SCADA System in the factory and in the field.
- B. Related Sections
 - 1. Section 13400 – Measurement and Control Instrumentation
 - 2. Section 13482 – SCADA and Control Systems – I/O List

1.02 Submittals

- A. In addition to submittal requirements of Section 13400, submit the following in accordance with Section 01300:
 - 1. Test Results:
 - a. Pass/fail status of all digital I/O
 - b. Results of analog I/O testing
 - 2. Miscellaneous:
 - a. Detailed step-by-step in-factory and field test procedure at least 6 weeks in advance of scheduled test date. Include sign-off sheets and punch list forms and description of configurations to be tested.
 - b. Complete inventory of equipment to be tested at factory including make, model, and serial number. Label each piece of equipment.
 - c. Preventive maintenance schedule
 - d. Repair Report Forms
 - e. Spares and Consumables Report

PART 2 - SERVICES

2.01 Preparation

- A. In-Factory Testing Aids and Equipment:
 - 1. Provide following documents.
 - a. One copy of submittals applicable to equipment to be tested
 - b. One copy of Drawings and Specifications, with Addenda and Change Orders
 - c. One master copy of test procedure
 - d. Complete inventory of equipment to be tested including make, model, and serial number
- B. Meet following criteria prior to start of test:
 - 1. Complete submittals and resolve disputes, if any
 - 2. Engineer review of test procedure

3. Include PLC processor, PLC network interface, and HMIs/SCADA System in testing
4. Coordinate test date agreeable to each party

C. Schedule:

1. At end of test, meet to review list of deficiencies. Engineer or Owner will indicate those items which must be corrected prior to shipment.
2. Confirm, in writing, times and dates two weeks before tests.

2.02 In-Factory Inspection and PLC I/O Testing

A. In-Factory inspection and testing shall be performed at site of panel fabrication.

B. SCADA System PLC shall pass in-factory inspection and testing prior to shipment to job site.

C. In-Factory Inspection

1. In-Factory inspection will verify following in accordance with approved submittals:
 - a. Panel dimensions
 - b. Equipment layout
 - c. Wiring
 - d. Wire and terminal identification
 - e. UPS placement
2. Verify proper access to equipment for maintenance.
3. Verify proper access to field wire termination points.
4. Inspect for neatness of wiring and wire harness construction.

D. In-Factory Testing and Demonstration.

1. Utilize PLC programming software to permit following:
 - a. Diagnostic test of PLC processor to assure proper run mode operation
 - b. Diagnostic test of remote I/O to assure proper operation
 - c. Inspection of PLC data table to allow viewing of discrete input on/off status
 - d. Inspection of PLC data table to view register contents when inputs are tested at 0, 4, 12, and 20 mA DC
 - e. Forcing of all digital outputs
 - f. Generation of 4, 12, and 20 mA DC signals for all analog outputs
2. Test as follows:
 - a. Verify equipment and manuals against inventory lists
 - b. Run hardware diagnostics
 - c. Testing of all input and output (I/O) signals at terminal strip used for field terminations
 - 1) Test change of state for all discrete inputs
 - 2) Test analog inputs at 0, 4, 12, and 20 mA DC
 - 3) Manipulate PLC data table or use forces to test response of all discrete output signals

- 4) Manipulate PLC data table to test response of all analog output signals at 4, 12, and 20 mA DC
3. Correct any deficiencies discovered prior to shipment to job-site.

E. Documentation

1. Prepare in-factory inspection and testing sign-off document. Document shall include following as a minimum:
 - a. Project description and number
 - b. Company name for PLC supplier, Owner, and Engineer
 - c. Section labeled "In-Factory Inspection", with listing of items to be inspected as described above
 - 1) For each item, include area for initials of PLC supplier, Owner, and Engineer representative indicating passing of inspection
 - 2) Include area for handwritten notes of any corrections required
 - d. Section labeled "In-Factory Testing", with listing of items to be tested as described above
 - 1) Include separate line for each I/O point to be tested
 - 2) For each item include area for PLC supplier to indicate PASS or FAIL and to enter initials of tester
 - 3) Include area for Owner and Engineer to indicate passing of tests
 - 4) Include area for handwritten notes of any corrections required

2.03 Field I/O and Software Testing

A. General:

1. Field testing is intended to check installation of the SCADA System PLC's in addition to providing a diagnostic check of field equipment and wiring.
2. Field testing shall make use of operator workstation that is to be used for running the equipment. Provide any configuration required to establish Ethernet communications with the SCADA System PLC.
3. Testing shall begin after SCADA System PLC has been installed and all terminations are complete.
4. Use PLC configuration utilized for In-Factory Testing.

B. Field I/O Testing:

1. Run hardware diagnostics.
2. Testing of all input and output (I/O) signals by activation or injection of signal at field device.
 - a. Digital input signals:
 - 1) For all equipment run signals, test by on/off operation of equipment. If operation of equipment is deemed inadvisable by Owner or PLC supplier due to potential process upset, inaccessibility of generating device, hazard to personnel or other factors, test by jumpering of motor starter auxiliary contact or other source of run signal.
 - 2) For all alarm or status signals, test by activation of device generating alarm. If generation of alarm is deemed inadvisable by Owner or PLC supplier due to potential process upset, inaccessibility of generating

- device, hazard to personnel or other factors, test by jumpering of alarm contact at nearest accessible location to generating device.
- 3) For signals designated as spare, test by jumpering of signal at SCADA System PLC panel field termination point.
 - 4) Demonstrate change of state in PLC data table.
- b. Analog input signals:
- 1) Verify impedance capabilities of transmitting device has not been exceeded by installation of SCADA System PLC.
 - 2) Disconnect transmitting device and inject 0, 4, 12, and 20 mA DC into loop.
 - 3) Demonstrate proper response to various signals in PLC data table.
 - 4) Verify proper response of other devices in analog loop to various signals.
 - 5) For signals designated as spare, test by injection of signal at SCADA System PLC panel field termination point.
- c. Digital output signals:
- 1) Manipulate PLC data table or use forces to test response of all discrete output signals.
 - 2) Verify proper response of other devices in loop to signals.
 - 3) For signals designated as spare, test by checking signal at SCADA System PLC panel field termination point.
- d. Analog output signals:
- 1) Verify impedance capabilities of analog outputs are not exceeded.
 - 2) Generate 4, 12, and 20 mA DC signals for all analog outputs through PLC data table.
 - 3) Verify proper response of other devices in analog loop to various signals. Verify proper loop current through measurement.
 - 4) For signals designated as spare, test by measuring of signal at SCADA System PLC panel field termination point.

C. Software Testing / Commissioning

- a. Control Function Test: The objective of this test is to demonstrate that all local and remote control panels, control stations, MCC, and Operator interface functions are ready to be placed into permanent operation.
- b. The Contractor shall prepare an agenda for the commissioning and submit to Engineer as part of the shop drawing submittal package.
- c. The Contractor shall conduct training as specified.
- d. Substantial completion of the system shall not be approved until satisfactory completion of the above commissioning tasks.

D. Documentation

1. Prepare field testing sign-off document. Document shall include following as a minimum:
 - a. Project description and number.
 - b. Company name for Owner, PLC supplier, and Engineer.
 - c. Include separate line for each I/O point to be tested.
 - d. For each item include area for PLC supplier to indicate PASS or FAIL and to enter initials of tester.

- e. Include area for Owner and Engineer to indicate passing of tests.
- f. Include area for handwritten notes of any corrections required.

E. Problem field devices or wiring.

- 1. Provide written documentation of any problems encountered with Owner's existing field devices or wiring during testing.

PART 3 - EXECUTION

3.01 Performance

- A. Test PLC's and Operator Workstations consistent with Drawings and Specifications.
- B. Refer to Section 13482 for information on ranges, signal functions, set-points, initial values, and activation points.

-END-

SECTION 13494 – SCADA SYSTEM - TRAINING

PART 1 - GENERAL

1.01 Summary

A. Provide training on the following subjects:

1. The review of the Operation and Maintenance Manuals prepared and furnished by the SCADA Control System Integrator (CSI).
2. The review of 'as-built' panel layout drawings and wiring diagrams.
3. Overview of equipment and how it interacts with equipment and processes.
4. Overview of equipment areas and how they interact with field panels and instruments and other area equipment.

1.02 Abbreviations

A. OWS: Operator Work Station

B. HMI: Human Machine Interface

C. PLC: Programmable Logic Controller

D. SCADA: Supervisory Control and Data Acquisition

1.03 The SCADA CSI shall include a minimum initial training period of one day at eight hours per day for up to four persons. At approximately six months after substantial completion, include follow-up Operator training for one day at four hours for three persons.

1.04 The SCADA CSI shall bear all expenses associated with the operator and maintenance training activities including labor, transportation, and material costs.

1.05 Submittals

A. General

1. Two weeks prior to training provide to Engineer/Owner a copy of the training documents to be presented to participants.
2. Material shall be arranged in a tabbed, 3-ring binder separated by primary subjects as defined below.
3. Material shall be comprehensive and arranged in a manner easy to find or reference key information.
4. Partial submittals are not acceptable.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Maintenance Training

A. Cover the following areas as a minimum:

1. Diagnostic procedures using special and general-purpose test equipment. Theory, testing, and troubleshooting procedures given for special test equipment.

3.02 Instrument Training

A. Cover following areas as a minimum:

1. General principle of operation
2. Calibration schedule and procedure
3. Calibration equipment required (if needed)
4. Recommended spare parts
5. Consumable part – recommended replacement schedule (e.g. reagents, filters, probe tips) and procedure
6. General care and maintenance with special consideration to all instruments that may require cleaning such as level elements, etc.

-END-

DIVISION 16 – ELECTRICAL

SECTION 16000 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish all labor, materials, tools, and equipment, and perform all work and services necessary for, or incidental to the furnishing and installation of all electrical work as shown on the Drawings and as specified in accordance with the provisions of the Contract Documents and completely coordinate with the work of other trades involved in the general construction. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work. The Contractor shall obtain approved Shop Drawings showing wiring diagrams, connection diagrams, roughing-in and hook up details for all equipment and comply therewith. All electrical work shall be complete and left in operating condition in accordance with the intent of the Drawings and the Specifications for the electrical work.
- B. Where the word "Contractor" appears in these Technical Specifications it shall be construed to mean the Electrical Contractor.
- C. CONTRACTOR SHALL REFERENCE THE FUNCTIONAL DESCRIPTIONS AND OTHER REQUIREMENTS FOUND IN 13400 – INSTRUMENT AND CONTROLS FOR ADDITIONAL REQUIREMENTS PERTAINING TO WORK UNDER THIS CONTRACT. THE FUNCTIONAL DESCRIPTIONS REFERENCED HEREIN SHALL BE CONSIDERED AS PART OF THE WORK REQUIRED UNDER THIS CONTRACT. THE PROGRAMMING OF PLC's WILL BE PROVIDED BY THE OWNER. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE SYSTEMS INTEGRATOR AND OTHER SUPPLIERS FOR CONNECTIONS REQUIRED BY THE SCADA SYSTEM HARDWARE. THE PROGRAMMING BY OWNER WILL BE BASED ON THE CONTROL DESCRIPTIONS REFERRED TO IN SECTION 13400, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING WIRING AND TERMINATIONS PER THESE DESCRIPTIONS AND AS SHOWN ON THE CONTRACT DRAWINGS.**
- D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL INTERCONNECTING DEVICES, CONDUIT, WIRE, AND APPURTENANCES NOT FURNISHED BY OTHERS BUT REQUIRED FOR THE OPERATION OF EQUIPMENT AS DESCRIBED IN THE FUNCTIONAL DESCRIPTIONS WHETHER SPECIFICALLY SHOWN ON THE DRAWINGS OR NOT. THE CONTRACTOR SHALL COORDINATE WITH THE PROVIDER OF DIVISION 13 EQUIPMENT AND CONTROLS REQUIREMENTS.**

- E. The scope of work for this project primarily includes, but is not limited to, the following:
 - 1. Providing normal and emergency power to 3 drinking water wells
- F. All electrical equipment shall conform to the applicable NEMA specifications. All electrical equipment shall be properly identified in accordance with these Specifications and Contract Drawings. Nameplates shall be engraved high pressure plastic laminate, black with white lettering for Modify for high/medium voltage if in project 120/208 or 120/240V equipment, and red with white lettering for 277/480 or 480V equipment. The nameplates shall be attached to the equipment cabinets with two (2) stainless steel sheet metal screws for nameplates up to 2-inch wide. For nameplates over 2-inch wide, four (4) stainless steel sheet metal screws shall be used, one (1) in each corner of the nameplate. All panelboards, switchboards, starters, control panels, cabinet enclosures, variable frequency drives and equipment switches shall be labeled in the manner described, or in an equally approved manner.
- G. All materials, equipment, sizes and capacities of electrical equipment incorporated in the project shall conform to the latest requirements of the current National Electric Code (NEC), the National Electrical Manufacturer's Association (NEMA), the State and local electrical codes, and to applicable rules and regulations of the local electrical utility serving the project.
- H. All material and equipment must be the product of an established and reputable manufacturer; must be new and of first class construction; must be designed and guaranteed to perform the service required; and must bear the label of approval of the Underwriters Laboratories, Inc., where such approval is available for the product of the listed manufacturer as approved by the Engineer.
- I. When a specified or indicated item has been superseded or is no longer available, the manufacturer's latest equivalent type or model of material or equipment as approved by the Engineer shall be furnished and installed at no additional cost to the Owner.
- J. Where the Contractor's selection of equipment of specified manufacturers or additionally approved manufacturers requires changes or additions to the system design, the Contractor shall be responsible in all respects for the modifications to all system designs, subject to approval of the Engineer. The Contractor's bid shall include all costs for all work of the Contract for all trades made necessary by such changes, additions or modifications or resulting from any approved substitution.
- K. Furnish and install all stands, racks, brackets, supports and similar equipment required to properly serve the equipment which is furnished under this Contract, or equipment otherwise specified or indicated on the Drawings.

1.02 Drawings

- A. Conduits and wiring are shown diagrammatically only, and the layout does not necessarily show the total number of conduits for the circuits required, nor are the

locations of indicated runs intended to show the actual routing of conduits. The Contractor shall furnish, install, and place in satisfactory condition ready for operation, all conduits, cables and all other material needed for the complete lighting, power, and other electrical systems shown or indicated in the Contract Documents. Additional conduits and the required wiring shall be installed by the Contractor for wherever needed to complete the installation of the specific equipment furnished, at no additional cost to the Owner.

1.03 Equipment Location

- A. The Drawings show the general location of feeders, transformers, outlets, conduits, and circuit arrangements. Because of the small scale of the Drawings, it is not possible to indicate all of the details involved. The Contractor shall carefully investigate the structural and finish conditions affecting all of their work and shall arrange such work accordingly; furnishing such fittings, junction boxes and accessories as may be required to meet such conditions. The Contractor shall refer to the entire Drawing set to verify openings, special surfaces, and location of other equipment, or other special equipment prior to roughing-in for panels, switches, and other outlets. **The Contractor shall verify all equipment dimensions to ensure that proposed equipment will fit properly in spaces indicated.**

1.04 Local Conditions

- A. The Contractor shall examine the site and become familiar with conditions affecting the work. They shall investigate, determine and verify locations of any overhead or buried utilities on or near the site and shall determine such locations in conjunction with all public and/or private utility companies and with all authorities having jurisdiction. All costs, both temporary and permanent, to connect all utilities shall be included in the Bid. Coordination with the serving utility is required prior to the bid to ensure these items have been adequately accounted for in the bid. The Contractor shall be responsible for scheduling and coordinating with the local utility for temporary and permanent services.
- B. The Contractor shall relocate all duct banks, lighting fixtures, receptacles, switches, boxes and other electrical equipment as necessary to facilitate the Work included in this project at no additional cost to the Owner.
- C. The Contractor is responsible for coordinating all electric utility equipment installations with the serving electric utility. The Contractor shall furnish and install all electric utility equipment required by the electric utility to be installed by the Contractor whether specifically shown on the Drawings or not.
- D. The Contractor is responsible for ensuring all electric utility equipment and construction installed by the Contractor is furnished and installed in accordance with the electric utility's design specifications and requirements. The Contractor is fully responsible for coordinating their scope of work with the electric utility. Any additional required electric utility construction or equipment not specified herein or shown on the Drawings shall be supplied by the Contractor at no additional cost to the Owner.

1.05 Submittals

- A. The Contractor shall submit to the Engineer Shop Drawings of all electrical materials, apparatus, appliances, equipment and miscellaneous devices shown or specified and shall be in accordance with the requirements of the General Conditions and Section 01300, Submittals.
- B. Shop Drawings shall be sufficiently complete in detail to enable the Engineer to determine compliance with Contract requirements. Details and information shown shall include but are not necessarily limited to the following:
 - 1. Performance characteristics.
 - 2. Physical sizes.
 - 3. Material and equipment specifications, and construction and methods of fabrication details.
 - 4. Compliance with standards (e.g. UL, NEMA), rules, regulations, and codes.
 - 5. Accessories.
 - 6. Complete wiring diagrams showing circuit designations as shown on the Drawings. A complete wiring diagram shall be submitted for each controller furnished.
 - 7. Complete product data sheets for all components of the specified equipment.
 - 8. Electrical ratings (voltage, current, KVA, phase, etc.)
 - 9. Weights of components parts and assembled unit weights.
 - 10. Complete assembly, layout, and installation drawings with clearly marked dimensions.**
- C. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- D. Shop Drawings will be approved only to the extent of the information shown. Approval of an item of equipment shall not be construed to mean approval for components of that item for which Contractor has provided no information.
- E. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's specification section.
- F. Each submittal shall be identified by the applicable specification section.

1.06 Domestic Product Requirements

- A. All steel and foundry products provided for in this project, including ferrous and non-ferrous metals, piping, fittings, and piping-related products, shall be manufactured in the United States.

1.07 Applicable Codes and Requirements

A. Conformance

1. All work, equipment and materials furnished shall conform with the existing rules, requirements and specifications of the Insurance Rating Organization having jurisdiction, the serving electrical utility company, the latest edition of the National Electrical Code (NEC), the National Electric Manufacturers Association (NEMA), the Institute of Electrical and Electronic Engineers (IEEE), the Insulated Power Cable Engineers Association (IPCEA), the American Society of Testing Materials (ASTM), the American National Standards Institute (ANSI), the requirements of the Occupational Safety Hazards Act (OSHA) and all other applicable Federal, State and local laws and/or ordinances.
2. All material and equipment shall bear the inspection labels of Underwriters Laboratories, Inc., if the material and equipment is of the class inspected by said laboratories.
3. All work shall be in accordance with local codes.

B. Nonconformance

1. Any paragraph of requirements in these Specifications, or Drawings, deviating from the rules, requirements and Specifications of the above organizations shall be invalid and their (the above organizations) requirements shall hold precedent thereto. The Contractor shall be held responsible for adherence to all rules, requirements and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra but shall be included in the Bid Price. Ignorance of any rule, requirement or Specification shall not be allowed as an excuse for nonconformity. Acceptance by the Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

C. Certification

1. Upon completion of the work, the Contractor shall obtain certificate(s) of inspection and approval from the National Board of Fire Underwriters or similar inspection organization having jurisdiction and shall deliver same to the Engineer and the Owner.

1.08 Permits and Inspections

- A. The Contractor shall reference the General Conditions and Section 01010, Summary of Work.

1.09 Tests

- A. Upon completion of the installation, the Contractor shall perform tests for operation, load (Phase) balance, overloads and short circuits. Tests shall be made with and to the satisfaction of the Owner and Engineer.

- B. The Contractor shall perform all field tests and shall provide all labor, equipment and incidentals required for testing and shall pay for electric power required for the tests. All defective material and workmanship disclosed shall be corrected by the Contractor at no cost to the Owner. The Contractor shall show by demonstration in service that all circuits and devices are in good operating condition. Test shall be such that each item of control equipment will function not less than five (5) times in a row with no failures in between.
- C. The grounding system shall be tested to ensure continuity and compliance with the requirement that ground resistances do not exceed 5 ohms when measured by a megohmmeter or equivalent device. Ground resistance measurements of each grounding electrode shall be taken and certified by the Contractor. Upon completion of the Project, the Contractor shall submit to the Engineer the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system as well as the resistance and soil conditions at the time the measurements were made. Ground resistance measurements shall be made in normally dry weather not less than 48 hours after rainfall and with the ground under test isolated from other grounds. Ground resistance shall also be measured from each piece of equipment to the grounding electrode. Reference Section 16170, Grounding and Bonding, for additional requirements.
- D. Each lighting and power distribution panelboard shall be tested with main circuit breaker disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the fixtures and all wall switches closed.
- E. Testing (Insulation Resistance Test) of all incoming and outgoing cables for switchgears, distribution and power panels, motor control centers and similar equipment shall be done after the cables are in place and just prior to final terminations. All data shall be recorded, as per Exhibit "A", attached to the end of this Section.
- F. The Contractor shall furnish all equipment and personnel as required for testing of electrical equipment.
- G. Feeder circuits shall be tested with the feeder conductors disconnected from the supplied equipment. Each individual power circuit shall be tested at the panel, motor control center or other similar equipment with the power equipment connected for proper operation.
- H. Megohmmeter tests of the insulation resistance of rotating machines and power feeders shall be conducted. The results will be accepted when the megger shows the insulation resistance to be not less than one megohm per 100 volts at 10°C using a 1,000-volt megger.
- I. All transformers shall be Megohmmeter tested in accordance with the manufacturer's recommendations.

- J. Upon final completion, the electrical system shall undergo a 30-day operational test period. During this period, the system shall operate continuously without incident, including but not limited to faults, interruptions, or malfunctions. Any deficiencies or failures observed during the test period shall be promptly corrected by the contractor at no additional cost to the owner, and the 30-day test period shall restart upon resolution of the issue.

1.10 Documentation

A. Required Documentation

The work requirements of this Section are in addition to and do not supersede testing and adjusting specified in other portions of the Contract Documents. The Contractor shall submit to the Engineer test records and reports for all testing.

1.11 Field Test of Equipment

A. The equipment to be tested shall include, but not be limited to, the following:

- VFDs
- Disconnect Switches
- Panelboards
- Hand Controls
- Lighting

B. Refer to each specific specification section for detailed field tests.

1.12 Final Field Test of System

A. The Contractor shall complete the installation and testing of the electrical installation at least two (2) weeks prior to the start-up and testing of all other equipment. During the period between the completion of electrical installation and the start-up and testing of all other equipment, the Contractor shall make all components of the Work available as it is completed for their use in performing Preliminary and Final Field Tests.

B. Before each test commences, the Contractor shall submit a detailed test procedure, test engineer resumé, manpower and scheduling information for approval by the Engineer. In addition, the Contractor shall furnish detailed test procedures for any of their equipment required as part of the field tests of other systems.

C. The Contractor shall perform an infrared inspection to locate and correct all heating problems associated with electrical equipment. The infrared inspection shall apply to new and existing equipment that has been modified.

1.13 Protective Device Setting and Testing

- A. All protective devices in the electrical equipment, shall be set, adjusted, calibrated and tested in accordance with the manufacturers' recommendations, the coordination study and best industry practice.
- B. Proper operation of all equipment associated with the device under test and its compartment shall be verified, as well as complete resistance, continuity and polarity tests of power, protective and metering circuits. Any minor adjustments, repairs and/or lubrication necessary to achieve proper operation shall be considered part of this Contract.
- C. All solid-state trip devices shall be checked and tested for setting and operation using manufacturers recommended test devices and procedures.
- D. Circuit breakers and/or contactors associated with the above devices shall be tested for trip and close functions with their protective device.
- E. When completed, the Contractor shall provide a comprehensive report on all equipment tested indicating condition, readings, faults and/or deficiencies. Inoperative or defective equipment shall be brought immediately to the attention of the Engineer.
- F. Prior to placing any equipment in service, correct operation of all protective devices associated with this equipment shall be demonstrated by field testing under simulated load conditions.

1.14 Schedules and Plant Operations

- A. Since the testing required 1.11 above shall require that certain pieces of equipment be taken out of service, all testing procedures and schedules must be submitted to the Engineer for review and approval one month prior to any work beginning. When testing has been scheduled, the Engineer must be notified forty-eight hours prior to any work to allow time for load switching and/or alternation of equipment. In addition, all testing that requires temporary shutdown of plant equipment must be coordinated with the Owner/Engineer so as not to affect proper plant operations.
- B. At the end of the workday, all equipment shall be back in place and ready for immediate use should a plant emergency arise. In addition, should an emergency condition occur during testing, at the request of the Owner, the equipment shall be placed back in service immediately and turned over to plant personnel.
- C. In the event of accidental shutdown of plant equipment, the Contractor shall notify plant personnel immediately to allow for an orderly restart of affected equipment.

1.15 Materials Handling

- A. Materials arriving on the job site shall be stored in such a manner as to keep material free of rust and dirt, and so as to keep material properly aligned and true

to shape. Rusty, dirty or misaligned material shall be rejected. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Rigid non-metallic conduit shall be stored on even supports and in locations not subject to direct sun rays or excessive heat. Cables shall be sealed, stored and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Adequate protection shall be required at all times for electrical equipment and accessories until installed and accepted. Materials damaged during shipment, storage, installation or testing shall be replaced or repaired in a manner meeting with the approval of the Engineer. The Contractor shall store equipment and materials in accordance with Section 01550, Plant Operations During Construction.

1.16 Power System Studies

A. General

1. The Contractor shall provide an Arc Flash Study performed by a professional registered electrical engineer currently registered in the State of Ohio. The study shall be in accordance with IEEE 1584 and NFPA 70E. The study shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to the release of equipment for manufacture.
2. The study shall include all portions of the electrical distribution system from the utility company protective devices, the normal and standby power sources down to and including the 480-volt feeder protective devices for each feeder, as well as all MCCs and panelboards.
3. The Contractor shall furnish and install any equipment necessary to comply with the study's findings at no extra cost to the Owner.
4. The software used for the studies shall be SKM Power Tools for Windows (no substitutions allowed).

B. Data Collection for the Study

1. The Contractor shall provide the required data for the preparation of the arc flash study. The preparer of the study shall furnish the Contractor with a listing of the required data immediately after awarding the Contract.
2. The Contractor shall expedite collection of the data to ensure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of equipment for manufacture.

C. Arc Flash Study

1. The Arc Flash Study shall be performed in accordance with the IEEE 1584 equations presented in NFPA 70E, Annex D.
2. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system where work could be performed on energized parts, including but not limited to switchboards, switchgear, motor control centers, panelboards, and busways.
3. The study shall include all significant locations in 240-volt and 208-volt systems fed from transformers equal to or greater than 125 kVA.

4. Safe working distances shall be based upon the calculated arc flash boundary, considering an incident energy of 1.2 cal/cm².
5. Calculations shall include contributions from both the line and load side of the main breakers at each significant location.
6. The arc flash risk assessment shall consider multiple fault current scenarios and normal and emergency operating conditions. The minimum calculation shall assume minimum motor contribution (all motors off), while the maximum calculation shall assume the maximum contribution from motors.
7. Fault contribution from motors and generators shall be decayed in the calculations, with induction motors not considered beyond 3-5 cycles and synchronous generators decremented based on actual performance characteristics.
8. Calculations must be performed for each equipment location where there is a separately enclosed main device, considering both line and load side contributions in the fault calculations.
9. Arc Flash Labels must be provided at all significant locations calculated in the study. display the information required by **NFPA 70E**, including but not limited to:
 - a. Warning Header
 - b. Incident Energy (cal/cm²)
 - c. Flash Protection Boundary (feet)
 - d. Required Personal Protective Equipment (PPE)
10. The maximum clearing time used for incident energy calculations shall be capped at 2 seconds, unless specific conditions prevent personnel from moving outside the flash boundary within that time.

D. Study Report

1. The results of the arc flash study shall be summarized in a report and submitted to the Engineer. The report shall include the following:
2. Single-line diagram with calculated fault currents at significant nodes.
3. Incident energy levels at each calculated point.
4. Tabulated information on arc flash boundaries and PPE requirements.
5. The final report, including all electronic files, shall be turned over to the Owner after final approval.

PART 2 - PRODUCTS

2.01 Product Requirements

- A. Unless otherwise indicated, the materials to be provided under this Specification shall be the products of manufacturers regularly engaged in the production of all such items and shall be the manufacturer's latest design. The products shall conform to the applicable standards of UL and NEMA, unless specified otherwise. International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured and labeled in compliance with IEC standards is not acceptable.

- B. All items of the same type or ratings shall be identical. This shall be further understood to include products with the accessories indicated.
- C. All equipment and materials shall be new unless indicated or specified otherwise.
- D. The Contractor shall submit proof if requested by the Engineer that the materials, appliances, equipment or devices that they provide under this Contract meet the requirements of Underwriters Laboratories, Inc., in regard to fire and casualty hazards. The label of or listing by the Underwriters Laboratories, Inc., will be accepted as conforming with this requirement.

2.02 Substitutions

- A. Any reference in the Specifications or on the Drawings to any article, service, product, material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing the type, function and standard of quality and shall not be construed as limiting competition.

2.03 Concrete

- A. The Contractor shall furnish all concrete required for the installation of all electrical work, Concrete shall be Class A unless otherwise specified, and in complete conformance with the applicable requirements of Division 3 of the Specifications.
- B. The Contractor shall provide concrete equipment pads for all free-standing electrical apparatus and equipment located on floors or slabs that are existing or provided by others. The Contractor shall provide all necessary anchor bolts, channel iron sills, etc. The exact location and dimensions shall be coordinated for each piece of equipment well in advance of the scheduled placing of these pads. Equipment pads shall be 4 inches high unless otherwise indicated on the Drawings. Pads shall be reinforced with steel wire mesh and shall have dowel rods inserted into the floor for anchorage.
- C. The Contractor shall provide concrete foundations for all free-standing electrical apparatus and equipment located outdoors or where floors or slabs are not existing or provided by others. The Contractor shall provide all necessary anchor bolts, channel iron sills, etc. The location and dimensions shall be coordinated for each piece of equipment well in advance of the scheduled placing of the foundations. Equipment foundations shall be constructed as detailed on the Drawings or if not detailed on the Drawings shall be 6 inches thick minimum reinforced with #4 bars at 12-inch centers each way placed mid-depth. Concrete shall extend 6 inches minimum beyond the extreme of the equipment base and be placed on a compacted stone bed (#57 stone or ABC) 6 inches thick minimum.
- D. Concrete and reinforcing steel shall meet the appropriate requirements of Division 3 of the Specifications.

PART 3 - EXECUTION

3.01 Cutting and Patching

A. Coordination

1. The work shall be coordinated between all trades to avoid delays and unnecessary cutting, channeling and drilling. Sleeves shall be placed in concrete for passage of conduit wherever possible.

B. Damage

1. The Contractor shall perform all chasing, channeling, drilling and patching necessary to the proper execution of their Contract. Any damage to the building or any equipment shall be repaired by qualified mechanics of the trades involved at the Contractor's expense. If, in the Engineer's judgment, the repair of damaged equipment would not be satisfactory, then the Contractor shall replace damaged equipment at their own expense.

3.02 Excavation and Backfilling

- A. The Contractor shall perform all excavation and backfill required for the installation of all electrical work. All excavation and backfilling shall be in complete accordance with the applicable requirements of Division 2.

3.03 Corrosion Protection

- A. Wherever dissimilar metals, except conduit and conduit fittings, come into contact, the Contractor shall isolate these metals as required with neoprene washers, nine (9) mil polyethylene tape, or gaskets.

-END-

SECTION 16111 – CONDUIT

PART 1 - GENERAL

1.01 The Requirement

- A. Under this Section, the Contractor shall furnish and install all conduits and conduit fittings to complete the installation of all electrically operated equipment as specified herein and as required.
- B. The Drawings indicate the general location of conduits both exposed and concealed; however, the Contractor shall install these conduits in such a manner to avoid all interferences.
- C. Reference Section 16000 Basic Electrical Requirements, 16195 Electrical Identification and 02226, Trenchless Excavation.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed shop tests
 - a. None required.
 - 2. Field tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1 and Section 16000, Basic Electrical Requirements.
 - b. All conduit shall be tested to ensure continuity and the absence of obstructions by pulling through each conduit a swab followed by a mandrel 85% of the conduit inside diameter. After testing, all conduits shall be capped after installation of suitable pulling tape.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable Specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

- C. Shop drawings shall include but not be limited to equipment specifications and product data sheets identifying all materials used and methods of fabrication.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The material covered by this Specification is intended to be standard material of proven performance as manufactured by reputable concerns. Material shall be fabricated, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and shown on the Drawings.

2.02 Conduits

- A. Unless specified otherwise herein, or indicated on the Drawings, all conduits shall be rigid, hot-dipped galvanized steel. Minimum size conduit shall be 1 inch unless specifically indicated otherwise on the Drawings. Unless specified otherwise herein or indicated on the Drawings, all underground conduits shall be PVC Schedule 40, minimum size 1 inch. The Contractor, at their option, for ease of installation to accommodate saddle size, may increase the size of encased conduits to 2-inch. However, no combining of circuits/conductors will be permitted in these larger conduits.

1. All components of the conduit system shall be of the same material of construction. Rigid galvanized steel or aluminum conduit systems shall include fittings, couplings, connectors and other components compatible with and approved for such systems.
2. Reference the "Conduit Uses" portion of this specification for additional information regarding conduit.

B. Rigid Steel OR Rigid Aluminum Conduit

1. Aluminum or steel conduits shall be rigid type, heavy wall. Steel conduits shall be hot-dipped galvanized inside and outside. Rigid metallic conduits shall be as manufactured by Allied Tube and Conduit Corporation, Wheatland Tube Company, Jones & Laughlin Steel Company or equal.
2. Each length of conduit shall be shipped with a coupling on one end and a color-coded thread protector at the other end.

C. Liquid-Tight Flexible Metal Conduit

1. Liquid-tight flexible conduit (LFMC) shall be galvanized steel, single strip, with a copper strip interwoven and suitable as a grounding means. LFMC shall be UL listed. LFMC shall have an extruded moisture and oil-proof PVC jacket. LFMC shall be Liqueflex Type "LA" as manufactured by Electri-Flex, "Ultratite" Type UL "Ultralite" as manufactured by Alflex Corporation, Type "A" as manufactured by Anaconda or equal.
2. Watertight connectors shall be used with liquid-tight flexible metal conduit on both ends. LFMC shall be used to connect all vibrating equipment installed

outdoors, in wet or damp areas, and other applications as directed by the Engineer.

D. Rigid Nonmetallic Conduit

1. Rigid nonmetallic conduit shall be Schedule 40 polyvinyl chloride (PVC), 90°C, UL rated and shall conform to NEMA TC-2. Fittings and conduit bodies shall conform to NEMA TC3.
2. Rigid non-metallic conduit shall be as manufactured by Carlon, Triangle Conduit and Cable, Cantex, Inc. or equal.

E. HDPE Conduit for Horizontal Drilling

1. HDPE shall only be utilized for conduits requiring horizontal directional drilling. Install conduits as shown on the drawings. Refer to specification 02226.

F. Conduit Fittings

1. Fittings for rigid metal conduit, rigid nonmetallic conduit, and liquid-tight flexible metal conduit shall conform to UL 467 and UL 514 as applicable.
2. Set screw or indenter type connectors shall not be used. Fittings for conduit installed in wet locations and underground shall provide a watertight joint. Fittings for rigid conduit shall be threaded.
3. Fittings or bushings shall be installed in easily accessible locations.
4. Where exposed conduits pass across structural expansion joints, approved weatherproof telescopic type expansion fittings shall be used. Fittings shall be OZ/GEDNEY Type AX, or equal, watertight, permit a movement up to 4 inches and shall be equipped with approved bonding jumpers around or through each fitting. Bonding jumpers shall be Appleton, Crouse-Hinds, OZ/Gedney or equal.
5. Where embedded conduits pass through expansion joints, approved watertight, concrete-tight, deflection/expansion fittings shall be used. Fittings shall compensate for movement of 3/4-inch from the normal in all directions. Fittings shall be OZ/GEDNEY Type DX or equal.
6. Where embedded conduits pass through structural expansion joints, approved watertight, concrete-tight, deflection/expansion fittings shall be used. Fittings shall compensate for movement of 3/4-inch from the normal in all directions. Fittings shall be OZ/GEDNEY Type DX, or equal.
7. Conduit fittings ("condulets") shall be used on exposed conduit work for lighting and power outlets, convenience outlets, changes in direction of conduit runs and breaking around beams. "Condulets" shall be cast ferrous alloy, galvanized or cadmium plated, as manufactured by Crouse-Hinds, OZ/Gedney, Appleton Company or equal. Coated fittings and boxes shall be used with coated conduit in all chemically aggressive areas or where called for on the Drawings. Covers shall be of a design suitable for the purpose intended. In damp areas, the outside condulets shall be made watertight. Install all condulets with the covers accessible. Use proper tools to assemble conduit system to prevent injury to the plastic covering. No damage to the covering shall be permitted.

8. Conduit fittings shall be cast type of non-ferrous metal or malleable iron thoroughly coated inside and outside with metallic zinc or cadmium after all machining has been completed. Cast fittings shall be provided with heavy threaded hubs to fit the conduit required. Covers shall be of the same material as the fittings to which they are attached and shall be screwed on with rubber or neoprene gaskets between the covers and fittings. Cast fittings 1-1/2 inches and above shall be of the "mogul" type. Provide fittings of the "deep" type.
9. Coated fittings shall be used with coated conduit. All conduit nipples, elbows, couplings, boxes, fittings, unions, expansion joints, connectors, bushing and other components of the raceway system shall be factory coated to maintain the corrosion-resistant integrity of the conduit system. The coated conduit and its respective components shall all be provided by the same manufacturer. Coated conduit shall be used in all areas specified herein or indicated on the Drawings.
10. Conduit seals shall be Type EYS as manufactured by Crouse-Hinds, Appleton equivalent, OZ/Gedney equivalent or equal.

PART 3 - EXECUTION

3.01 Conduit and Fittings

- A. Unless otherwise specified herein or indicated on the Drawings, the minimum size conduit shall be 1 inch for exposed work and 1 inch for conduit encased in concrete or mortar.
- B. Conduit home runs for some circuits are not necessarily indicated on the Drawings; however, the circuit numbers are shown or are in the panel schedules. Conduit shall be furnished and installed for these lighting circuits and shall be installed as required to suit field conditions, subject to review and acceptance by the Engineer.
- C. Conduit shall be installed concealed unless otherwise indicated or specified. Conduit may be run exposed on walls only where concealing is not practical, or at the direction of the Engineer.
- D. Where exposed, maintain a minimum distance of 6 inches from parallel runs of flues or water pipes. Conduit runs shall be installed in such locations as to avoid steam or hot water pipes. A minimum separation of 12 inches shall be maintained where conduit crosses or parallels hot water or steam pipes.
- E. For floor mounted equipment, conduit may be run overhead and dropped down, where underfloor installation is not practical. Groups of conduits shall be uniformly spaced in straight runs and at turns. Conduit shall be cut with a hacksaw or an approved conduit-cutting machine and reamed after threading to remove all burrs. Securely fasten conduit to outlets, junction and pull boxes to effect firm electrical contact. Join conduit with approved couplings. Conduits shall be freed from all obstructions.
- F. Empty (spare) conduit systems shall be furnished and installed as indicated on the Drawings and shall have pull wires installed. The pull wire shall be No. 14 AWG

zinc-coated steel, or of plastic material, having not less than 200 pound tensile strength. Not less than 12 inches of slack shall be left at each end of the pull wire.

- G. Each piece of conduit installed shall be free from blisters or other defects. Each piece installed shall be cut square, taper reamed and a coat of sealing compound applied to threads. Threads on conduits shall be painted with a conducting compound prior to making up in a fitting. Conduit connections shall be made with standard coupling and the ends of the conduit shall butt tightly into the couplings. In exposed work only, where standard coupling cannot be used, only Erickson couplings are permitted, or as otherwise acceptable to the Engineer.
- H. Conduit threaded in the field shall be of standard sizes and lengths.
- I. All bends shall be made with standard factory conduit elbows or field bent elbows. Field bending of conduit shall be done using tools approved for the purpose. Heating of conduit to facilitate bending is prohibited. Field bends shall be not less than the same radius than a standard factory conduit elbow. Bends with kinks shall not be acceptable.
- J. The equivalent number of 90° bends in a single conduit run are limited to the following:
 - 1. Runs in excess of 300 feet: 0
 - 2. Runs of 300 feet to 201 feet: 1
 - 3. Runs of 200 feet to 101 feet: 2
 - 4. Runs of 100 feet and less: 3
- K. All conduit for fiber optic cable shall have a minimum bending radius of 16 inches and be no less than 2 inches in diameter. Final bending radius shall be determined by the fiber optic cable manufacturer.
- L. Unless otherwise specified herein, indicated on the Drawings or required by the NEC, conduit shall be supported every 8 feet and shall be installed parallel with or perpendicular to walls, structural members or intersections of vertical planes and ceilings with right angle turns consisting of fittings or symmetrical bends. Conduits shall be supported within 1 foot of all changes in direction. Supports shall be approved pipe straps, wall brackets, hangers or ceiling trapeze. All fasteners, clamps, straps and anchors shall be stainless steel. The use of perforated strap hangers or Mineralac conduit hangers are prohibited. Perforated strap hangers shall not be used. In no case shall conduit be supported or fastened to another pipe or installed to prevent the removal of other pipe for repairs. Fastenings shall be by expansion bolts on concrete; by machine screws, welded threaded studs or spring-tension clamps on steel work. Explosive-drive equipment may be used to make connections where the use of this equipment complies with safety regulations. Wooden plugs inserted in masonry and the use of nails as fastening media are prohibited. Threaded C-clamps may be used on rigid steel conduit only. Conduits or pipe straps shall not be welded to steel.
- M. The load applied to fasteners shall not exceed 1/4 of the proof test load. Fasteners attached to concrete ceilings shall be vibration and shock resistant. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of

more than 3/4 inch in concrete joints shall not cut the main reinforcing bars. Holes not used shall be filled. Spring steel fasteners may only be used to support lighting branch circuit conduits to structural steel members. Conduits shall be fastened to all sheet metal boxes and cabinets with two (2) locknuts where required by the National Electrical Code to insure adequate bonding for grounding. Where insulated bushings are used, or where bushings cannot be secured firmly to the box or enclosure, a bonding jumper shall be installed to maintain suitable grounding continuity. Locknuts shall be the type with sharp edges for digging into the wall of metal enclosures. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the National Electrical Code.

- N. Conduit installed in concrete floor slabs or walls shall be located so as not to affect the designed structural strength of the slabs. Conduit shall be installed within the middle one-third of the concrete slab except where necessary to not disturb the reinforcement. The outside diameter of conduit shall not exceed one-third of the slab thickness, and conduits shall be spaced no closer than three (3) diameters except at cabinet locations. Curved portions of bends shall not be visible above the finish slab. Where embedded conduits cross expansion joints, suitable watertight expansion fittings and bonding jumpers shall be provided. Conduit larger than 1-inch trade size shall be parallel with or at right angles to the main reinforcement. When at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Conduits shall not be stacked more than two (2) diameters high in floor slabs.
- O. Install polyvinyl chloride (PVC) schedule 80 conduits when entering or exiting concrete. Extend stub-ups at least 12 inches above and below grade or finish floor. Conduits extending through the concrete floor shall be installed using straight runs (for vertical penetrations) or factory elbows (for conduits installed within the slab).
- P. All conduit extending through the floor behind panels or into control centers or similar equipment may be PVC Schedule 80 and shall extend a minimum of 6 inches above the floor elevations, where practicable, with no couplings at floor elevations.
- Q. Unless specifically identified on the Drawings as "Direct Buried," all conduits in the earth, including conduits below slabs-on-grade, shall be installed per the standard details. Joints in conduit shall be staggered so as not to occur side by side.
- R. No more than three (3) 90 degree bends will be allowed in any one conduit run. Where more bends are necessary, a conduit or pull box shall be installed. All sizes shall have machine bends. Joints in threaded conduit shall be made up watertight with the appropriate pipe thread sealant or compound applied to male threads only; all field joints shall be cut square, reamed smooth and properly threaded to receive couplings. No running threads are permitted. All conduit ends at switch and outlet boxes shall be fitted with an approved locknut and bushing forming an approved tight bond with box when screwed up tightly in place.
- S. Conduits stubbed up through concrete floors for connections to freestanding equipment and for future equipment shall be provided with an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Wiring shall be extended in rigid metal conduit to equipment except that, where required, liquid-

tight flexible metal conduit may be used 6 inches above the floor. Screwdriver operated threaded flush plugs shall be installed in conduits from which no equipment connections are made.

- T. Where outlets are shown near identified equipment furnished by this or other Contractors, it is the intent of the Specifications and Drawings that the outlet be located at the equipment to be served. The Contractor shall coordinate the location of these outlets to be near the final location of the equipment served whether placed correctly or incorrectly on the Drawings. Changes in outlet locations required to serve the equipment furnished by other Contractors on the Project shall be brought to the attention of the Engineer.
- U. Conduit shall be protected immediately after installation by installing flat non-corrosive metallic discs and steel bushings, designed for this purpose, at each end. Discs shall not be removed until it is necessary to clean the conduit and install the conductors. Before the conductors are installed, insulated bushings shall be installed at each end of the conduit.
- V. Where "all-thread" nipples are used between fittings and electrical equipment, they shall be so installed that no threads are exposed.
- W. Connections from rigid conduit to motors and other vibrating equipment, limit switches, solenoid valves, level controls and similar equipment, shall be made with short lengths of liquid-tight flexible metal conduit. These conduits shall be installed in accordance with the NEC and shall be furnished and installed with appropriate connectors with devices which will provide an excellent electrical connection between the equipment and the rigid conduit for the flow of ground current. Liquid-tight flexible metal conduit length shall be five feet (5 feet), maximum.
- X. Liquid-tight flexible metal conduit installed between rigid metal conduit and motor terminal box and/or any other apparatus shall have a green insulated grounding conductor running through flexible conduit. This conductor shall be terminated to the nearest pull box, motor terminal box, or any other apparatus ground terminal.
- Y. All threaded ends of conduits shall be coated with an approved conducting compound as manufactured by Thomas & Betts, or equal prior to making up the joint.
- Z. Conduits installed within or underneath floor slabs, underground direct-buried or concrete encased conduits, and all conduits installed in areas subject to liquid inadvertently entering the conduit system shall be sealed or plugged at both ends in accordance with NEC Article 300-5(g). This requirement applies to both conduits containing conductors and "spare" conduits. Where practicable, the interior of the conduit shall be sealed as well as around the conductors by using conduit sealing bushings: Type CSB as manufactured by O/Z Gedney, or equal. Where the conduit fill does not allow the use of these bushings, the conduits shall be tightly caulked or plugged.
- AA. Conduit passing through the walls and floors of buildings below grade shall be installed with appropriate watertight fittings to prevent the entrance of ground water around the periphery of the conduits. For vertical conduit penetrations through

openings in concrete floors, the fittings shall be Type FSK Floor Seals as manufactured by OZ/Gedney. For conduit penetrations through openings in concrete walls, the fittings shall be Type WSK Thruwall seals as manufactured by OZ Gedney. Conduits shall be sloped away from the buildings toward splice boxes, handholes and/or manholes to provide drainage away from the building wall.

Conduits passing through sleeves in interior walls and floors shall be tightly caulked.

- BB. Weatherproof, insulated throat "Meyers" hubs shall be used on all conduit entries to boxes and devices without integral hubs in process areas to maintain NEMA 4X integrity. The Contractor shall furnish and install "Meyers" hubs on all conduit entries into non-cast enclosures such as metallic or non-metallic control panels, control component enclosures, wireways, pull boxes, junction boxes, control stations and similar type equipment when this type of equipment is located in process areas requiring NEMA 4X integrity. This specified requirement for "Meyers" hubs does not apply to any area of the plant facilities where NEMA 4X integrity is not required.
- CC. The use of two (2) locknuts and a grounding bushing shall be required at all conduit terminations where hub type fittings are not required, such as electrical rooms, control rooms and office areas.
- DD. Conduit installation shall be arranged to minimize cleaning. No horizontal runs of conduit will be permitted in brick or masonry walls.
- EE. Install non-metallic conduits in accordance with manufacturer's instructions where specified herein or indicated on the Drawings.
- FF. Join non-metallic conduit using cement as recommended by the manufacturer. Clean and wipe non-metallic conduit dry before joining. Apply full even coat of cement to entire area inserted in fitting.
- GG. Use proper installation tools approved for the purpose to assemble coated conduit systems to prevent damage to the covering and maintain the corrosion-resistant integrity of the conduit system. No damage to the covering is permitted.

3.02 Conduit Uses and Applications

- A. No PVC conduit shall be installed exposed unless specifically accepted in writing by the Engineer. Where PVC conduit is allowed to be installed exposed, the conduit shall be Schedule 80 as required by the NEC. Reference Article 300-5(d) of the NEC.
- B. PVC Schedule 40 conduit shall be furnished and installed in concrete slabs (for slab-on-grade construction) and in walls when the conduit is shown to be encased. Rigid steel conduit shall be installed in all elevated slabs when the conduits are shown to be encased.
- C. Aluminum conduit shall be used where conduit is exposed in all outdoor locations.

- D. Other conduit uses not specifically listed above shall be brought to the attention of Engineer for a decision.
- E. All conduits transitioning from above ground to below ground shall be clearly labeled at both the entry and exit points. Labels shall include the conduit designation and a description of its intended use (e.g., power, signal, control, or communications). Labeling will be in accordance to Section 16195 Electrical Identification.

-END-

SECTION 16118 - UNDERGROUND DUCTS AND HANDHOLES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install underground duct systems, electric manholes, and electric handholes as specified herein and as shown on the Drawings. The work shall be complete and shall include excavation, concrete construction, backfilling and all materials, items and components required for a complete system.
- B. The provisions of this Division are applicable to all underground conduit work. All work shall be coordinated with that of the various utility companies and other Contractors. The Contractor shall adhere to all utility company requirements.
- C. Reference Section 16000, Basic Electrical Requirements and Section 16111, Conduit.

1.02 Testing

- A. The following tests are required:
 - 1. Witnessed shop tests
 - a. None required.
 - 2. Field tests
 - a. Field tests for all completed duct systems shall consist of pulling a swab through each conduit followed by a mandrel equal in size to 85% of the conduit inside diameter.
 - b. After testing, all conduits shall be capped after installation of a suitable pulling tape. All field tests shall be witnessed by the Engineer.

1.03 Submittals

- A. Each submittal shall be identified by the applicable Specification Section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to, the following:
 - 1. Equipment specifications and product data sheets.
 - 2. Outline and dimensional drawings including detailed sections of the manholes and/or handholes.

3. Materials specifications and structural calculations for the manholes sealed by a Professional Engineer in the State of Indiana.

1.05 Identification

- A. Each electric manhole and handhole cover shall be lettered with the word "Electric", the manhole or handhole identification number (e.g. MH-1, HH-1, etc.), manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The material covered by this Specification is intended to be standard material of proven performance as manufactured by reputable concerns. Material shall be fabricated, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and shown on the Drawings.

2.02 Duct System

- A. Underground duct system shall consist of parallel runs of Schedule 40 PVC conduit or rigid galvanized steel conduit encased in native soil with no stones in open areas) unless otherwise specified herein or indicated on the Drawings.
- B. Nonmetallic conduit joints shall be made with standard Schedule 40 PVC Couplings and PVC solvent cement of the same manufacturer as the conduit. All PVC conduit shall be supplied by the same manufacturer. All joints shall be staggered, installed in accordance with the manufacturer's recommendations, and made watertight.
- C. All conduit elbows 2" and larger shall be rigid steel conduit.
- D. Provide at least 24" separation between all power conduits containing voltages between 120V and 480V and signal conduits.
- E. Provide at least 6' separation between medium/high voltage buried power lines and all other conduits/conductors.

2.03 Electric Handholes

- A. The electric handholes shall be a precast polymer concrete enclosure suitable for use as part of an underground electric raceway system. The enclosure shall be UL listed if available in the required size.
- B. The enclosure load rating shall be Tier 15 when located in an area subject to occasional non-deliberate vehicular traffic and AASHTO H-20 when located in an area subject to deliberate vehicular traffic.

- C. The enclosure shall be the straight side design to allow easy adjustment of box to grade. The box shall be stackable for increased depth. The enclosure shall have an open bottom
- D. Handhole opening size shall be as required to suit the application, 24" X 24", minimum.
- E. Heavy duty covers shall be used with Tier 15 enclosures and extra heavy-duty covers shall be used with AASHTO H-20 enclosures. Covers shall be provided with cover hooks.
- F. The electric handholes shall be "PG" Style Quazite boxes as manufactured by Strongwell, or equal.

PART 3 - EXECUTION

3.01 General

- A. The underground duct system, manholes, and handholes shall be installed as specified herein, indicated on the Drawings, and in accordance with manufacturers' instructions.

3.02 Duct System

- A. Conduit duct bank elevations at the handholes shall be maintained as shown on the Drawings. Where deviation is necessary to clear unforeseen obstacles, the elevations may be changed after authorization by the Engineer.
- B. Slope all conduits continuously away from structures and buildings with a minimum slope of 3" per 100' unless otherwise indicated on the Drawings.
- C. Care shall be exercised during excavation from the duct banks to prevent digging too deep. Backfilling of low spots with earth fill will not be permitted unless thoroughly compacted and acceptable to the Engineer.
- D. Care shall be exercised, and temporary plugs shall be installed during installation to prevent the entrance of concrete, mortar, or other large particles of matter into the conduit systems. Manufactured spacers shall be utilized to support conduit during the pouring of concrete to prevent movement and misalignment of the conduits.
- E. Large radius elbows, 36" minimum, shall be used for all 90-degree conduit bends in the duct system. Conduits shall be sealed as specified in Section 16111.
- F. Construct concrete-encased conduits connecting to underground structures to have a flared section adjacent to the manhole to provide shear strength. Construct underground structures to provide shear strength. Construct underground structures to provide for keying the concrete encasement of the duct line into the wall of the structure. Use vibrators when this portion of the encasement is poured to ensure a seal between the encasement and the wall of the structure.

- G. Six (6) inches above all duct banks, the Contractor shall furnish and install a six (6) inch wide yellow plastic electrical hazard tape. Tapes shall be 0.009 inch polyethylene and shall have a continuous two line message in bold black letter. Top line shall indicate "CAUTION CAUTION". Second line shall indicate "ELECTRIC LINE BURIED BELOW."
- H. The Contractor shall perform all earthwork including excavation, backfill, bedding, compaction, shoring and bracing, grading and restoration of surfaces and seeded areas disturbed during the execution of the work.

3.03 Electric Handholes

- A. Electric handholes shall be installed to a sufficient depth to accommodate the required grading of ducts as well as maintaining a minimum distance of 9" from the bottom of the lowest duct centerline entrances to finished floor line and/or highest duct centerline entrance to roof. All handholes shall be built on or placed over a 6" layer of well-tamped gravel.
- B. Duct envelopes and conduit with bell ends shall enter at approximately right angles to the walls, except as may otherwise be shown on the Drawings.
- C. All individual cables and/or bundles of conductors shall be identified and "dressed" along the wall of the enclosure. Cable racks as specified herein shall be provided if the handhole is of sufficient size to accommodate the installation and is practical.

-END-

SECTION 16123 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish, install, connect, test and place in satisfactory operating condition, ready for service, all cables and wires indicated on the Drawings and as specified herein or required for proper operation of the installation, with the exception of internal wiring provided by electrical equipment manufacturers. The work of connecting cables to equipment, machinery, and devices shall be considered a part of this Section. All hardware, junction boxes, bolts, clamps, insulators and fittings required for the installation of cable and wire systems shall be furnished and installed by the Contractor.
- B. The Contractor shall submit Shop Drawings and other material required to substantiate conformance with the requirements set forth on the Drawings and in Section 16000, Basic Electrical Requirements, and Section 01300, Submittals. Shop drawings shall include, but not be limited to, detailed specifications and product data sheets for the power, control and instrumentation cable required for this project.
- C. The wire and cable to be furnished and installed for this project shall be the product of manufacturers who have been in the business of manufacturing wire and cable for a minimum of ten (10) years.
- D. Reference Section 16000, Basic Electrical Requirements and Section 13455, SCADA Local Area Network.

1.02 Testing

- A. All testing shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witness Shop Tests
 - a. Not required.
 - 2. Shop Test
 - a. Prior to the first shipment of each size of power, control, and instrumentation cable to be furnished and installed under this Contract, samples of each size of cable shall be subjected to complete physical and electrical factory production tests at the manufacturer's plant. Other cable and wiring shall be tested in accordance with the applicable ICEA Standards. Six copies of certified test data sheets shall be submitted to the Engineer for approval prior to installation at the site. Subsequent shipment of each size of wire shall be covered by certificates of compliance which shall list Contractor's name, point of delivery, reel numbers, size of wire, length of wire and date of shipment. Certificates shall attest that the wires and cables comply with specification requirements and that those wires and

cables are equal in every respect to wires and cables which have been successfully tested.

b. All test data or certificates shall be submitted.

3. Field Tests

a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

b. After installation, all wires and cables shall be tested for insulation levels and continuity. Insulation resistance between conductors of the same circuit and between conductor and ground shall be tested. Testing for insulation levels shall be as follows:

1) For 600V power and control cable, apply 1,000 VDC from a Megaohmmeter for all 600V wires and cables installed in lighting, control, power, indication, alarm and motor feeder circuits. Testing for continuity shall be "test light" or "buzzer".

2) 600V instrumentation signal cable shall be tested from conductor to conductor, conductor to shield, and conductor to ground using a Simpson No. 260 volt-ohmmeter or approved equal. The resistance value shall be 200 Megaohms or greater.

B. Low voltage wires and cables shall be tested before being connected to motors, devices or terminal blocks.

C. Voltage tests shall be made successively between each conductor of a circuit and all other conductors of the circuit grounded.

D. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.

E. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.

1.03 Submittals

A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the wire and cable manufacturer and submit the following:

1. Shop Drawings
2. Reports of Certified Shop and Field Tests
3. Wiring Identification Methods

B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed material's compliance with the Contract Documents.

B. Partial, incomplete or illegible Submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.
2. Cable pulling calculations.
3. Wiring identification methods and materials.

1.05 Identification

A. Each cable shall be identified as specified in Part 3, Execution, of this Specification.

1.06 Cable Pulling Lubricants (Necessary if non-lubricated wire is used)

A. The Contractor shall submit a list with a minimum of four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required. Lubricant shall be non-hardening type.

1.07 Cable Pull Calculations

A. The Contractor shall submit cable pulling calculations. These calculations, to be performed by a currently registered professional engineer in the State of Ohio, shall define pulling tension and sidewall loading (sidewall bearing pressure values) for all installations of 600VAC, #1/0 conductors and larger greater than 200 feet in length. Calculations for straight horizontal installations of 600VAC, #1/0 conductors and larger greater than 200 feet are not required.

PART 2 - PRODUCTS

2.01 Manufacturers

A. The wire and cable covered by this Specification is intended to be standard equipment of proven performance as manufactured by the Okonite Company, Rome Cable Corporation, Southwire Company or equal. Wire and cable shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and shown on the Drawings. Only one manufacturer for each wire and cable type shall be permitted.

2.02 600 Volt Power Wire and Cable

A. 600 volt cable and wire shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations THWN, 75°C for wet locations.

B. Conductors shall be tin or alloy coated (if available), stranded copper per ASTM-B8 and B-33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum size wire shall be No. 12 AWG.

- C. Uncoated conductors shall only be allowed if specifically accepted by the Engineer.
- D. 600 volt individual power wire and cable shall be Okoseal-N as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent or equal. Multi-conductor power cables shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent or equal.

2.03 600 Volt VFD Cable

- A. Where Variable Frequency Drives are used, wire shall be shielded VFD type cable with full sized symmetrical segmented grounding rated to an equivalent of 100%.
- B. Conductors shall be tin or alloy coated, stranded copper per ASTM-B8 and B33, and Class B or C stranding contingent on the size unless otherwise specified. Minimum wire size shall be No. 12 AWG.
- C. Cable shall be shielded and armored with black PVC outer jacketed and rated to 90°C.

2.04 600 Volt Control Cable

- A. 600 volt control cable shall consist of stranded, copper conductor with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations. The individual conductors of the multiple conductor cable shall be color coded for proper identification. Color coding shall be equal to ICEA S-68-514, Table K-1. Cables shall meet requirements of IEEE-383.
- B. Conductors shall be tin or alloy coated (if available), stranded copper per ASTM B-8 and B-33 and Class B or C stranding contingent on the size unless otherwise specified. Minimum wire size shall be No. 14 AWG.
- C. Uncoated conductors shall only be allowed if specifically accepted by the Engineer.
- D. 600 volt individual conductor control wire shall be Okoseal-N as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent, or equal. Multi-conductor control cable shall be Okoseal-N Type TC Cable as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent or equal.

2.05 Lighting and Receptacle Wire and Cable

- A. The lighting and receptacle branch circuit wire shall consist of stranded, copper conductors with insulation rated THHN, 90°C for dry locations and THWN, 75°C for wet locations.
- B. Conductors shall be tin or alloy coated (if available), stranded copper per ASTM-B8 and B-33 and Class B or C stranding contingent on the size unless otherwise specified. Minimum size wire shall be No. 12 AWG.
- C. Uncoated conductors shall only be allowed if specifically accepted by the Engineer.

- D. Lighting and receptacle cables and wire shall be Okoseal-N as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent or equal.

2.06 Instrumentation Cable

- A. The instrumentation cable for analog signals shall be single, shielded, twisted pairs or triads with 600 volt insulation and shall have a 90°C insulation rating.
- B. Conductors shall be tin or alloy coated (if available), soft, annealed copper, stranded per ASTM-B8, Class B stranding unless otherwise specified. Minimum size wire shall be No. 16 AWG.
- C. The instrumentation cable shall be Okoseal-N Type P-OS for single pair or triad applications and Okoseal-N Type SP-OS for multiple pair or triad applications as manufactured by the Okonite Company, Rome Cable Corporation equivalent, Southwire Company equivalent or equal.

PART 3 - EXECUTION

3.01 600V Cable Installation

- A. The cable and wires shall be installed as specified herein and shown on the Drawings.
- B. The cables shall be terminated in accordance with the cable and/or termination product manufacturer's instructions for the particular type of cable.
- C. To minimize oxidation and corrosion, wire and cable shall be terminated using an oxide-inhibiting joint compound recommended for "copper-to-copper" connections. The compound shall be Penetrox E as manufactured by Burndy Electrical, or equal.
- D. Splices shall not be allowed in the underground manhole and handhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing. Splicing materials shall be barrel type butt splice connectors and heat shrink tubing as manufactured by 3M, Ideal, or equal.
- E. **No splicing of instrumentation cable is allowed.** The use of screw-on wire connectors (wire nuts) for power or control wiring will only be permitted if specifically accepted by the Engineer.
- F. All wiring runs shall be continuous from protective device to load. Deviation from this statement is only permitted if specifically accepted by the engineer.
- G. Wire and Cable Sizes
 - 1. The sizes of wire and cable shall be as shown on the Drawings, or if not shown, as approved by the Engineer. If required due to field routing, the size of

conductors and respective conduit shall be increased so that the voltage drop does not exceed 2-1/2%.

2. Minimum wire size within control panels, motor control centers, switchboards and similar equipment shall be No. 12 AWG for power and No. 14 AWG for control.

H. Number of Wires

1. The number of wires indicated on the Drawings for the various control, indication and metering circuits were determined for general schemes of control and for particular indication and metering systems.
2. The actual number of wires installed for each circuit shall, in no case, be less than the number required; however, the Contractor shall add as many wires as may be required for control and indication of the actual equipment selected for installation at no additional cost to the Owner. The addition of conductors shall be coordinated with and approved by the Engineer to avoid violations of the NEC regarding conduit fill.
3. All spare field conductors shall be terminated on the terminal blocks mounted within the equipment.

I. Wiring Identification

1. All wiring shall be identified at each termination, shall have a unique wire number, and shall be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers as indicated in the accepted Shop Drawings. Where no wire numbers are indicated, the Contractor shall advise the Engineer in writing prior to assigning wire numbers. Wire numbers shall not be duplicated.
2. In addition to color coding, for all 1-phase and 3-phase systems, identify each cable (single or multi-conductor) and conductor at each end, in each manhole, pullbox, cable tray, or other component of the raceway system. This identification is applicable to all power, control, alarm, signal, instrumentation cables and conductors.
3. Identify each cable (single or multi-conductor) and groups or bundles of individual single conductors in each manhole, pullbox, cable tray or other component of the raceway system with circuit identification markers. Implement a "from-to" cable/conductor bundle tagging system as part of this identification effort.
4. For instrumentation wiring, the Contractor shall provide, on the Shop Drawings, a schedule indicating the wire number, color code (if applicable), origin and destination devices and terminals.
5. Wire identification shall be accomplished through the use of a portable printer and white, polyolefin wire marking sleeves. The wire identification system shall be a "Bradymarker" XC Plus Printer with "Bradysleeve" wire marking sleeves, Panduit equivalent, Seton equivalent or equal.
6. The Contractor shall submit a written description outlining their intended method of wiring identification and supporting information (i.e., product data sheets, etc.) identifying the materials to be used. The Contractor shall meet with the Owner and the Engineer to come to an agreement regarding wire identification prior to the installation of any wiring.

J. Cable Identification Tags

1. The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a bronze metal tag, 1/2-inch in diameter, with a 1/8-inch diameter hole, with copper wire through the hole, the cable identification number approved by the Engineer. The tag shall be attached to the cable by twisting the ends of the copper wires. All cables shall be tagged with its full ID number immediately after it has been pulled.

K. Cable Installation

1. All interior cable not protected by a compartment enclosure shall be run in conduit.

L. Wiring Supplies

1. Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used.
2. Rubber insulating tape shall be in accordance with ASTM Des. D119. Friction tape shall be in accordance with ASTM Des. D69.

M. Training of Cable

1. The Contractor shall furnish all labor and material required to train cables around cable vaults within buildings and in manholes and handholes in the outdoor underground duct system. Sufficient length of cable shall be provided in each handhole, manhole, and vault so that the cable can be trained and racked in an approved manner. Instrumentation cable shall be racked separate from all other AC and DC wiring to maintain the required separation specified herein. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fire-proofed. The training shall be done in such a manner as to minimize chaffing.

N. Connections at Control Panels, Limit Switches, and Similar Devices

1. Where stranded wires are terminated at panels and/or devices, connections shall be made by solderless lug, crimp type ferrule or solder dipped.
2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and complete with terminal strips and shall install No. 14 AWG stranded wires from the device to the junction box in a conduit. The #12 AWG field wiring shall also be terminated in the same junction box to complete the circuit.

O. Pulling Temperature

1. Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage area with an ambient temperature not lower than 55°F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

P. Color Coding

1. Conductor insulation shall be color coded as follows:
 - a. 480V AC Power
 - Phase A - BROWN
 - Phase B - ORANGE
 - Phase C - YELLOW
 - Neutral – WHITE
 - b. 120/208V or 120/240V AC Power
 - Phase A - BLACK
 - Phase B - RED
 - Phase C - BLUE
 - Neutral - WHITE
 - c. DC Control
 - Positive - Blue
 - Negative - Blue with white stripe
 - d. 120VAC Control
 - Single conductor 120 VAC control wire shall be RED except for a wire entering a motor control center compartment or control panel which is an interlock. This conductor shall be color coded YELLOW.
 - e. 24VAC Control
 - All wiring - ORANGE
 - f. Equipment Grounding Conductor
 - All wiring - GREEN
2. Conductors No. 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape.

3.02 Instrumentation Cable Installation

- A. The Contractor shall install all cable or conductors used for instrumentation wiring (4-20 mA DC, etc.) in rigid galvanized steel or PVC coated rigid galvanized steel conduit. The use of asbestos cement or plastic conduit will not be permitted. Analog signal wires shall exclusively occupy these conduits. No other wiring for AC or digital DC circuits shall be installed in these conduits.
- B. All shielding shall be continuous and shall be grounded in accordance with the instrumentation equipment manufacturer's recommendations, as approved.

- C. A raceway containing instrumentation cable shall be installed to provide the following clearances:
 - 1. Raceway installed parallel to raceway conductors energized at 480 through 208 volts shall be 18 inches and 208/120 volts shall be 12 inches.
 - 2. Raceway installed at right angles to conductors energized at 480 volts or 120/208 volts shall be 6 inches.
- D. Where practical, raceways containing instrumentation cable shall cross raceway containing conductors of other systems at right angles.
- E. Where instrumentation cables are installed in panels, manholes, handholes and other locations, the Contractor shall arrange wiring to provide maximum clearance between these cables and other conductors. Instrumentation cables shall not be installed in same bundle with conductors of other circuits.
- F. Grounding of cable shield shall be accomplished at one point (terminal block) only unless otherwise required by instrumentation system's manufacturer.
- G. Additional pullboxes shall be furnished and installed for ease of cable pulling and the cable manufacturer's recommended conduit fill factor shall be followed. Where required for specifically directed by the Engineer, the Contractor shall moisture seal the cables at all connections with OZ Gedney Type "CSB", or equal, sealing bushings.
- H. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc. shall be per manufacturer's recommendations.
- I. All cable, insulation and jacket shall have adequate strength to allow for it to be pulled through the conduit systems. Sufficient conductors shall be installed to provide space and serve future equipment where shown and specified. All conductors shall be color coded and all wires shall be suitably tagged with permanent markers at each end.

3.03 Fiber Optic Cable Installation

- A. The Contractor shall install the fiber optic cable furnished by the General Contractor and/or the Instrumentation and Control Subcontractor. The cable shall be installed in its respective raceway system(s) as specified herein, indicated on the Drawings, and in accordance with the cable manufacturer's instructions. Reference Division 13 for additional information regarding the fiber optic cable.

3.04 Schedules

- A. The conduit and wire schedules on the Drawings list conduit size, wire size, type and number required.
- B. All conduits and wiring shall be furnished and installed under this Contract.

- C. The definition of the term conduit shall include all types of raceways used on this project.
- D. In all cases where the word “install” or “installed” refers to conduit, it shall mean install all conduit, raceways, fittings, supports, boxes and appurtenances. In addition, it shall include all grounding and bonding. Pull cords are to be pulled upon completion of each raceway.
- E. In all cases where the word “install” or “installed” refers to cable, it shall include pulling the cable and testing the cable for insulation resistance, continuity and absence from grounds, as well as terminating all conductors and testing for proper connection.
- F. The conduit and wire schedules do not indicate all of the conduit and wire required for the project. The Contractor is advised to refer to these Specifications and Drawings for the additional conduit and wire requirements. All lighting, receptacle and control circuits may require field routing by the Contractor.
- G. Conduits leaving or entering a building or structure may be shown in a different arrangement as compared to the duct bank. The Contractor shall arrange conduits penetrating the building based on field conditions. The Drawings are not meant to represent actual conduit arrangements required. Furthermore, spare conduits from duct banks into buildings or structures are required and shall be furnished and installed based on field conditions and Engineer approval.
- H. Certain runs of underground duct banks are not detailed, such as site lighting home runs, but all underground ducts shall comply with the requirements of these Specifications.

-END-

SECTION 16130 – OUTLET AND JUNCTION BOXES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install junction boxes and outlet boxes for wiring devices of the type and at the locations as specified herein and as shown on the Drawings or as required. As a rule, provide junction boxes in all runs of greater than 100' in length. For other lengths, provide boxes as required for splicing, pulling, or as specified in Section 16111, Conduit.
- B. Reference Section 16000, Basic Electrical Requirements, Section 16111, Conduit, Section 16123, Building Wire and Cable, Section 16141, Wiring Devices and Section 16190, Supporting Devices.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Field Tests
 - a. All field testing shall be done in accordance with the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include, but not be limited to:
 - 1. Product data sheets.
 - 2. Product dimensional drawings.

1.05 Supplies and Spare Parts

- A. The Contractor shall furnish 10% (minimum of 1) spare box for each type of receptacle, switch and plug furnished and installed for this project and 10% (minimum of 1) spare junction box for each type of junction box furnished in this project.
- B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.06 Identification

- A. Each junction box shall be identified with the equipment item number, manufacturer's name or trademark, and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by these Specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.
- B. The Contractor shall use the products of a single manufacturer for each type of box.

2.02 Junction Boxes

- A. Junction and pull boxes shall be properly sized for the application, considering future expansion and location.
- B. Junction and pull boxes shall be constructed with screw covers, without knockouts except where required for installation and of materials for specified areas as follows:
 - 1. In dry, dust free conditions: Galvanized steel in finished areas, aluminum in unfinished areas.
 - 2. In damp or wet conditions: Gasketed steel cover in finished areas and NEMA 4 construction with gasketed cast aluminum cover in unfinished areas.
 - 3. In exterior locations: Cast malleable iron type with threaded hubs and vellunoid gasket.

4. In corrosive conditions and all chemical rooms: NEMA 4X non-metallic construction with gasketed cover.
- 2.03 Outlet Boxes

- A. Outlet boxes shall be properly sized to fit the corresponding wiring device.
- B. Outlet boxes shall be constructed of NEC gauge galvanized steel for flush mount, and NEC gauge cast aluminum for devices and fixtures on exposed conduit on walls. Provide removable covers attached with round head silicon bronze machine screws.

2.04 Supports

- A. Support boxes independently of conduits entering them by means of bolts, rod hangers, or other suitable means coated in zinc chromate primer and in accordance with Section 16190, Supporting Devices.

PART 3 - EXECUTION

3.01 Installation and Procedures

A. Outlet Boxes

1. Set box square and true with building surfaces.
2. Secure box firmly to building structure.
3. Verify location of outlets and switches in finished rooms. In centering outlets and locating boxes, allow for overhead pipes, ducts and mechanical equipment, variations in fireproofing and plastering, windows, etc.
4. Maintain symmetry of all outlets as closely as possible.
5. Locate light switches on the latch side of the door.
6. Protect devices on outlets in locations where outlets are subject to injury.
7. Cap all outlets not used with blank covers.

B. Junction and Pull Boxes

1. Install pull boxes wherever necessary to facilitate pulling of wire and as indicated.
2. Locate junction and pull boxes in a finished space so not exposed unless otherwise approved. Reroute conduit or make other arrangements for concealment as approved.
3. Covers shall be easily accessible.
4. Splicing boxes for fixtures recessed in hung ceilings shall be accessible through openings created by removal of fixtures.

- C. Switch boxes shall be of unit construction and of sizes as required to adequately house the number of switches required. No sectional type switch boxes shall be permitted.

- D. All outlet boxes shall be set true and plumb and shall be flush against the finished wall surfaces.

- E. All devices shall be flush-mounted in finished areas unless otherwise noted. The Contractor shall determine the proper position of every outlet box and relocate any outlet without additional cost to the Owner if any are incorrectly or improperly located.
- F. In all areas where thermal or acoustic insulation is applied to the ceiling or walls, outlet boxes shall be set to finish flush with the finished surface of the insulation.
- G. When indicated height would place any of the equipment at an unsuitable location such as at a molding or break in wall finish, the Engineer shall determine final location.
- H. For the below-named items mounting heights from finish floor, or finish grade to top is applicable. Mounting heights shall be as follows, unless otherwise specified herein, indicated on the Drawings or required by the Americans with Disability Act (ADA):
 - 1. Single-pole light switches, 48 inches.
 - 2. Duplex receptacles in dry areas, 16 inches
 - 3. Duplex receptacles in pump rooms, 48 inches

-END-

SECTION 16141 - WIRING DEVICES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install all switches and receptacles for lighting and miscellaneous power applications of the type and at the locations as specified herein and as shown on the Drawings.
- B. All switches and receptacles shall be furnished and installed in outlet boxes as specified in Section 16130, Boxes.
- C. Reference Section 16000, Basic Electrical Requirements.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Field Tests
 - a. All field testing shall be done in accordance with the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include, but not be limited to:
 - 1. Product data sheets.

1.05 Supplies and Spare Parts

- A. The Contractor shall furnish 10% (minimum of 1) spare of each receptacle, switch and plug furnished and installed for this project.

- B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.06 Identification

- A. Each switch and receptacle shall be identified with the equipment item number, manufacturer's name or trademark, and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by these Specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.
- B. The Contractor shall use the products of a single manufacturer for each type of wiring device.
- C. The Contractor shall use the products of a single manufacturer for all device plates. Plate variations are allowed for the following devices:
 - 1. Where the selected plate manufacturer does not manufacture a suitable finish plate.
 - 2. For heavy-duty receptacles rated at more than 30A.
 - 3. Where non-standard plates are required, specified or shown.
- D. The Contractor shall furnish and install all wiring devices and device plates. Wiring devices as listed herein are intended to indicate type, function and quality of the products.
- E. The receptacles, switches, device plates and other appurtenances shall comply with the requirements of these Specifications. Receptacles installed in toilet, locker and bathrooms shall be of ground fault interrupter type to meet the minimum NEC requirements. Ground fault circuit interrupter receptacles shall also be furnished and installed as specified herein, indicated on the Drawings and required by the NEC.
- F. The Contractor shall provide specification grade devices which shall be as manufactured by Appleton, Crouse-Hinds, Leviton, Harvey Hubbell Co., General Electric Company, Bryant Electric Company, Pass & Seymour or equal.

2.02 Wiring Devices

A. Wiring devices shall be in accordance with the following for nonhazardous areas:

1. Wall Switches, Single Pole, 20 A, 120-277V equivalent to Hubbell No. 1221, Pass & Seymour No. 20AC1, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3031, Hubbell equivalent, Pass & Seymour equivalent or equal.
2. Wall Switches, Double Pole, 20 A, 120-277V equivalent to Hubbell No. 1222, Pass & Seymour No. 20AC2, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3032, Hubbell equivalent, Pass & Seymour equivalent or equal.
3. Wall Switches, Three-Way, 20 A, 120-277V equivalent to Hubbell No. 1223, Pass & Seymour No. 20AC3, Leviton equivalent, or equal. Switches rated 30 A, 120-277V shall be Leviton 3033, Hubbell equivalent, Pass & Seymour equivalent or equal.
4. Wall Switches, Four-Way, 20 A, 120-277V equivalent to Hubbell No. 1224, Pass & Seymour No. 20AC4, Leviton equivalent or equal.
5. Convenience Receptacles 20 A, 125V, duplex polarized with grounding connection equivalent to Hubbell No. 5362, Pass & Seymour equivalent, Leviton equivalent or equal.
6. Hubbell Cat. No. GF-5362, Pass & Seymour equivalent, Leviton equivalent or equal, for 20A, 120V, duplex, ground fault circuit interrupting type.

B. Special Purpose Receptacles shall be rated to carry, at least where required the full load amperes and voltage of the unit connected thereto. These receptacles shall be provided with grounding poles and shall be equivalent to the following:

1. Hubbell Cat. No. HBL-5661, Pass & Seymour No. 5871, Leviton equivalent or equal, for 20A, 250VAC, 1-phase service.
2. Hubbell Cat. No. HBL-9330, Pass & Seymour No.3801, Leviton equivalent or equal, for 30A, 250VAC, 1-phase service.
3. Hubbell Cat. No. 9430, Pass & Seymour No. 5740, Leviton equivalent or equal, for 30A, 208/120V, 3-phase service.
4. Hubbell Cat. No. 9450, Pass & Seymour No. 5750, Leviton equivalent or equal, for 50A, 208/120V, 3-phase service.
5. Hubbell Cat. No. 9460, Pass & Seymour No. 5760, Leviton equivalent or equal, for 60A, 208/120V, 3-phase service.
6. Hubbell Cat. No. 9330, Pass & Seymour No. 5930, Leviton equivalent or equal, for 30A, 208V, single-phase service.
7. Hubbell Cat. No. 9315, Pass & Seymour equivalent, Leviton equivalent or equal, for 30A, 277V, single-phase service.
8. Hubbell Cat. No. 23CM10, Pass & Seymour equivalent, Leviton equivalent, or equal, for 20A, single, 125V, polarized with grounding connection, twist lock type. Matching plug shall be Hubbell Cat. No. 23CM11, Pass & Seymour equivalent, Leviton equivalent or equal.
9. Crouse-Hinds "Arktite" Series, Appleton equivalent, Killark equivalent, or equal, 30A, 3P, 600 Volt, twist lock, weatherproof, power receptacle and box with matching plug.

C. For hazardous areas, the following shall be provided:

1. Wall Switches, single pole, 20 A, 120 V equivalent to Crouse Hinds Cat. No. EFD3591 or EFDC3591 (as required); Appleton No. EDS175F1 or EDSC175F1, Killark equivalent or equal.
2. Convenience Receptacles 20 A, 120-250 VAC, 2 wire, 3 pole equivalent to Crouse Hinds Cat. No. CPS152-201, Appleton No. CPE1-2375, Killark equivalent or equal.

D. Plugs for hazardous and non-hazardous receptacles shall be provided:

1. One mating plug of the same or better grade for each 10 convenience receptacles, minimum of 2 each.
2. Plugs and respective cable shall be provided for equipment furnished under other Divisions (steam cleaners, welders, etc.) as necessary.

2.03 Device Plates

- A. Wall plates with gaskets for flush-mounted receptacles and switches shall be made of Type 304 stainless steel, not less than 0.040 of an inch thick, with beveled edges and milled on the rear so as to lie flat against the wall. Wall plates shall be equivalent to Hubbell Series 9600, Pass & Seymour series 93000, Leviton equivalent or equal.
- B. Device plates for weatherproof and watertight installations shall be Appleton Type FSR, Crouse-Hinds #DS185, or equal for wall switches and Appleton Type FSK, Crouse-Hinds #WLRD, or equal for convenience receptacles. "In-use" weatherproof covers shall be rugged, die-cast aluminum as manufactured by Thomas & Betts "Red Dot" or equal.

2.04 Plugs

- A. The Contractor shall furnish suitable plugs with equipment furnished under the respective Contract. Plugs shall be black rubber or plastic. For waterproof receptacles, the plugs shall be similar in construction to the receptacles and shall be encased in corrosion resistant yellow housing provided with clamping nuts and stuffing gland cable outlets.

2.05 Process Instruments

- A. The Contractor shall furnish and install a local disconnect switch at each process instrument (e.g., level transmitter, flow transmitter, analytical instrument etc.) to disconnect the 120VAC power supply to the instrument. The device shall be a NSSC series manual motor starting switch without overload protection as manufactured by Crouse-Hinds, Appleton equivalent or equal. For hazardous locations, the device shall be a front operated general use snap switch mounted in an EFS enclosure as manufactured by Crouse-Hinds, Appleton equivalent or equal.

PART 3 - EXECUTION

3.01 Installation

- A. Switch boxes shall be of unit construction and of sizes as required to adequately house the number of switches required. No sectional type switch boxes shall be permitted.
- B. Where more than one switch occurs at one point, gang plates shall be used.
- C. All device plates shall be set true and plumb and shall fit tightly against the finished wall surfaces and outlet boxes.
- D. All devices shall be flush-mounted in finished areas unless otherwise noted. The Contractor shall determine the proper position of every outlet and relocate any outlet without additional cost to the Owner if same is incorrectly or improperly located. The Engineer reserves the right to change the location of any outlet or connecting equipment up to the time of roughing in without additional cost to the Owner, provided conduit runs are not increased by more than 10 feet.
- E. In all areas where thermal or acoustic insulation is applied to the ceiling or walls, outlet boxes shall be set to finish flush with the finished surface of the insulation.
- F. When indicated height would place any of the equipment at an unsuitable location such as at a molding or break in wall finish, the Engineer shall determine final location.
- G. For the below-named items mounting heights from finish floor, or finish grade to top is applicable. Mounting heights shall be as follows, unless otherwise specified herein, indicated on the Drawings or required by the Americans with Disability Act (ADA):
 - 1. Single-pole light switches, 48 inches.
 - 2. Duplex receptacles in dry areas, 16 inches
 - 3. Duplex receptacles in pump rooms, 48 inches

3.02 Circuiting

- A. Convenience receptacles shall be grouped on circuits separate from the lighting circuits. A maximum of eight (8) convenience outlets are permitted per 20A, 120V circuit.

-END-

SECTION 16170 - GROUNDING AND BONDING

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install grounding systems complete in accordance with the minimum requirements established by Article 250 of the NEC. Article 250 of the NEC shall be considered as a minimum requirement for compliance with this Specification.
- B. Grounding of all instrumentation and control systems shall be furnished and installed in accordance with the manufacturer/system requirements and IEEE 1100-92, Powering and Grounding of Sensitive Electronic Equipment. Conflicts shall be promptly brought to the attention of the Engineer.
- C. In addition to the NEC requirements, building structural steel columns shall be permanently and effectively grounded.
- D. Reference Section 16000, Basic Electrical Requirements.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings
 - 2. Reports of certified field tests.
- B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to:
 - 1. Equipment specifications and product data sheets.
 - 2. Drawings and written description of how the Contractor intends to furnish and install the grounding system.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by these specifications shall be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 Ground Rods and Grid

- A. Ground rods shall be rolled to a commercially round shape from a welded copper-clad steel manufactured by the molten-welding process or by the electro-formed process (molecularly bonded). They shall have an ultimate tensile strength of 75,000 pounds per square inch (psi) and an elastic limit of 49,000 psi. The rods shall be not less than 3/4 inch in diameter by 10 feet in length; and the proportion of copper shall be uniform throughout the length of the rod. The copper shall have a minimum wall thickness of 0.010 inch at any point on the rod.
- B. The maximum resistance to ground of a driven ground rod shall not exceed 5 ohms under normally dry conditions. Where the resistance obtained with one (1) ground rod exceeds 5 ohms, additional ground rods shall be installed not less than 6 feet on centers. Except where specifically indicated otherwise, all exposed non current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductors in nonmetallic raceways and neutral conductors of wiring systems shall be grounded.
- C. The ground connection shall be made at the main service equipment and shall be extended to the point of entrance of the metallic water service. Connection to the water pipe shall be made by a suitable ground clamp or lug connection to a plugged tee. If flanged pipes are encountered, connection shall be made with the lug bolted to the street side of the flanged connection. If there is not suitable metallic water service to the facility, the ground connection shall be made to the driven ground rods on the exterior of the building.
- D. Where ground fault protection is employed, care shall be taken so that the connection of the ground and neutral does not interfere with the correct operation of the ground fault protection system.

2.03 Fittings

- A. Grounding connections to equipment shall be bolted. Cable end connections may be made by use of the crucible weld process or bolted type connectors. Bolted type connectors for this application shall consist of corrosion resistant copper alloy with silicone bronze bolts, nuts and lockwashers which are designed for this purpose.

2.04 Grounding Conductors

- A. A green, insulated equipment grounding conductor, which shall be separate from the electrical system neutral conductor, shall be furnished and installed for all circuits. Equipment grounding conductors shall be furnished and installed in all conduits. Use of conduits as the NEC required equipment grounding conductor is not acceptable.

2.05 Equipment Grounds

- A. Equipment grounds shall be solid and continuous from a connection at earth to all distribution panelboards. Ground connections at panelboards, outlets, equipment, and apparatus shall be made in an approved and permanent manner.

PART 3 - EXECUTION

3.01 Installation

- A. Metal surfaces where grounding connections are to be made shall be clean and dry. Steel surfaces shall be ground or filed to remove all scale, rust, grease and dirt. Copper and galvanized steel shall be cleaned with emery cloth to remove oxide before making connections.
- B. Ground Grid
 1. A main ground grid shall be provided for each structure and interconnecting structure grids consisting of driven ground rods. The ground rods shall be driven deep enough to obtain a ground resistance of not more than 5 ohms and shall be interconnected by the use of copper cable bus, welded to the rods by the crucible weld process. The grounding cables shall be installed after the excavations for the building have been completed and prior to the pouring of concrete for the footings, mats, etc. Copper "pigtailed" shall be connected to the ground system and shall enter the buildings and structure from the outside and shall be connected to steel structures, and equipment as described in this Section and as required to provide a complete grounding system.
 2. Grounding conductors shall be continuous between points of connection; splices shall not be permitted.
 3. Where conductors are exposed and subject to damage from personnel, traffic, etc., conductors shall be installed in metal raceway. The raceway shall be bonded to the grounding system.
 4. Connections to ground rods shall be exposed to permit maintenance and inspection for continuity and effectiveness of grounding system.

5. Where subsurface conditions do not permit use of driven ground rods to obtain proper ground resistance, rods shall be installed in a trench or plate electrodes shall be provided, as applicable and necessary to obtain proper values of resistance.

C. Raceways

1. Conduit which enters equipment such as switchgear, motor control centers, transformers, panelboards, variable frequency drives, instrument and control panels and similar equipment shall be bonded to the ground bus or ground lug, where provided, and as otherwise required by the NEC.

D. Grounding Bus

1. All wire installed to the grounding bus shall be installed in conduit. There shall be no exposed copper on site.
2. The grounding bus bar shall be installed within an enclosure. There shall be no exposed copper on site.

-END-

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install structural steel supports for mounting and installing all electrical, lighting, alarm systems, instrumentation and communications equipment furnished under this Contract.
- B. Equipment shall be installed strictly in accordance with recommendations of the manufacturer and best practices of the trade resulting in a complete, operable and safe installation. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation.
- C. Reference Section 16000, Basic Electrical Requirements.

1.02 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable Specification section.

1.03 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to:
 - 1. Equipment specifications and product data sheets.
 - 2. Complete assembly, layout, installation and foundation drawings with clearly marked dimensions.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade and shall operate satisfactorily when installed as shown on the Drawings.

2.02 Materials

- A. Materials used in accordance with this Section shall be as specified herein.

PART 3 - EXECUTION

3.01 Installation

A. Concrete or Masonry Inserts

1. The Contractor shall be responsible for the furnishing and installation of all conduit sleeves, anchor bolts, masonry inserts and similar devices required for installation of equipment furnished under this Contract.
2. If a time delay for the arrival of any special inserts or equipment drawings, etc. occurs, the Contractor may, if permitted by the Engineer, make arrangements for providing approved recesses and openings in the concrete or masonry and, upon subsequent installation, the Contractor shall be responsible for filling in such recesses and openings. Any additional costs that may be incurred by this procedure shall be borne by the Contractor.
3. The Contractor shall furnish leveling steel channels for all switchgear, switchboards, motor control centers, and similar equipment. The leveling steel channels shall be provided for installation in the equipment supporting pads. Coordination of the installation of these channels with the concrete pad is essential and required. Pad height shall be as required to maintain coverage of the reinforcement bars while not exceeding the maximum mounting heights requirements of the NEC.

B. Support Fastening and Locations

1. All equipment fastenings to columns, steel beams, and trusses shall be by beam clamps or welded. No holes shall be drilled in the steel. Where supports or hangers are required for heavy electrical equipment units exceeding fifty pounds, a registered professional engineer shall check the steel. Where required, additional sections shall be provided for a safe installation. Supports and hangers shall be PVC coated as required to suit the application and shall be compatible with the balance of the installation.
2. All holes in hung ceilings for support rods, conduits and other equipment shall be made adjacent to bars where possible to facilitate removal of ceiling panels.
3. For interior dry areas, a bracket and channel type support of zinc chromated galvanized steel construction shall be provided wherever required for the support of starters, switches, panels and miscellaneous equipment.
4. For outdoor service or in indoor damp/wet process areas, the support system shall be made of either Type 304 stainless steel, PVC coated rigid galvanized steel or aluminum. The materials of construction shall be coordinated with the process/chemical area in which the support system will be installed.
5. All hardware (bolts, nuts, washers, etc.) shall be Type 304 stainless steel.
6. All supports shall be rigidly bolted together and braced to make a substantial supporting framework. Where possible, control equipment shall be grouped together and mounted on a single framework. Wherever this occurs, a

provision shall be made for ready access to the wiring for connections to the equipment by means of boxes with screw covers.

7. Aluminum support members shall not be installed in direct contact with concrete. Stainless steel or non-metallic "spacers" shall be used to prevent contact of aluminum with concrete.
8. Actual designs for supporting framework should take the nature of a picture frame of channels and bracket with a plate for mounting the components. The Contractor is responsible for the design of supporting structure; They shall submit design details to the Engineer for acceptance before proceeding with the fabrication.
9. Wherever dissimilar metals come into contact, the Contractor shall isolate these metals as required with neoprene washers, nine (9) mil polyethylene tape or gaskets.

-END-

SECTION 16195 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 The Requirement

- A. All electrical equipment shall be properly identified in accordance with these Specifications and the Contract Drawings. All switchgear, switchboards, motor control centers, variable frequency drives, lighting and distribution panelboards, combination starters, control panels, pull/junction boxes, enclosures, disconnect switches, control stations and similar equipment shall be identified in the manner described, or in an equally approved manner.
- B. The types of electrical identification specified in this section include, but are not limited to, the following:
 - 1. Exposed conduit color banding.
 - 2. Operational instructions and warnings.
 - 3. Danger signs.
 - 4. Equipment/system identification signs.
 - 5. Nameplates.

1.02 Signs

- A. "DANGER-HIGH-VOLTAGE" signs shall be securely mounted on the entry doors of all electrical rooms.

1.03 Lettering and Graphics

- A. The Contractor shall coordinate names, abbreviations and other designations used in the electrical identification work with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

1.04 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit shop drawings. Each submittal shall be identified by the applicable specification section.

1.05 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to:
 - 1. Equipment specifications and product data sheets.

PART 2 - PRODUCTS

2.01 Manufactures

- A. The material covered by these Specifications is intended to be standard material of proven performance as manufactured by reputable concerns. Material shall be fabricated, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as specified herein and shown on the Drawings.

2.02 Nameplates

- A. Nameplates shall be engraved, high pressure plastic laminate, black with white lettering.

2.03 High Voltage Signs

- A. Standard "DANGER" signs shall be of baked enamel finish on 20 gage steel; of standard red, black and white graphics; 14 inches by 10 inches size except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where a larger size is needed for adequate vision.

2.04 Conduit Markers

- A. All conduits shall be labeled in accordance with the conduit and wire schedules. Color coded conduit markers shall be standard preprinted, flexible permanent, plastic sheet conduit markers, extending 360 degrees around conduits; designed for attachment to conduit by adhesive. Lettering shall indicate the conduit number as indicated in the conduit schedule. Provide 8 inch minimum length for 2 inch and smaller conduit and 12 inch length larger than 2 inch conduit.
- B. All conduits transitioning from above ground to below ground shall be clearly labeled at both the entry and exit points. Labels shall include the conduit designation and a description of its intended use (e.g., power, signal, control, or communications). Labeling shall be durable, legible, and suitable for outdoor and underground environments, complying with applicable standards for environmental and mechanical resistance.

PART 3 - EXECUTION

3.01 Nameplates

- A. Nameplates shall be attached to the equipment enclosures with (2) two stainless steel sheet metal screws for nameplates up to 2-inches wide. For nameplates over 2-inches wide, four (4) stainless steel sheet metal screws shall be used, one (1) in each corner of the nameplate. The utilization of adhesives is not permitted.

3.02 Conduit Identification

- A. Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on the electrical conduit in a manner similar to the piping identification. Except as otherwise indicated, use orange as the coded color for conduit marker backgrounds. Conduit identification shall be made after the conduit has been painted.

3.03 Operational Identification and Warnings

- A. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install plastic signs or similar equivalent identification, instruction, or warnings on switches, outlets and other controls, devices, and covers or electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes. Signs shall be attached as specified above for nameplates.

3.04 Power Source Identification

- A. After installation of all field equipment (i.e., valves, motors, fans, unit heaters, instruments etc) install nameplates at each power termination for the field equipment. Nameplate data shall include equipment designation (tag number), power source (MCC number, panelboard etc), circuit number, conduit number from schedule and voltage/phase.
- B. Contractor to coordinate with the Engineer and the Owner regarding exact nameplate placement during construction.
- C. Nameplates shall be as specified herein.

-END-

SECTION 16440 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install separately mounted, individual disconnect switches as specified herein and indicated on the Drawings.
- B. Reference Section 16000, Basic Electrical Requirements and Section 16195, Electrical Identification.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings
 - 2. Spare Parts List
- B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to:
 - 1. Product data sheets.
 - 2. Complete layout and installation drawings with clearly marked dimensions for each type/size/rating of disconnect switch.
 - 3. Assembled weight of each unit.

- D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items that the Contractor intends to provide are acceptable and shall be submitted.

1.05 Tools, Supplies and Spare Parts

- A. The equipment shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment and with all spare parts as recommended by the equipment manufacturer.
- B. One complete set of spare fuses for each ampere rating installed shall be furnished and delivered to the Owner at the time of final inspection.
- C. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- D. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.06 Identification

- A. Each equipment item shall be identified with a nameplate. The nameplate shall be engraved indicating the circuit number and equipment name with which it is associated. Equipment identification shall be in accordance with Section 16195, Electrical Identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.
- B. Switches shall be manufactured by Square D Company, Eaton, or General Electric Company.

2.02 Disconnect Switches

- A. Disconnect switches shall be heavy-duty type and/or as specified in these Specifications. Switches shall be furnished and installed as shown on the Drawings and as required by the NEC. Handles shall be lockable.

- B. Switches shall be NEMA Type HD, single-throw, externally operated, fused or non-fused as required. Switches of the poles, voltage and ampere ratings shown shall be furnished in NEMA 1A (gasketed) enclosures in indoor dry areas, and in NEMA 4X Type 304 stainless steel enclosures for damp/wet indoor process areas. Enclosures for outdoor applications shall be NEMA 4X Type 304 stainless steel. Switches located in hazardous areas shall be suitable for the Class, Division and Group to suit the application.
- C. Disconnect switches shall be quick-make, quick-break and with an interlocked cover which cannot be opened when switch is in the "ON" position and capable of being locked in the "OPEN" position.
- D. A complete set of fuses for all fusible switches shall be furnished and installed as required. Time-current characteristic curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Fuses shall have voltage rating not less than the circuit voltage.
- E. Switches for motors on VFDs shall be supplied with auxiliary contacts to shut down VFD when disconnect switch is opened.

PART 3 - EXECUTION

3.01 Installation

- A. All disconnect switches to be mounted five (5) feet above the floor, at the equipment height where appropriate or where shown otherwise.
- B. The Contractor shall furnish and install fuses of various types as required with the continuous ampere ratings as required or shown on the Drawings.

-END-

SECTION 16461 - DRY TYPE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish, install, and test transformers for power and lighting distribution systems as specified herein, as indicated on the Drawings and as required to complete the electrical installations.
- B. All equipment specified in this Section shall be furnished by the transformer manufacturer who shall be responsible for the suitability and compatibility of all included equipment.
- C. Reference Section 16000, Basic Electrical Requirements, Section 16195, Electrical Identification and Section 09900, Protective Coatings.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Certified Shop Tests
 - a. The transformers shall be given routine factory tests in accordance with the requirements of the ANSI and NEMA standards. Temperature rises may be certified from basic design.
 - b. As a minimum, the following tests shall be made on all transformers:
 - 1) Ratio tests on the rated voltage connection and on all tap connections.
 - 2) Polarity and phase-relation tests on the rated voltage connection.
 - 3) Applied potential tests.
 - 4) Induced potential tests.
 - 5) No-load and excitation current at rated voltage on the rated voltage connection.
 - 3. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.
 - b. After installation, the transformers shall be subjected to routine insulation resistance tests. The tests shall be made by the Contractor who shall also furnish the required testing equipment.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Division 1, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings.

2. Operation and Maintenance Manuals.
3. Spare Parts List.
4. Special Tools List.
5. Reports of Certified Shop Tests.

B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein, and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Shop drawings shall include but not be limited to:
 1. Product data sheets.
 2. Drawings showing clearly marked dimensions and weight for each transformer.
 3. Sample equipment nameplate diagram.
- D. The submittal information shall reflect the specific equipment identification number as indicated on the Drawings (e.g. T-LP-XXX).
- E. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items that the Contractor intends to provide are acceptable and shall be submitted.

1.05 Operation and Maintenance Manuals

- A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.06 Tools, Supplies and Spare Parts

- A. The transformers shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished to the Owner by the Contractor.
- B. Spare parts lists, included with the Shop Drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate

number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 Identification

- A. Each transformer shall be identified with the equipment item number indicated on the Contract Drawings and the accepted Shop Drawings. A nameplate shall be securely affixed in a conspicuous place on each transformer. Nameplates shall be as specified in Section 16195, Electrical - Identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.
- B. Dry type distribution transformers shall be manufactured by Square D Company, General Electric Company or Eaton.

2.02 Dry Type Transformers

- A. Furnish and install single-phase and three-phase general purpose, dry-type transformers, as specified herein and indicated on the Drawings. The transformers shall be 60 Hz, self-cooled, quiet-design insulated of the two winding type.
- B. The transformers shall be Underwriters Laboratories, Inc. listed and shall bear the UL label.
- C. The primary windings shall be rated 480 VAC for use on 3-phase systems and connected delta unless indicated otherwise on the Drawings. KVA ratings shall be as shown on the Drawings. Furnish transformers with two 2-1/2% primary taps above, and four 2-1/2% primary taps below rated voltage for transformers 15 KVA and above, and two 2-1/2% primary taps above, and two 2-1/2% primary taps below rated voltage for transformers less than 15 kVA. All taps shall be full capacity rated.
- D. The ratings of the secondary windings shall be as indicated on the Drawings.
- E. Transformers shall be designed for continuous operation at rated KVA, 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE 65 and ANSI C57.96. This performance shall be obtainable without exceeding 150 degrees Celsius average temperature rise by resistance or 180 degrees Celsius hot spot temperature rise in a 40 degrees Celsius maximum ambient and 30 degrees Celsius average ambient. The maximum coil hot spot temperature shall not exceed 220 degrees Celsius. All insulating materials shall be flame retardant and shall not support combustion as defined in ASTM Standard Test Method D

635. All insulating materials shall be in accordance with NEMA ST 20 Standard for a 220 degrees Celsius UL component recognized insulation system.

- F. Transformer coils shall be of the continuous wound copper construction and shall be impregnated with nonhygroscopic, thermosetting varnish.
- G. Transformers shall have copper windings. Alternate winding materials may be submitted for review by engineer if significant cost reduction for identical operation is possible.
- H. All cores are to be constructed of high grade, nonaging, grain-oriented silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be tightly clamped and compressed with structural steel angles. The completed core and coil shall then be bolted to the base by means of vibration-absorbing mounts to minimize sound transmission. There shall be no metal-to-metal contact between the core and coil assembly and the enclosure.
- I. The enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed and finished with a baked weather-resistant enamel. See painting requirements specified in this Section.
- J. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees Celsius. Transformers shall be furnished with lugs of the size and quantity required and suitable for termination of the field wiring.
- K. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.
- L. Transformers shall have core and coil assemblies mounted on rubber isolation pads to minimize the sound levels. The transformers shall not exceed the following ANSI sound levels:

0 to	9 kVA	40 dB
10 to	50 kVA	45 dB
51 to	150 kVA	50 dB

2.03 Painting

- A. The exteriors of the transformer enclosures shall be painted as follows:
 - 1. Factory painting: Surfaces shall be cleaned carefully and given a priming basic lead chromate. This shall be followed by two coats of an approved paint applied by brushing.
 - 2. Field Painting: After delivery and installation, but before transformers are placed in service, all factory-painted surfaces shall be carefully cleaned and all abrasions shall be repaired. All painted surfaces shall then be given one

brushed-on coat of paint as specified for the fourth coat of machinery and equipment in Section 09900 - Painting. Color shall be ANSI #61.

PART 3 - EXECUTION

3.01 Installation

- A. The transformers shall be furnished and installed as shown on the Drawings and as recommended by the equipment manufacturer.
- B. Conduit routed to and from the transformer shall be arranged for easy removal of the transformer.

-END-

SECTION 16470 – PANELBOARDS

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install panelboards of voltage and current ratings as specified herein and indicated on the Drawings. Panelboards shall be furnished with circuit breaker ratings, number of breakers, number of poles and locations conforming with the panelboard schedules on the Drawings.
- B. Reference Section 16000, Basic Electrical Requirements, Section 16195, Electrical Identification and Section 16461, Dry Type Distribution Transformers.

1.02 Standards

- A. Panelboards shall conform to all applicable Federal, UL and NEMA standards. Materials and components shall be new and conform to grades, qualities and standards as specified herein and shown on the Drawings.
- B. Panelboards shall comply with the following industry standards:
 - 1. UL Listing/Approval
 - 2. UL Standards
 - a. Panelboards - UL 67
 - b. Cabinets and Boxes - UL 50
 - 3. National Electrical Code
 - 4. NEMA Standard - PB1

1.03 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required
 - 2. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1 and Section 16000, Basic Electrical Requirements.

1.04 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings.
 - 2. Reports of Certified Shop Tests.
 - 3. Spare Parts List.

4. Operation and Maintenance Manuals.

B. Each submittal shall be identified by the applicable specification section.

1.05 Shop Drawings

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Shop drawings shall include but not be limited to:

1. Product data sheets.
2. Complete assembly, layout and installation drawings with clearly marked dimensions for each panelboard.
3. Complete panelboard schedules indicating circuit designations and connected loads as shown on the Drawings for each panelboard.

D. The submittal information shall reflect the specific equipment identification number as indicated on the Drawings (e.g., LP-1, PP-2 etc.).

1.06 Tools, Supplies and Spare Parts

A. The panelboards and accessories shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. For each panelboard, the Contractor shall furnish to the Owner all spare parts as recommended by the equipment manufacturer including one (1) molded case circuit breaker of each type, size and rating used except for main circuit breakers.

B. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

C. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size shall have the same parts number.

1.07 Identification

A. Each panelboard shall be identified with the identification number indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on each panelboard. Nameplates shall be as specified in Section 16195, Electrical - Identification.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 Conductors (Main Bus and Branch Connectors)

- A. All main bus shall be copper sized in accordance with UL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above a maximum ambient temperature of 40 degrees C.

2.03 Lighting Panelboards

A. General

1. The lighting panelboards shall be dead-front type with automatic trip-free, non-adjustable, thermal-overload, branch circuit breakers. Panelboards shall be of the configuration and rating as specified herein and indicated on the Drawings.
2. The panelboards shall be equipped with a main breaker or main lugs complete with branch circuit breakers, as shown on the Drawings. The panelboards shall be enclosed in a cabinet suitable for flush or surface mounting. Some panelboards shall be furnished and installed within motor control center structures as shown on the Drawings.
3. Lighting panelboards shall be fully rated and shall have a short circuit rating of 10,000 amperes symmetrical, minimum.
4. Panelboards shall be 42 circuit minimum. Supply 20A spares in all slots not explicitly shown on drawings.
5. Provide panelboards with an external surge suppression device. Current Technologies CurrentGuard CG3-060 or equal with voltage type as required. Enclosure type to match power panel. Wiring to be supplied by manufacturer.
6. Lighting panelboards shall be Eaton Pow-R-Line Series, Square-D Company equivalent or General Electric Company equivalent.

B. Cabinets

1. Except for lighting panelboards installed in motor control centers, the cabinet shall be NEMA 12 (minimum) constructed of No. 12 U.S.S. code gauge galvanized steel. The door shall be fastened to the cabinet with concealed hinges and shall be equipped with flush-type catches and locks. All locks shall be keyed alike. The cabinet shall have wiring gutters on sides and shall be at least 5-3/4 inches deep. The Contractor shall provide an engraved nameplate for the panelboard. The nameplate shall include the panelboard designation, voltage, phase, wires and bus rating.
2. An Underwriter's Laboratories, Inc. inspection label shall appear on the interior of the cabinet.

C. Bus Work

1. Main bus bars shall be of ample size so that a current density of not more than 1000 amperes per square inch of cross section will be attained. This current density shall be based on the application of the full load connected to the panel plus approximately 25% of the full load for spare capacity. The main bus shall be full capacity as based on the preceding for the entire length of the panel so as to provide full flexibility of circuit arrangement.
2. Solid neutral bus bars are required. Ratings shall be in accordance with applicable standards.
3. A separate ground bus shall be provided with lugs for termination of equipment grounding conductors.
4. Branch bus work shall be rated to match the maximum branch circuit breaker which may be installed in the standard space.
5. All bus shall be tin plated copper. Alternate bus plate materials may be submitted for engineer approval if there is a significant cost benefit.

D. Circuit Breakers

1. Circuit breakers shall be bolt-on, molded-case type conforming to NEMA Standard AB 1. Trip elements of circuit breakers shall be 20A unless otherwise shown on the Contract Drawings. Minimum branch circuit breaker shall be 100A frame for 60A and above except where shown otherwise on the Drawings or where a larger frame size is standard for the continuous current rating required. Breakers shall have an interrupting rating of 10,000 amperes symmetrical at panel rated voltage, minimum. All breakers shall have quick-make, quick-break, toggle mechanism for manual as well as automatic operation. Tandem or half-size breakers are not acceptable.
2. Where indicated, or where required by Code, circuit breakers for receptacle circuits shall be equipped with integrally mounted ground fault interrupters complete with "TEST" push button and shall be of a type which fit standard panelboard spaces for the breaker continuous current rating required.
3. Instrument power panel branch circuit breakers set for control instrumentation, telephone, fire alarm or auxiliary equipment circuits requiring continuous operation shall be provided with a lock-on device. Circuit breakers used for lighting circuit switching shall be approved for the purpose and shall be marked "SWD". Where required by Article 440 of the NEC, circuit breakers installed for air conditioning units shall be HACR type.

E. Directories

1. Approved directories with glass or noncombustible plastic cover, and with typewritten designations of each branch circuit, shall be furnished and installed in each panelboard. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service. This directory shall be updated as work progresses, and final, typewritten directories, as specified above, shall be installed at the end of the project. Designations and circuit locations shall conform with the panelboard schedules on the Drawings, except as otherwise authorized by the Engineer.

2. The Contractor shall provide directories identifying panelboards and indicating the size of the feeder (cable and conduit) serving the panel, circuit numbers and a description of associated branch circuits including branch circuit trip and connected load for each circuit.

2.04 Power Distribution Panelboards

A. General

1. The power distribution panelboards shall be of the configuration and rated as specified herein and as shown on the Drawings. The panelboards shall be dead-front type with automatic trip-free, non-adjustable, thermal overload branch circuit breakers. Circuit breakers shall be bolt-on molded case type conforming to NEMA Standard AB1. The bus ratings shall be as shown on the Drawings. Panels shall be listed by Underwriter's Laboratories, Inc., and so labeled.
2. Power distribution panelboards shall be fully rated and shall have a short circuit rating of 35,000 amperes symmetrical, minimum.
3. Power distribution panelboards shall be Eaton Pow-R-Line Series, Square-D Company equivalent or General Electric Company equivalent.
4. Panelboards shall be 42 circuit minimum. Supply 20A spares in all slots not explicitly shown on drawings.
5. Provide panelboards with an external surge suppression device. Current Technologies CurrentGuard Plus CGP3-200 or equal with voltage type as required. Enclosure type to match power panel. Wiring by manufacturer.

B. Cabinets

1. Except for power panelboards installed in motor control centers, the cabinets shall be NEMA 12 (minimum) constructed of No. 12 U.S.S. code gauge galvanized steel. The door shall be fastened to the cabinet with concealed hinges and shall be equipped with flush-type catches and locks. All locks shall be keyed alike. The cabinet shall have wiring gutters on sides and shall be at least 5-3/4 inches deep. The Contractor shall provide nameplates for each panelboard. The nameplate shall include the panelboard designation, voltage, phase, wires and bus rating.
2. An Underwriter's Laboratories, Inc. inspection label shall appear on the interior of the cabinet.

C. Bus Work

1. Main bus bars shall be of ample size so that a current density of not more than 1,000 amperes per square inch of cross section will be attained. This current density shall be based on the application of the full load connected to the panel plus approximately 25% of the full load for spare capacity. The main bus shall be full capacity as based on the preceding for the entire length of the panel so as to provide full flexibility of circuit arrangement.
2. Solid neutral bus bars, where required, shall be provided. Ratings shall be in accordance with applicable standards.

3. A separate ground bus shall be provided with lugs for termination of equipment grounding conductors.
4. Branch bus work shall be rated to match the maximum branch circuit breaker which may be installed in the standard space.
5. All bus shall be tin plated copper.

D. Circuit Breakers

1. Circuit breakers shall be bolt-on, molded-case type conforming to NEMA Standard AB 1. Trip elements of circuit breakers shall be 20A, minimum. Minimum branch circuit breaker shall be 100A frame for 60A and above except where shown otherwise on the Drawings or where a larger frame size is standard for the continuous current rating required. Breakers shall have an interrupting rating of 35,000 amperes symmetrical at 480 VAC, minimum. All breakers shall have quick-make, quick-break toggle mechanism for manual as well as automatic operation.

E. Directories

1. Approved directories with glass or noncombustible plastic cover, and with typewritten designations of each branch circuit, shall be provided in each panel. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service. This directory shall be updated as work progresses, and final, typewritten directories, as specified above, shall be installed at the end of the project. Designations and circuit locations shall conform with the panelboard schedules on the Drawings, except as otherwise authorized by the Engineer.
2. The Contractor shall provide directories identifying panelboards and indicating the size of the feeder (cable and conduit) serving the panel, circuit numbers and a description of associated branch circuits including branch circuit trip and connected load for each circuit.

2.05 Combination Power Units

- A. The Contractor shall furnish and install a combination power unit as specified herein and indicated on the Drawings. The unit shall be a combination of a dry type transformer and a lighting panelboard. The transformer and panelboard shall meet the requirements for these products as specified elsewhere in these Specifications and in specification 16461 Dry Type Distribution Transformers. Combination power units located outdoors shall be suitable for outdoor use rated NEMA 3R.
- B. The combination power unit shall be a Mini-Power Zone as manufactured by Square D Company, a Mini-Power Center as manufactured by Eaton or General Electric Company equivalent.
- C. Base bid shall be copper wound. Aluminum may be submitted for engineer approval if there is a significant cost benefit.

PART 3 - EXECUTION

3.01 Mounting

- A. The lighting panelboards, power distribution panelboards and combination power units shall be furnished and installed as shown on the Drawings and as recommended by the equipment manufacturer. It is the responsibility of the contractor to ensure that all electrical components can fit in the spaces as shown on the drawings.
- B. Panelboards shall be set true and plumb in locations as shown on the Drawings. The top of panelboard enclosure shall not exceed six (6) feet above finished floor elevation.
- C. Enclosures shall not be fastened to concrete or masonry surfaces with wooden plugs. Appropriate cadmium plated or galvanized steel bolts shall be used with expansion shields or other metallic type concrete insert for mounting on concrete or solid masonry walls. Cadmium plated or galvanized steel toggle bolts shall be used for mounting on concrete block or other hollow masonry walls. Bolt diameter shall be as required considering the size and weight of the completed panelboard and enclosure to provide adequate structural support.
- D. The Contractor shall not use factory furnished knockouts with surface back boxes. The Contractor shall punch or drill required openings during installation and shall equip flush back boxes with manufacturer's standard pattern of knockouts. The Contractor shall equip cabinet doors exceeding 40 inches in height with vertical bolt three-point locking mechanism.
- E. The Contractor shall install cabinets (and other enclosure products) in plumb with the building construction. Flush enclosures shall be installed so that the trim will rest against the surrounding surface material and around the entire perimeter of the enclosure.

3.02 Rubber Mats

- A. A three foot wide rubber mat shall be furnished and installed on the floor and in front of each panelboard. The mat shall be long enough to cover the full length of each panelboard. The mat shall be located so as not to obstruct the movement of the panel door. The mat shall be 1/4 inch thick with beveled edges, canvas back, sold type with corrugations running the entire length of the mat. The mat shall be guaranteed extra quality, free from cracks, blow holes, or other defects detrimental to their mechanical or electrical strength. The mat shall meet OSHA requirements and the requirements of ANSI/ASTM D-178 J6-7 for Type 2, Class 2 insulating matting.

-END-

SECTION 16495 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish, install, connect, test and place in satisfactory operating condition all variable frequency drives (VFD's) as specified herein and indicated on the Drawings.
- B. Reference Section 16000, Basic Electrical Requirements and Section 16195, Electrical Identification.
- C. Allen Bradley Powerflex TL XT 755 Drive with active front end and ethernet card shall be the only acceptable VFD.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. The VFD's specified in this Section shall be witness shop tested and inspected in accordance with the equipment manufacturer's standard procedures. The testing and inspection procedures shall demonstrate that the equipment tested conforms to the requirements specified and shall be approved by the Engineer. At least 10 days' notice shall be given the Engineer prior to such tests and inspection dates.
 - b. Factory test the complete variable frequency drive system in accordance with IEEE and NEMA standards with these Specifications. In addition, the variable frequency drive system shall be tested for efficiency as defined in this Specification and for operational integrity during output short circuit conditions. Short circuit test shall demonstrate that the equipment will successfully protect against and survive a minimum of three (3) successfully repeated phase-to-phase short circuits at the drive output terminals.
 - c. Variable frequency drive system components, including power transistors, GTOs, SCRs, IGBT's, diodes shall be 100 percent inspected and tested, including temperature cycling and inspected and tested including temperature cycling and ambient high temperature of 65 degrees Celsius load testing. All integrated circuits shall be inspected, pass/fail tested, temperature cycled and ambient high temperature tested. Small components, including small signal semiconductors, resistors, capacitors, diodes etc. shall be lot sampled and tested for functionality. Test printed circuit boards under a temperature cycled 20-hour load test and functionally bench test prior to unit installation. Inspect all final assemblies and test at full load with application of line-to-line and line-to-ground bolted faults. The variable frequency drive system shall electrically trip offline under these conditions without device failure.

- d. After the specified inspections and tests have been successfully completed, the variable frequency drive system shall undergo an 8-hour burn-in test. Burn system in at 100 percent inductive or motor load for 40 hours without an unscheduled shutdown.
 - 2. Certified Shop Tests and Reports
 - a. Submit description of proposed testing methods, procedures and apparatus.
 - b. Submit notarized and certified copies of all test reports.
 - c. Submit factory bench-test data to indicate that the manufacturer's proposed equipment has been tested in the specified arrangement and found to achieve specified accuracy.
 - 3. Field Tests
 - a. Field tests shall be performed in accordance with requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.
- B. Authorized representatives of the Owner shall be allowed free access to the shop at all times while work is in progress for the purpose of inspection, witnessing of tests and obtaining information on the progress of the work. The Owner shall give the Contractor 72 hours prior notice.
- C. Acceptance of a shop test does not relieve Contractor from requirements to meet field installation tests under specified operating conditions, nor does the inspection relieve the Contractor of responsibilities.
- D. The Contractor shall successfully complete acceptance test procedures on the assembled drive system that demonstrate compliance with the requirements of this Specification. The test plan shall be submitted for acceptance at least 30 days prior to the planned test date.
- E. Drive system shall not be shipped from the manufacturing and assembly facility until the acceptance tests are completed and the acceptance tests are completed and the results approved by the test representative.
- F. Tests shall be witnessed by a representative of the Engineer. Variable frequency drive manufacturer shall notify the Engineer 2 weeks in advance and shall provide testing procedures to the Engineer 4 weeks prior to actual testing. Failure of a test shall result in rejection of the equipment until performance is in compliance with these Specifications.
- G. Certification on materials and records of shop tests necessary for the inspector to verify that the requirements of the Specifications are met, shall be made available to the inspector.
- H. Submit signed and dated certification that all of the factory inspection and testing procedures described herein have been successfully performed by the Contractor prior to shipment.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings
 - 2. Harmonic Study Report
 - 3. Programming Guides/Manuals
 - 4. Operation and Maintenance Manuals
 - 5. Spare Parts List
 - 6. Special Tools List
 - 7. Shop Test Plan
 - 8. Reports of Certified Shop and Field Tests
- B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.
- C. Drawings submitted by the manufacturer shall be complete and documented to provide the Owner with operations and maintenance capabilities.
- D. Shop drawings for each VFD shall include but not be limited to:
 - 1. Layout drawings of the variable frequency drive system that include all cabinet or enclosure dimensions, access details and weights.
 - 2. Layout drawings of panels or enclosures showing size, arrangement, color and nameplates. Drawings shall include the physical arrangement of door mounted devices located on the variable frequency drive enclosure. Sufficient detail shall be provided for locating conduit stub-ups. General "catalog data sheet" layout drawings which are not specific to the systems specified herein are not acceptable.
 - 3. Schematic and interconnection wiring diagrams of all electrical work, including terminal blocks and identification numbers, wire numbers and wire colors. These drawings shall be circuit specific for each motor-load combination (e.g. WAS pumps, equalization blowers, backwash pumps, raw water pumps, etc.). Indicate all devices, regardless of their physical location, on these diagrams. Specific equipment names consistent with the Drawings shall appear on each respective diagram.
 - 4. Complete single line diagrams indicating all devices comprising the variable frequency drive system including, but not limited to, circuit breakers, motor circuit protectors, contactors, instrument transformers, meters, relays, timers, control devices and other equipment comprising the complete system.

Electrical ratings of all equipment and devices shall be clearly indicated on these single line diagrams.

5. Complete Bills of Material and catalog data sheets for all equipment and devices comprising the variable frequency drive system.
 6. A complete list of recommended spare parts, including item descriptions, recommended quantities and unit costs. The recommended list should be based on a maintenance plan where the Owner will remove and replace failed items to the lowest replaceable module/component level.
 7. Control and layout drawings shall be submitted in AutoCAD format on CDROM in addition to the hard copies.
- E. The shop drawing information shall be completed and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "Soft Cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items the Contractor intends to provide are to provide are acceptable and shall be submitted.
- F. Prior to completion and final acceptance of the project, the Contractor shall furnish and install "as-built" wiring diagrams for each VFD and bypass starter. These final drawings shall be plastic laminated and securely placed inside each VFD and starter door and included in the O&M manuals.
- G. Product Data shall include, but not be limited to:
1. Functional diagrams that identify major system functional blocks and interfaces.
 2. Special requirements or restrictions of the motor-load combination that may result from operation on the variable frequency drive system.
- H. Programming Guides and Manuals shall be submitted. If the variable frequency drive systems require computer software or configuration, provide copies of all programming guides/manuals. Flow charts and listings of software developed shall be submitted to the Engineer. Submit final flow charts and program listings no later than 6 weeks prior to factory testing of the system.

1.05 Operations and Maintenance Manuals

- A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions, Section 01300, Submittals and Section 11000, Equipment - General Provisions.
- B. Operation and Maintenance Manuals shall also be provided in electronic format.

1.06 Tools, Supplies, and Spare Parts

- A. The VFD's and accessories shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished by the Contractor to the Owner.

- B. The Contractor shall furnish the following spare parts:
 - 1. A keypad for each type of VFD provided, two minimum.
- C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
- D. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the Work, at which time they shall be delivered to the Owner.
- E. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- F. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 Services of Manufacturer's Representative

- A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract and instruct the Contractor's personnel and the Owner's operating personnel in its maintenance and operation as outlined in the General Conditions, Division 1, and Section 11000, Equipment General Provisions. The services of the manufacturer's representative shall be provided for a period of not less than as follows:
 - 1. Two trips of one (1) working day during installation and start-up/configuration of the equipment.
 - 2. One trip of one (1) working day after acceptance of the equipment.
 - 3. One trip of one (1) working day during the warranty period.
- B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Resident representative on each day they are at the project.

1.08 Identification

- A. Each VFD shall be identified by the circuit number and equipment name as indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on each VFD. Nameplates shall be as specified in Section 16195, Electrical-Identification.

1.09 Training

- A. The Contractor shall provide training for Owner personnel. Training shall be conducted by the manufacturer's factory trained specialists who shall instruct Owner personnel in operation and maintenance of all equipment provided under this Section.
- B. Provide the services of an experienced, factory trained technician or service engineer of the variable frequency drive manufacturer at the jobsite for minimum of 1 day for training of Owner personnel, beginning at a date mutually agreeable to the Contractor and the Owner. The technician shall be on duty at the site for at least 8 hours per day and shall be available 24 hours per day when required to advise concerning special problems with equipment and systems.
- C. Include in the bid the training of personnel in the operation and maintenance of each furnished variable frequency drive pump control system. For the purpose of this training section of the Specifications, a system is by definition a group of pumps or equipment which all serve a common function (e.g., equalization blowers, raw water pumps etc.). Training shall include at least one session for 5 designated employees for each system.

1.10 Warranty

- A. Contractor shall warrant that the material and workmanship of all components and the operation of the variable frequency drive system and auxiliary equipment is in accordance with the latest design practices and meets the requirements of this Specification.
- B. Warranty work shall include, but not be limited to, the following:
 - 1. Replace components found to be faulty and make changes in equipment arrangement or adjustments necessary to meet the equipment or functional requirements or this Specification.
 - 2. Warranty shall include system rewiring and substitution and rebuilt or additional equipment required during trial operation or subsequent operation of the unit during the period of this warranty.
 - 3. Warranty shall be in effect for a period of 24 months following final acceptance of the system.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade and shall operate satisfactorily when installed as shown on the Drawings.

- B. The Contractor shall obtain the VFD's from one manufacturer who shall also manufacture the enclosure and major equipment components. The manufacturer shall have a minimum of five years' experience in the manufacture of similar units and shall have a general distribution to the electrical trade. Subcontracting of wiring will not be acceptable.
- C. Motor control circuits shall be wired in accordance with the requirements specified herein or indicated on the Drawings. Where not indicated, the control circuits shall be standard three-wire "start-stop" and the Contractor shall furnish wiring accordingly.
- D. Variable frequency drive manufacturer shall be responsible for the successful application and operation of the entire drive and control system serving the motor and driven equipment. This includes the responsibility for obtaining all load, torque, speed and performance requirements from the respective sources and integrating these into a variable frequency drive system that fulfills the requirements of this Specification.
- E. The Contractor and variable frequency drive system manufacturer are cautioned regarding the review and compliance with the total Contract Documents. Typical examples are circuit breakers, motor circuit protectors, magnetic starters, relays, timers, control and instrumentation products, pilot devices including pushbuttons, selector switches and pilot lights, enclosures, conduit, disconnect switches, terminal boxes and other equipment.
- F. Variable Frequency drives shall be by Allen Bradley.

2.02 Product Requirements

- A. Variable speed drives shall be adjustable frequency, adjustable voltage, pulse width modulated (PWM) design. The units shall be microprocessor controlled, fully digitally programmable, and capable of precise and repeatable speed regulation of three phase 480 volt AC NEMA Design B induction motors. Variable frequency drives for other than NEMA Design B induction motors (e.g. NEMA Design C) shall be coordinated with the requirements of that respective load.
- B. Drive units shall perform continuous self-diagnostics as well as load and drive self-check on startup.
- C. All drives shall have permanently mounted programming and display modules. These modules shall provide programming access to all drive parameters, display all fault codes to assist with diagnostics and provide a display of output speed in percent or load.
- D. This specification describes variable speed motor control which includes the design, fabrication, testing, installation and support requirements for variable frequency drive systems for 3-phase, squirrel cage rotor, induction motors driving pumps or other equipment.

- E. Each variable frequency drive is to be a complete alternating current electric drive system including hardware, software, technical data and spare parts necessary to accomplish variable speed operation of an induction motor and load combination in accordance with the requirements as indicated on the Drawings and as described in these Specifications. Contractor shall refer to Section 13400 of the Specifications for a functional control description of each variable frequency drive system.
- F. Variable frequency drive system manufacturer shall be responsible for the design and performance of the entire drive system and shall either manufacture all items of equipment or supply them using coordinated specifications furnished to the original equipment manufacturers to insure compatibility and performance in accordance with this Specification. Variable frequency drive manufacturer shall coordinate with suppliers of the drive motors and driven equipment. Motors shall be as specified in Section 16801 and other specific equipment Sections of the Specifications.
- G. Variable frequency drive system shall be suitable for operation as part of a 480 VAC, 3-phase, 60 Hertz power distribution system. The complete variable frequency drive system shall withstand the mechanical forces exerted during short circuit conditions when connected directly to a power source having available fault current of 65,000 amperes symmetrical at rated voltage.
- H. The variable frequency drive system shall be suitable to operate, at times, on a limited power source engine-generator set. The system shall be provided with equipment and devices to prevent waveform distortion as specified herein.
- I. Provide control and sequence logic as specified herein and indicated on the Drawings. Control and sequence logic shall be designed such that the motor-load combination can be operated in the manual mode upon control and sequence logic failure, including all necessary personnel and equipment safety interlocks.
- J. Design each variable frequency drive motor drive speed control system so that through simple programming by either factory engineers or Owner's trained operating personnel, specific control and protection functions can be attained.

2.03 Design Requirements

- A. Each variable frequency drive system shall meet the requirements of this Specification without derating any of the induction motor operating parameters including service factor and nameplate horsepower. The variable frequency drive system manufacturer shall specifically identify special requirements or restrictions of the motor-load combination that may result from operation on the variable frequency drive system.
- B. The variable frequency drive shall consist of a LCL filter, a line-side IGBT converter, a direct current link, a motor-side IGBT converter, and a common mode filter. The motor-side IGBT converter shall convert the direct current voltage into an alternating current voltage at a frequency which shall be proportional to the desired speed. This alternating current voltage and frequency shall both vary

simultaneously at a constant "Volts-Per-Hertz" ratio to operate the induction motor at the desired speed.

- C. Variable frequency drive shall operate from fixed frequency power supply and convert this input power into variable speed induction motor shaft power as required by this Specification.
- D. Provide each variable frequency drive with a motor circuit protector as indicated on the Drawings which shall be padlockable. Provide each 200 HP variable frequency drive with 5% line reactors at the input, and all others with 3%. Include the necessary drive controllers and output contactors to accomplish the intended control of the variable frequency drive system.
- E. The drive shall operate the motor and produce full rated nameplate horsepower at the motor output shaft without exceeding motor nameplate full load current and with the motor not exceeding rated total temperature not including the additional temperature increment that constitutes the motor service factor. Motor shall retain its service factor when operated by the variable frequency drive.
- F. The overall drive system efficiency shall be a minimum of 95 percent when operating the specified motor-load combination at rated voltage, frequency and current.

1. This efficiency shall be calculated as follows:

$$\text{Efficiency (\%)} = \frac{\text{Power (Load)}}{\text{Power (Supply)}} \times 100$$

- G. Power (Load) is the total 3-phase power delivered to the motor, measured at the output terminals of the drive system, including output filters or transformers. Power (Supply) is the total electrical power delivered to the drive system, measured at the input terminals of the variable frequency drive including input filters, line reactors, isolation transformers or other harmonic distortion suppression equipment. Include power input required for auxiliary equipment (e.g., controls, fans, air conditioning, pumps) for complete system operating in this Power (Supply) total.
- H. Variable frequency drive shall provide smooth, stepless changes in motor speed and acceleration over the entire operating speed range from minimum to maximum speed (revolutions per minute). The variable frequency drive shall be provided with maximum and minimum frequency limits.
- I. Variable frequency drive system to maintain a desired output frequency (setpoint) with a steady state accuracy of 0.5 percent of rated frequency of 60 Hertz for a 24 hour period.
- J. Variable frequency drive to have an automatic current limit feature to control motor currents during startup and provide a "soft start" torque profile for the motor-load combination. The variable frequency drive shall also limit current due to motor winding or motor lead phase-to-phase short circuit or phase-to-ground short circuit. The current limit protection setting shall be field adjustable.

- K. Variable frequency drive shall be furnished with programmable electronic overload and torque limits.
- L. Drive system shall achieve a desired output frequency (setpoint) with a repeatability of 0.1 percent of rated frequency of 60 Hertz.
- M. Drive system to be capable of operating the specified load continuously at any speed within the operating speed range of 10 percent to 100 percent of rated speed. The minimum and maximum continuous operating speeds shall each be adjustable within this speed range. The variable frequency drive shall provide for field adjustment of these setpoints.
- N. Drive system controls to be microprocessor-based and have controlled linear acceleration capability to ramp up the speed, revolutions per minute, of the motor-load combination from the minimum selected operating speed to the maximum selected operating speed in a minimum of 30 seconds. Provide two (2) field-adjustable speed setpoints for the variable frequency drive to skip equipment resonant frequencies. Provide controlled linear deceleration capability. The acceleration and deceleration time limits shall be field adjustable to values up to 120 seconds.
- O. Voltage or current unbalance between phases of the variable frequency drive output voltage shall not exceed 3 percent of the instantaneous values. The variable frequency drive system shall continuously monitor the output voltages and generate an alarm condition when the unbalance exceeds 3 percent. The system shall detect and generate a separate alarm for loss of any output phase voltage (single phasing). Phase unbalance shall be as defined by NEMA Standard MG-1.
- P. Variable frequency drive system to operate continuously without interruption of service or damage to equipment during transient input voltage variations of plus or minus 10 percent for a duration of 15 cycles. Unacceptable voltage fluctuations on the supply bus shall cause under or overvoltage protection to trip and remove supply voltage from the drive system. Variable frequency drive output voltage regulation shall be plus or minus 2 percent.
- Q. The variable frequency drive system shall be furnished with line surge protection.
- R. The Contractor shall size variable frequency drive system and components to provide, indefinitely, motor load current equal to 125% of the motor nameplate full load current.**
- S. The Contractor is fully responsible for the review of the mechanical specifications to determine specified motor speed, horsepower and full load amperes. This information is available in the applicable mechanical specifications for each pump, drive, conveyor, blower etc. Reference the Table of Contents.
- T. The audible noise (sound pressure) level of a motor when operated from no load to full load with the variable frequency drive described herein shall not increase more than 5 decibels (dbA), at 5 feet in any direction from the motor, above its

noise level when operated from a utility power source without the variable frequency drive.

2.04 Operating Conditions

A. The following operating conditions are applicable for all equipment of this Specification.

1. Humidity: 0-95 percent.
2. Ambient Temperature: Minus 20 degrees Celsius to plus 50 degrees Celsius.
3. Altitude: up to 3,300 feet
4. Power Supply: 480 volts, 3-phase, 60 Hertz.
5. Available Short Circuit Duty: as specified herein.

2.05 System Features and Characteristics

A. Controls and indicators to accomplish operation and maintenance shall be located on the variable frequency drive equipment assembly as specified herein and indicated on the Drawings. At a minimum, each VFD shall provide indication of the following:

1. Digital Speed Indicator: Revolutions per minute (input from tachometer).
2. Variable Frequency Drive Mode Indicator: Red; as required.
3. Bypass Mode Indicator: Red; as required;
4. Input Voltage
5. Output Voltage
6. Output Current
7. Output Frequency
8. Output Speed: 0-60Hz
9. Drive Ready Indicator: White
10. Run Indicator: Green.
11. Stop Indicator: Red.
12. Running Time Meter.
13. Enclosure Overtemperature.
14. Alarm Indicator: Amber.
15. Alarm Read-out: Display.
16. Ethernet communications card.

B. Each VFD shall provide the following automatic and manual controls:

1. Hand-Off-Auto Selector Switch (as required).
2. Start and Stop pushbuttons (as required).
3. VFD - Bypass Selector Switch (as required).
4. Local - Remote Speed Control Selector Switch (as required).
5. Local Speed Potentiometer.
6. Alarm Reset Pushbutton.
7. 24 VDC coil pilot relay for remote run command.
8. Alarm auxiliary contacts and other devices as indicated on the Drawings and specified.
9. Provision for a run permissive from other equipment when the drive is in "Auto".

- C. Each VFD shall provide "potential-free" output contacts for the following conditions:
1. Drive running.
 2. Drive in "Auto" and all trip conditions cleared.
- D. Variable frequency drive system shall provide a 4-20 mADC output signal that is proportional to the drive output frequency for use as speed feedback or control and remote speed indication.
- E. Variable frequency drive system shall accept a 4-20 mADC input command signal to control the output frequency in the automatic and/or manual control modes as specified herein or indicated on the Drawings. The system shall accept the input increase/decrease command with a resolution that permits incremental changes in speed, revolutions per minute, equal to or less than 0.1 percent of rated speed.
- F. When operating in the automatic mode, the variable frequency drive system shall shut down during a power outage. Upon restoration of normal power and after an adjustable time delay (0-2 minutes; motor has coasted to zero speed and there is no backspin), the variable frequency drive system shall automatically restart and then ramp up to speed as required by the control system. The process operator shall not be required to reset the system manually after a shutdown caused by a power outage.
- G. Variable frequency drive shall be furnished with a multiple attempt restart feature.
- H. Furnish a door mounted selector switch or other pilot device for those variable frequency drives where an additional speed reference signal (e.g., from a remote potentiometer, an analog output from a setpoint (PID) controller, an analog output from a programmable logic controller, or similar analog signal) is to be supplied to the variable frequency drive in addition to the door mounted manual speed control.
- I. Provide a motor circuit protector with shunt trip coil and current-limiting fuses for each variable frequency drive. Provide each variable frequency drive with its respective drive controller and output contactors for each motor.
- J. Include in each variable frequency drive system an automatic trip feature which will open the output contactor and remove the drive output from the motor and allow it to decelerate safely. This automatic system shall trip and indicate the fault only upon the following conditions:
1. Output voltage unbalance (trip threshold field set).
 2. Open phase.
 3. Motor overload.
 4. Motor stator winding fault (phase-to-ground, phase-to-phase).
 5. Loss of input power to the variable frequency drive or unacceptable voltage variation.
 6. High variable frequency drive equipment temperature.
 7. Variable frequency drive system failure as determined by the manufacturer.
 8. Component failure.
 9. Overcurrent.

10. Undercurrent.

- K. Provide variable frequency drive system with transmitted and received radio interference protection. In addition, provide protection against starting a rotating motor, both directions (coasting to zero speed and backspin). In the event that a motor automatic restart feature (catch the motor "on-the-fly") is provided in the drive controller as standard, this feature shall be capable of being disabled.
- L. Variable frequency drive design shall include on-line diagnostics, with an automatic self-check feature that will detect a variable frequency drive failure which in turn affects motor operation and generates an alarm contact output rated for 125 VDC suitable for interfacing with the control system.
 - 1. Diagnostics shall operate a visual alarm indicator that is visible on the variable frequency drive equipment cabinets without opening the cabinet doors.
 - 2. Diagnostics shall provide an easily readable output that will isolate a failure.
 - 3. Provide an event and diagnostic recorder to printout in narrative English of the specific fault(s) and the sequence in which the faults occurred. An indication of the "First Out" failure is a minimum for fault sequence detection.
 - 4. Provide a normally open dry contact for each alarm function to enable remote indication. A communication port shall be provided for possible future link to the plant control system.
- M. Provide each VFD with an Ethernet communications card.

2.06 Enclosures

- A. Unless otherwise specified or indicated on the Drawings, the variable frequency drive enclosures shall be NEMA 4X Stainless Steel, dead-front, with front accessibility. Design variable frequency drive system so that rear cabinet access is not required for operations, maintenance, and repair tasks. Other enclosure requirements are:
 - 1. The doors shall have full length piano type hinges.
 - 2. Brace each door to prevent sag when fully open.
 - 3. Provide Air Conditioning sized as required to keep drives cooled
 - 4. Provide Heating sized as required to prevent condensation
- B. Air Conditioning unit shall be NEMA4X and installed as to not affect the NEMA4X rating of the overall enclosure. Air conditioning unit shall be 480V by Hoffman or equal.
- C. The Contractor shall reference the Drawings for maximum dimensions of the VFDs.
- D. Furnish each variable frequency drive system with the control switches, alarm lights and indicators as specified herein and as indicated on the Drawings. Furnish main circuit breakers with an external operating handle interlocked with the door so that the door cannot be opened unless the disconnect is in the OFF position. Power supply to the motor from the variable frequency drive shall be capable of

being positively locked in the OFF position. The disconnect shall be interlocked so that equipment cannot be energized when the door is open.

- E. Electrical bus, including ground bus, shall be tin-plated copper. Power and control wiring shall be copper, color coded and identified in accordance with these Specifications.
- F. Equipment shall be of modular construction allowing normal maintenance and repair to be done with ordinary hand tools. Design and install power electronic component assemblies so that, where practicable, components can be individually removed and replaced.

2.07 Miscellaneous

- A. Encapsulate critical components in ceramic or metal.
- B. Auxiliaries, including fans, that are required for rated load operation at maximum ambient temperature, shall be 100 percent redundant. A new and unused spare replacement fan(s) or air conditioning unit(s), shipped in original carton, may be acceptable.
- C. Fans may not run 100% of the time, fans should only operate when the VFD is operating or is above normal temperature range.
- D. Circuit boards and electrical components shall meet the corrosion protection requirements specified in these Specifications. Varnished or epoxy encapsulated circuit boards and tropicalized contactors suitable for corrosive environments shall be furnished where the VFDs are not located in climate controlled areas.
- E. Include an output dv/dt filter on the motor side of the VFD on VFDs with runs of greater than 300 feet from VFD to motor or as specified in the Drawings. Filter shall be manufactured by TCI of type V1K and shall be current rated according to the rating of the VFD. Enclosure shall be UL Type 1 for air conditioned, dry, areas (in all other areas, filter enclosure shall match the enclosure type of the VFD) or shall be as specified in the drawings.

PART 3 - EXECUTION

3.01 Installation

- A. The VFD's shall be installed as shown on the Drawings and in accordance with the manufacturer's installation instructions.
- B. Install VFD's to allow complete door swing required for component removal. This is specifically required where a VFD is set in the corner of a room.
- C. Include in the bid an allowance for factory-trained service personnel, other than sales representatives, to supervise field installation, inspect, make final adjustments and operational checks, make functional checks of spare parts, and prepare a final report for record purposes. Adjust control and instrument

equipment until this equipment has been field tested by the Contractor and the results of these tests have been accepted by the Engineer.

- D. The grounding conductor between the motor and the VFD shall be continuous and unbroken to ensure proper grounding. Splices, terminations, or interruptions in the grounding conductor are not permitted.

3.02 Painting

- A. All metal surfaces of the motor control equipment shall be thoroughly cleaned and given one prime coat of zinc chromate primer. All interior surfaces shall then be given one shop furnished coat of a lacquer of the nitro-cellulose enamel variety. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be as approved by the Engineer. Color chips shall be forwarded to the Engineer for color selection and approval prior to finish painting. The interior of the VFD enclosure shall be painted white.
- B. Prior to final completion of the work, all metal surfaces of the equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same coating as used for factory finishing coats.

3.03 Substantial Completion Tasks

- A. Along with other tasks the following shall be completed for each VFD:
- B. Exposed surfaces shall be wiped down with non-abrasive cleaner.
- C. Air filters shall be replaced.
- D. Spare parts shall be neat and organized in a location of the Owner's choosing.

-END-

SECTION 16496 - AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish, install, connect, test and place in satisfactory operation automatic transfer switches as specified herein and indicated in Drawings.
- B. All devices and components of the automatic transfer switch shall be NEMA rated. IEC rated devices are unacceptable and shall be cause for rejection of the submittals/equipment.
- C. Reference Section 16000, Basic Electrical Requirements, and Section 16195, Electrical Identification.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. Shall be made available at manufacturing facilities if requested.
 - 2. Certified Shop Tests and Reports
 - a. Automatic transfer switches shall be given routine factory tests. The factory tests shall demonstrate that the completed switches function correctly and that the required timing has been set. Certification of these settings shall be submitted to the Engineer upon request.
 - b. Test procedures shall be in accordance with UL-1008. During the 3-cycle withstand tests, there shall be no contact welding or damage.
 - c. The three cycle tests shall be performed without the use of current limiting fuses.
 - d. Oscillograph traces across the main contacts shall verify that contact separation has not occurred and there is contact continuity across all phases after completion of the test.
 - e. When conducting temperature rise tests in accordance with UL-1008, include post-endurance temperature rise tests to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.
 - f. Manufacturer shall submit test reports upon request.
 - 3. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1 and Section 16000, Basic Electrical Requirements.
 - b. Prior to acceptance of the installation, load test the equipment with all available motor load, but do not exceed the generator's or automatic transfer switch's nameplate rating. Correct defects which become evident during this test.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
1. Shop Drawings
 2. Operation and Maintenance Manuals
 3. Spare Parts Lists
 4. Special Tools List
 5. Reports of certified shop tests shall be submitted which indicates a closing and withstand ampere rating as required based on short circuit study requirements. Rating shall be symmetrical, 3 cycles at 480 VAC.
 6. Guarantee/Warranty Program
- B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor for resubmittal without review.
- C. Shop drawings for each automatic transfer switch shall include but not be limited to:
1. Product data sheets.
 2. Complete assembly, layout and installation drawings with clearly marked dimensions and conduit entrance locations.
 3. Example equipment nameplate data sheet.
 4. Complete internal schematic and interconnecting wiring diagrams.
 5. Nameplate schedule.
 6. Manufacturer's standard installation instructions.
 7. Manufacturer's standard warranty.
- D. The shop drawing information shall be complete and organized in such a way that the Engineer can determine if the requirements of these specifications are being met. Copies of technical bulletins, technical data sheets from "soft-cover" catalogs, and similar information which is "highlighted" or somehow identifies the specific equipment items the Contractor intends to provide are acceptable and shall be submitted.
- E. Prior to completion and final acceptance of the project, the Contractor shall furnish and install "as-built" wiring diagrams for each automatic transfer switch. These final drawings shall be plastic laminated and securely placed inside each transfer switch and included in the O&M manuals.

1.05 Operation and Maintenance Manuals

- A. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.06 Tools, Supplies, and Spare Parts

- A. The automatic transfer switches shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished to the Owner by the Contractor.
- B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
- C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner.
- D. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 Services of Manufacturer's Representative

- A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract and instruct the Contractor's personnel and the Owner's operating personnel in its maintenance and operation as outlined elsewhere in Division 1 and Section 11000, Equipment - General Provisions. The services of the manufacturer's representative shall be provided for a period of not less than as follows:
 - 1. One trip of one (1) working day during installation of the equipment for each automatic transfer switch.
 - 2. One trip of one (1) working day after acceptance of the equipment.
 - 3. One trip of one (1) working day during the warranty period.
- B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Engineer's Field Representative on each day they are at the project.

- C. The manufacturer shall have an established network of service centers capable of servicing the specified equipment. The manufacturer shall have a service center within 200 miles of the project site which shall stock parts necessary to service the switch. The manufacturer shall include an 800 telephone number for a field service contact affixed to each enclosure.
- D. Service center personnel shall be on call 24 hours a day, 365 days a year. Personnel shall be factory-trained and certified in the maintenance and repair of the specified equipment.
- E. After-warranty service contracts shall be made available to the Owner by the manufacturer, through the service centers, to provide periodic maintenance and/or repair of the specified equipment.

1.08 Identification

- A. Each automatic transfer switch shall be identified with the identification number indicated on the Drawings (e.g. ATS-1 etc.). A nameplate shall be securely affixed in a conspicuous place on each switch. Nameplates shall be as specified in Section 16195, Electrical Identification.

1.09 Training

- A. The Contractor shall provide training for Owner personnel. Training shall be conducted by the manufacturer's factory trained specialists who shall instruct Owner personnel in operation and maintenance of all equipment provided under this Section. Training shall be in accordance with the requirements of Section 11000, Equipment General Provisions.
- B. Provide the services of an experienced, factory trained technician or service engineer of the switch manufacturer at the jobsite for minimum of one(1) day for training of Owner personnel, beginning at a date mutually agreeable to the Contractor and the Owner. The technician shall be on duty at the site for at least 8 hours per day and shall be available 24 hours per day when required to advise concerning special problems with equipment and systems.

1.10 Warranty

- A. The manufacturer shall warrant each automatic transfer switch for a minimum of five (5) years from date of shipment. In addition, the manufacturer shall repair or replace equipment found faulty under the terms of the warranty. The manufacturer shall submit data outlining the guarantee/warranty program.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall

be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

- B. The equipment described herein, as a minimum, shall meet all of the requirements specified in this Section and shall be a product of a manufacturer who has produced automatic transfer switches for a period of at least five (5) years. The equipment shall be compatible with the loads to be served. Assembly of the switches by a fabricator is not acceptable.
- C. The manufacturer of the automatic transfer switch shall verify that the switches are listed by Underwriters Laboratories, Inc., standard UL-1008, with 3-cycle withstand and close-in values as indicated on the Drawings or specified herein.
- D. The automatic transfer switches for the Wastewater Lift Stations shall be contactor style, open transition switches as manufactured by Asco Series 300, or Russelectric equivalent.

2.02 Automatic Transfer Switch

A. General

1. Switches shall have ampere ratings and number of poles as indicated on the Drawings and shall be suitable for 480/277 VAC, three-phase, 60 Hertz operation.
2. For three phase, four-wire systems where a neutral is required, a true four-pole switch shall be supplied with all four electrically and mechanically identical poles mounted on a common shaft. The continuous current rating and the closing and withstand rating of the fourth pole shall be identical to the rating of the main poles.
3. Plant transfer switches shall be housed in a NEMA 1 (gasketed) free-standing enclosure fabricated from 12-gauge steel suitable for floor mounting. Lift Station transfer switches shall be mounted in a rack mounted NEMA 4X, stainless steel enclosure. The enclosure shall exceed the UL-1008 minimum wire bending space requirements. The enclosure shall be equipped with an internal, welded steel, door-mounted print pocket.
4. The transfer switch shall have both top and bottom mounted cable access.
5. The switch shall be capable of switching all classes of load and rated for continuous duty when installed in a non-ventilated enclosure.
6. The three-cycle closing and withstand current rating of the switch shall be 42,000 amperes RMS (minimum). This rating shall not be restricted by the use of a specific manufacturer's circuit breaker.
7. This switch shall be complete with all accessories and listed by UL under Standard UL-1008 for use on emergency systems.
8. All bolted bus connections shall have Belleville compression type washers. Switches for four-wire systems shall be furnished with a fully rated solid neutral bus.
9. The switch shall be equipped with 90°C rated copper/aluminum solderless mechanical type lugs of the proper quantity and size to accommodate the termination of field wiring.

10. Switches shall be capable of normal operation during and after seismic loading. Seismic loading shall not cause false operation.

B. Design Requirements

1. Switches shall contain two contactors with ampere ratings and number of poles as indicated on the Drawings and shall be suitable for 480 VAC, three-phase, 60 Hertz operation. Minimum transfer time shall 400 milliseconds. The switches shall be service entrance rated with bypass isolation and shall bear the service entrance label as indicated on the Drawings.
2. Switches shall be capable of transferring successfully in either direction with 70 percent of rated voltage applied to the terminals.
3. Main contacts to be of silver-tungsten alloy, mechanically locked in position in both the normal and standby positions without the use of hooks, latches, or magnets. Provide separate arcing contacts, with magnetic blowouts on each pole. Interlocked molded case circuit breakers switches or contactors are not acceptable.
4. Equip the transfer switch with a permanently attached, safe, manual operator designed to prevent injury to personnel in the event the electrical operator should become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from slowly switching the main contacts.

C. Sequence of Operation

1. Should the voltage on any phase of the normal source drop below 80 percent or increase to 120 percent, or frequency drops below 90 percent, or increase to 110 percent, or 20 percent voltage differential between phases occur, after a programmable time delay period of 0-9999 seconds factory set at three (3) seconds to allow for momentary dips, the engine starting contact(s) shall close to start the standby plant.
2. Transfer to the standby power source shall occur when 90 percent of rated voltage and frequency has been reached by the standby power source.
3. After restoration of normal power on all phases to a preset value of 90 percent to 110 percent of rated voltage, at least 95 percent to 105 percent of rated frequency, and voltage differential is below 20 percent between phases, an adjustable time delay period of 0-9999 seconds factory set at 300 seconds shall delay the transfer to allow stabilization of the normal source. Should the standby source fail during this time delay period, the switch shall automatically retransfer to the normal source.
4. After retransfer to the normal power source, the standby plant shall operate at no load for a programmable period of 0-9999 seconds factory set at 300 seconds. Should the normal power source fail during this time delay period, the transfer switch shall automatically return to the standby source.

D. Controls

1. The transfer switch shall be equipped with a microprocessor-based control system to provide all the operational functions of the automatic transfer switch.

- The controller shall have two asynchronous serial ports. The controller shall have a real time clock with Nicad battery back-up.
2. The CPU shall be equipped with self-diagnostics which perform periodic checks of the memory, I/O, and communication circuits with a watchdog power fail circuit.
 3. The controller shall use industry standard open architecture communication protocol for high-speed serial communications via multidrop connection to other controllers and to a master terminal with up to 4000 ft of cable, or further with the addition of a communication repeater. The serial communication port shall be RS422/485 compatible.
 4. The serial communication port shall allow interface to either the manufacturer's or the Owner's furnished remote supervisory control system.
 5. The controller shall have password protection to limit access to authorized personnel.
 6. The controller shall include a 20-character LCD display with a keypad, which allows access to the system.
 7. The controller shall include three-phase over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring on both normal and standby sources.
 8. The controller shall be capable of storing the following records in memory for access either locally or remotely:
 - a. Number of hours the transfer switch is in the standby position (total since record reset).
 - b. Number of hours standby power source is available (total since record reset).
 - c. Total transfer in either direction (total since record reset).
 - d. Date, time, and description of the last four source failures.
 - e. Date of the last exercise period.
 - f. Date of record reset.
 9. Light emitting diodes shall be mounted on the controller to indicate:
 - a. Switch is in normal position
 - b. Switch is in standby position.
 - c. Controller is running.
 10. A three-phase digital LCD voltage readout, with 1% accuracy shall display all three separate phase-to-phase voltages simultaneously for both the normal and standby source.
 11. A digital LCD frequency readout with 1% accuracy shall display frequency for both the normal and standby source.
 12. An LCD readout shall display both normal source and standby source availability.
 13. The microprocessor controller shall meet the following requirements:
 - Storage conditions - 25°C to 85°C
 - Operation conditions - 20°C to 70°C ambient
 - Humidity 0 to 99% relative humidity, non-condensing
 - Capable of withstanding infinite power interruptions
 - Surge withstand per ANSI/IEEE C-37.90A-1978
 14. All control wiring shall be 18 gauge (minimum), 600 VAC, SIS switchboard type. All control wiring shall be identified at each termination (both ends) using tubular, sleeve-type wire markers.

E. Accessories

1. Programmable three phase sensing of the normal source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage. Programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases, set at 20%, and phase sequence monitoring.
2. Programmable three phase sensing of the standby source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage. Programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases, set at 20%, and phase sequence monitoring.
3. Time delay for override of momentary normal source power outages (delays engine start signal and transfer switch operation). Programmable 0-9999 seconds. Factory set at 3 seconds.
4. Time delay on retransfer to normal, programmable 0-9999 seconds, factory set at 300 seconds, with overrun to provide programmable 0-9999 second time delay, factory set at 300 seconds, unloaded engine operation after retransfer to normal.
5. Time delay on transfer to standby, programmable 0-9999 seconds, factory set at 3 seconds.
6. A maintained type load test switch shall be included to simulate a normal power failure, keypad initiated.
7. A time delay bypass on retransfer to normal shall be included. Keypad initiated.
8. Contact, rated 10 A at 30VDC, to close on failure of normal source to initiate engine starting.
9. A plant exerciser shall be provided with (10) 7 day events, programmable for any day of the week and (24) calendar events, programmable for any month/day, to automatically exercise the standby plant programmable in one minute increments. Also include a control switch for selection of either "no load" (switch will not transfer) or "load" (switch will transfer) during the exercise period. Keypad initiated.
10. Relay contacts which close when normal source fails wired to a terminal strip.
11. Relay contacts which open when normal source fails wired to a terminal strip.
12. Two auxiliary contacts rated 15 A at 120 VAC on main shaft, closed on normal and wired to a terminal strip.
13. Two auxiliary contacts rated 15 A at 120 VAC on main shaft, closed on standby and wired to a terminal strip.

PART 3 - EXECUTION

3.01 Installation

- A. Each automatic transfer switch shall be installed as shown on the Drawings and in accordance with the manufacturer's installation instructions.

- B. The automatic transfer switch shall be provided with adequate lifting means for installation of wall or floor mounted enclosures.
- C. The Contractor shall tighten all assembled bolted connections to the manufacturer's torque recommendations prior to energizing.
- D. Install each switch to allow complete door swing required for component removal. This is specifically required where a switch is set next to a wall to the left of the switch enclosure.
- E. Startup shall include complete training and programming of the generator exercise schedule per the generator supplier recommendations and the Owner preferred timing. Once a month the transfer switch should be programmed to transfer load during this exercise period. For closed transition switches, loads should be transferred every time.
- F. ATS shall work with the generator in such a way that the generator can be remotely stopped and started via SCADA.

3.02 Rubber Mats

- A. A three foot wide rubber mat shall be furnished and installed on the floor and in front of each automatic transfer switch. The mat shall be long enough to cover the full length of each enclosure. The mat shall be 1/4 inch thick with beveled edges, canvas back, solid type with corrugations running the entire length of the mat. The mat shall be guaranteed extra quality, free from cracks, blow holes or other defects detrimental to their mechanical or electrical strength. The mat shall meet OSHA requirements and the requirements of ANSI/ASTM D-178 J6-7 for Type 2, Class 2 insulating matting.

-END-

SECTION 16500 – LIGHTING

PART 1 - GENERAL

1.01 The Requirement

- A. The Contractor shall furnish and install all lighting fixtures, labor and material, in accordance with the preceding Specifications, the requirements of this Section and as shown on the Drawings.
- B. Lighting shall be in accordance with the latest requirements of the Illuminating Engineering Society and all lighting fixtures shall have the Underwriters Laboratories, Inc. label of approval.
- C. All wiring shall be placed in conduit and shall comply with the Specifications for conduit, outlet boxes, pull and junction boxes, wires and cables, grounding and other Sections as set forth in these Specifications and as noted herein.
- D. Reference Section 16000, Basic Electrical Requirements and Section 16141, Wiring Devices.

1.02 Testing

- A. All tests shall be performed in accordance with the requirements of the General Conditions and Division 1. The following tests are required:
 - 1. Witnessed Shop Tests
 - a. None required.
 - 2. Certified Shop Tests
 - a. The lighting fixtures shall be given routine factory tests in accordance with the requirement of ANSI, NEMA and Underwriters Laboratories standards.
 - 3. Field Tests
 - a. Field testing shall be done in accordance with the requirements specified in the General Conditions, Division 1, and Section 16000, Basic Electrical Requirements.

1.03 Submittals

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300, Submittals, the Contractor shall obtain from the equipment manufacturer and submit the following:
 - 1. Shop Drawings
 - 2. Operation and Maintenance Manuals
 - 3. Spare Parts Lists
 - 4. Special Tools List
 - 5. Reports of Certified Shop Tests
- B. Each submittal shall be identified by the applicable specification section.

1.04 Shop Drawings

- A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- B. Partial, incomplete or illegible submittals will be returned to the Contractor for resubmittal without review.
- C. Shop drawings shall include but not be limited to:
 - 1. Product data sheets.
 - 2. Catalog cuts for each fixture type showing performance and construction details of standard fixtures, and complete working drawings showing all proposed construction details of special or modified standard fixtures.
 - 3. Photometric curves.
 - 4. Lamp data.
 - 5. Ballast information.
 - 6. Catalog data including applicable coefficients of utilization tables, isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread and beam lumens.
 - 7. Pole calculations.
- D. Shop drawings shall be submitted to the Engineer for review and acceptance for all fixtures before fixtures and poles are manufactured. Substitutions will be permitted only if acceptable to the Engineer.
- E. Manufacturer's catalog number and description in the fixture schedule on the Contract Drawings establishes a level of quality, style, finish etc. The use of a catalog number describing the various types of fixtures shall be used as a guide only and does not exclude all the required accessories or hardware that may be required for a complete installation.

1.05 Operation and Maintenance Manuals

- A. The Contractor shall submit Operation and Maintenance Manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1.

1.06 Tools, Supplies, and Spare Parts

- A. The light fixtures shall be furnished with all special tools necessary to disassemble, service, repair and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished to the Owner by the Contractor. The following minimum spare parts shall be furnished:
 - 1. A minimum of one (1) ballast and LED Driver for every ten (10) ballasts or LED Drivers (of the same type) installed.
 - 2. A minimum of 10% spare lamps shall be provided for each type of lamp provided.

- B. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
- C. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner.
- D. Spare parts lists, included with the shop drawing submittal, shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.
- E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 Lighting Controls

- A. The lighting systems shall be controlled as specified herein and indicated on the Drawings.
- B. Lighting contactors shall be furnished and installed for specific lighting control applications as specified herein and indicated on the Drawings.

PART 2 - PRODUCTS

2.01 Manufacturers

- A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

2.02 Lighting Controls

- A. Motion sensor switches shall be dual technology passive infrared and ultra-sonic type with a coverage area of 1200 Square-Ft. Motion sensors switches shall be wall mounted with a viewing angle 180 Deg. Motion sensors shall have a timer range of 30 seconds to 20 minutes with a manual time delay. Switches shall have a minimum rating of 800 Watts @ 120VAC. Color will be selected by Owner. Switches shall be U.L. listed and have a minimum 5-year warranty. Motion sensor switches shall be Holophane Sensor Switch or equal.

2.03 Fixtures

- A. Each fixture shall bear the Underwriters Laboratories, Inc. label. All lighting fixtures shall be furnished complete with lamps of the size and type as indicated on the

Drawings and all fittings and hardware necessary for a complete installation. Lighting fixtures shall have all parts and fittings necessary to completely and properly install the fixtures.

- B. Fixture leads shall be as required by NEC and shall be grounded by the conduit connection to the fixture.
- C. All glassware shall be high quality, homogeneous in texture, uniform in quality, free from defects, of uniform thickness throughout and properly annealed. Edges shall be well rounded and free from chips or rough edges.
- D. Fixtures shall be complete with housing, louvers (if required) and accessories of the types and quantities specified herein and indicated on the Drawings.
- E. Fixtures shall be as specified in the fixture schedule on the Drawings.

2.04 Ballasts

- A. All ballasts shall be designed to a ballast factor of 1.0. Ballasts shall be designed to operate a nominal lamp at nominal wattage given nominal input voltage and have full rated output.
- B. Ballasts shall be multi-voltage/multi-tap where available.
- C. Where available, ballasts shall be as manufactured by the fixture manufacturer. Ballasts shall be guaranteed against service failure for a period of five (5) years. Ballasts shall be rated "Class P" to agree with requirements of 410-73 (e) and other applicable articles of the NEC, to conform to the time schedule for this requirement, and shall be Class A sound rated.
- D. All outdoor fixtures and fixtures located in unheated areas shall be furnished and installed with ballasts rated for outdoor installation.
- E. Fixtures shown or specified to be controlled by dimmers shall be furnished with suitable dimming ballasts.
- F. Ballasts shall be as manufactured by Holophane, Universal, Advance or Magnetek.

2.05 Lamps

- A. The Contractor shall furnish and install lamps in all fixtures. Lamps shall be of the following types:
 - 1. L.E.D.
- B. Lamps shall be as manufactured by General Electric Company, Sylvania Lighting Equipment, Phillips Lighting Company or as specified in the schedule on the Drawings.

2.06 Poles

- A. Poles shall be designed to withstand calculated wind force due to 100 mph winds with a 1.3 gust factor without structural damage.
- B. Pole mounted fixtures shall be mounted on poles as designated in the fixture schedule or as indicated on the Drawings. All metal poles shall be bonded to the plant grounding system. Poles shall have adequate handholes and weatherproof receptacles where indicated. All anchor bolts and nuts shall be stainless steel.

PART 3 - EXECUTION

3.01 Installation

- A. Lighting fixtures shall be located symmetrically with building lines as shown on the Drawings. The Contractor shall furnish and install the lighting fixtures to allow "convenient" access for maintenance such as cleaning, relamping, and other activities. The fixtures shall be installed to be accessed by a 16 ft. ladder. Where fixtures are shown in locations on the Drawings where maintenance would be difficult, the Contractor shall notify the Engineer for direction.
- B. The Contractor shall provide and install all inserts, conduit, structural supports as required, lamps, ballasts, poles, wiring and any other items required for a complete system. Contractor shall properly adjust and test, to the satisfaction of the Engineer, the entire lighting system. The Contractor shall provide pigtails and flexible conduit connected to an outlet box where necessary or required resulting in a neat and complete installation.
- C. The Contractor shall protect all fixtures at all times from damage, dirt, dust and the like. Before final acceptance, all fixtures and devices shall be cleaned of all dust, dirt or other material, be fully re-lamped and in operating condition to the satisfaction of the Engineer.
- D. Circuiting shall be as shown on the Drawings and as follows:
 - 1. Bus loads in all panelboards shall be balanced between phases to within a tolerance of one (1) KVA. Convenience receptacles shall be distributed evenly among all phase buses as much as practical.
 - 2. Voltage drop to the most remote lighting fixture shall be limited to 2 percent.
- E. The Contractor shall furnish and install all pendant trapezes and pendant stem hangers with durable swivel or equivalent trapeze hanger permitting normal fixture motion and self-alignment. Fixture pendants shall be Appleton Type UNJ ball type flexible hanger at the fixture and supports from an Appleton JBLX junction box with JBLX hub cover, or equal. Pendant lengths shall be adequate and adjusted to provide uniformity of installation heights above the reference datum. Stems shall be one-piece, with matching canopies and fittings.
- F. Fixtures located on the exterior of buildings shall be provided with neoprene gasket and non-ferrous metal screws finished to match the fixtures.

- G. The finish or exposed metal parts of lighting fixtures and finish trims of all recessed lighting fixtures shall be as directed by the Engineer.
- H. The Contractor shall furnish and install recessed fixtures with a separate junction box concealed and located as to be accessible when fixture is removed.
- I. The Contractor shall furnish and install all boxes for lighting fixtures such that the box is not the sole support of the fixture. The boxes shall be offset to allow maintenance such that access to wiring within the box can be attained without having to consider supporting (holding) the fixture.
- J. All lighting units, when installed, shall be set true and be free of light leaks, warps, dents and other irregularities. All hangers, cables, supports, channels and brackets of all kinds for safely erecting this equipment in place shall be furnished and erected in place by the Contractor.
- K. The Contractor shall install fixtures at mounting heights indicated on the Drawings or as instructed by the Engineer. In areas with exposed ducts and/or piping installation of lighting fixtures shall be adapted to field conditions as determined by the Engineer.
- L. The Contractor shall support each fixture securely. The Contractor shall not secure fixtures to the work of other trades, unless specified or noted otherwise, and shall not support fixtures to plaster. The Contractor shall furnish and install all steel members and supports as required to fasten and suspended fixtures from the structure.
- M. In all mechanical equipment areas, the Contractor shall install lighting fixtures on the ceiling after all piping and equipment therein has been installed. Exact locations for such fixtures may be determined by the Engineer on the site during the course of the work.
- N. Upon completion of work, and after the building area is broom clean, all fixtures shall be made clean and free of dust and all other foreign matter both on visible surfaces and on surfaces that affect the lighting performance of the fixture including diffusers, lenses, louvers, reflectors and lamps.
- O. All fixtures that require physical adjustment shall be so adjusted in accordance with the directions of the Engineer. The Contractor shall also adjust angular direction of fixtures and/or lamps, as directed.
- P. Relamping access shall require no special tools. All optical control surfaces such as lenses and reflectors shall be safely and securely attached to fixtures and shall be easily and quickly removed and replaced for cleaning without the use of tools. No fixture part that may be removed, for maintenance, shall be held in place by metal tabs that must be bent to remove said part.
- Q. The Contractor shall furnish and install a concrete foundation for the pole mounted fixtures as indicated on the Drawings and as required. Foundation shall be approved by a professional structural engineer currently registered in the State of

Indiana. Pole structure/foundation shall be able to handle fixture/pole weight and withstand wind velocity of up to 100 MPH with a 1.3 gust factor. Provide calculations for review.

- R. The Contractor shall furnish and install switches as indicated on the Drawings. Switches shall be single pole, double pole, 3-way, or 4-way as indicated on the Drawings and as required. Switches located outdoors or in wet indoor locations shall be installed in cast boxes complete with yellow, fiberglass weatherproof covers. Reference Section 16141, Wiring Devices.
- S. The Contractor shall furnish and install time switches and photocells as specified herein or indicated on the Drawings. Time switches shall be provided with a manual bypass switch controlling the lights locally and remotely. Time switches shall control contactors, relays or direct controlling of one, two or three lighting circuits, as indicated. The Contractor shall furnish and install photocells as specified herein or indicated on the Drawings for automatic "ON/OFF" switching of outdoor lighting.

-END-

SECTION 16780 – VIDEO SURVEILLANCE SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Requirements for Video Surveillance System including cameras and other supporting equipment.

B. Related Sections

1. Section 13455 SCADA Local Area Network (LAN) Equipment

1.02 Definitions

A. Acronyms and abbreviations

1. LAN: Local Area Network
2. POE: Power Over Ethernet

1.03 System Description

A. Design Requirements:

1. Provide a camera and associated hardware for each of the well platforms: Well PW-1, Well PW-2, and Well PW-3.
2. Ethernet switch for cameras is provided under Section 13455.

1.04 Submittals

A. Provide the following submittals in accordance with Section 01300:

B. Product Data

1. Product data cut sheets and catalog literature.

C. Shop Drawings

1. Installation and mounting details for all cameras.
2. Confirm locations and orientations with owner before installation.

D. Warranty

1. The cameras shall be covered by a 10-year warranty.

- 1.05 Maintenance
 - A. Camera Equipment Supplier shall provide maintenance and troubleshooting assistance throughout the equipment warranty period.
 - B. Equipment that fails during the warranty period should be provided, installed, configured and tested at no charge to the OWNER during the warranty period.
- 1.06 Extra Materials (Spares)
 - 1. Provide one spare camera.

PART 2 - PRODUCTS

- 2.01 Cameras
 - A. Manufacturers
 - 1. Verkada, CH52-E
 - 2. No Substitutes
 - B. General Requirements
 - 1. Camera Features
 - a. Four 5MP sensors collectively capturing 20MP of resolution (2688 x 1944).
 - b. Each camera head can be repositioned and each lens can be zoomed up to 2.5x, allowing for comprehensive coverage while maintaining image detail.
 - c. Each camera head is powered by a dedicated computer vision processor to provide the image quality, stability and analytics performance of four independent cameras.
 - 1) CPU: 4 x Ambarella CV25S88
 - d. 30m / 98ft IR illuminators for nighttime visibility.
 - e. Edge processing for motion, people, and vehicle analytics.
 - f. Image Sensor: 4 x 1 / 2.8" Progressive CMOS
 - g. Lens Type: Varifocal; motorized zoom
 - h. Focal Length: 3.7 – 7.7 mm
 - i. Aperture: F1.9 – F2.9
 - j. Field of View:
 - 1) Horizontal: 37° - 89°
 - 2) Vertical: 29° - 65°
 - 3) Diagonal: 46° - 99°
 - k. Sensor Movement:
 - 1) Tilt: +0° - 105° for each lens from horizon
 - 2) Pan: +/-90° for each lens
 - 3) Rotation: +/-90° for each lens
 - l. Shutter Speed: 1/5 sec. to 1/32,000 sec.
 - 2. Video Features
 - a. Compression: H.265, H.264
 - b. Frame Rate: 24 fps / sensor

- c. Live Streaming Settings (Per Head):
 - 1) High Quality: Up to 3,000 Kbps
 - 2) Standard Quality: Up to 600 Kbps
- d. Audio not supported
- 3. Operating Temperature: -40°F to 122°F
- 4. Humidity: 0 to 90%
- 5. LED Indicator: System power and status indicator

C. Electrical and Network Requirements

- 1. Power Input
 - a. With IR: IEEE 802.3bt Type 3 PoE++
 - b. Without IR: IEEE 802.3at Type 2 PoE+
 - c. Extended Temperature Range: IEEE 802.3bt Type 3 PoE++
- 2. Power Consumption
 - a. With IR: 42.5 – 57V, 0.65 – 0.49A, 27.69W
 - b. Without IR: 42.5 – 57V, 0.46 – 0.34A, 19.54W
 - c. Extended Temperature Range: 42.5 – 57V, 0.91 – 0.68A, 38.68W
- 3. Connectivity: RJ-45 cable connector for network/PoE connection; 10/100 Mbps

D. Mechanical Requirements

- 1. Camera Weight: 2,900g / 102.3oz
- 2. Mounting Plate Weight: 536g / 18.9oz
- 3. Dimensions
 - a. With Mount Plate: 275mm / 10.82in Diameter, 118mm / 4.65in Height
 - b. Without Mount Plate: 267mm / 10.51in Diameter, 114mm / 4.49in Height
- 4. Body: Aluminum, plastic dome trim

E. Software Capabilities

- 1. Alerts: camera status, motion detection, people detection, vehicle detection, person of interest detection, crowd detection, line-crossing detection, loitering detection.
- 2. People Analytics: people search, attribute search, face search, occupancy trends, motion search, trajectory analysis, selective face blurring, AI-powered search.
- 3. Vehicle Analytics: vehicle search, attribute search, motion search, trajectory analysis, occupancy trends, AI-powered search.
- 4. Streaming and Storage: cloud backup, configurable retention days, selectable storage location, low bandwidth mode, timelapse, RTSP.
- 5. Sharing and Privacy: live links, live face blur, privacy regions, audit log.

F. Environmental Requirements

- 1. Sealed interior components must have IP66 rated protection against dust particles and heavy rain
- 2. Exterior housing must provide IK10 rated protection against direct impacts from vandals, hail, and flying debris.

G. Supplied Accessories

1. IR Cover
2. Mounting Template
3. 3 Mounting Screws
4. 3 Wall Anchors
5. 2 Desiccants
6. T10 Security Screwdriver
7. Offset Wrench
8. Mounting for Each Well Location

PART 3 - EXECUTION

3.01 Installation

- A. Cameras must be installed and protected in a location that is not easily accessible and is away from impacts or heavy vibration.
- B. Ethernet cable shall be installed through a cable gland assembly provided by camera manufacturer.

3.02 Field Quality Control

A. Tests

1. Confirm camera system is complete and fully functional before utilizing for surveillance.

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