

CITY OF FLINT
FINANCE DEPARTMENT - DIVISION OF PURCHASES AND SUPPLIES

City Hall
1101 S. Saginaw Street, M203 – Flint, Michigan 48502
(810) 766-7340 FAX (810) 766-7240 www.cityofflint.com TDD 766-7120



Dr. Karen W. Weaver
Mayor

REQUEST FOR PROPOSAL

OWNER/RETURN TO:

THE CITY OF FLINT
FINANCE DEPARTMENT - DIVISION OF PURCHASES AND SUPPLIES
1101 S. SAGINAW ST., ROOM 203, 2nd FLOOR
FLINT, MI 48502

PROPOSAL NO.: 19000547

SCOPE OF WORK:

The City of Flint, Finance Department – Division of Purchases & Supplies, is soliciting sealed proposals for providing:

WATER PUMP REPLACEMENT @ EAST PUMP STATION @ WPCF

Per the attached additional requirements.

If your firm is interested in providing the requested goods or services, please submit one (1) original and two (2) copies of your detailed proposal to the City of Flint, Finance Department - Division of Purchases and Supplies, 1101 S. Saginaw St., Room 203, Flint, MI, 48502, **August 15, 2019 @ 3:00 PM (EST)**. Please note: all detailed proposals received after 3:00 PM (EST) will not be considered. Proposals must be in a sealed envelope clearly identifying the proposal and number. Faxed proposals into the Finance Department - Division of Purchases and Supplies are not accepted.

All additional proposal documents, requirements, addendums, specifications, and plans/drawings (if utilized) are available on the Purchasing page of the City of Flint's web site at <https://www.cityofflint.com/finance/purchasing/bids-2/> under "open bids" and the specific bid or proposal number assigned to this notice.

A mandatory Pre-Bid meeting will be held on Tuesday, August 6, 2019 @ 11:00 AM EST at the Water Pollution Control Flint, located at G-4652 Beecher Road, Flint, MI 48532.

Successful proposers should complete and submit a vendor application, IRS W-9 Form, and Vendor ACH Payment Authorization Form with the City of Flint. Contact (810)766-7266 or accountspayable@cityofflint.com for Vendor ACH Payment Authorization Form and instructions.

Results may be viewed next business day online at <https://www.cityofflint.com/finance/purchasing/results/> under "bid results".

Any questions regarding the proposal process may be directed to Joyce McClane in writing by **no later than 8/9/19**, no later than 1:00 PM to jmcclane@cityofflint.com.

Sincerely,
Joyce A. McClane
Division of Purchases and Supplies

INSTRUCTIONS TO VENDORS

- 1) **PRE-BID INFORMATION AND QUESTIONS:** Each proposal that is timely received will be evaluated on its merit and completeness of all requested information. In preparing proposals, Proposers are advised to rely only upon the contents of this RFP and accompanying documents and any written clarifications or addenda issued by the City of Flint. If a Proposer finds a discrepancy, error or omission in the RFP package, or requires any written addendum thereto, the Proposer is requested to notify the Purchasing contact noted on the cover of this RFP, so that written clarification may be sent to all prospective Proposers. **THE CITY OF FLINT IS NOT RESPONSIBLE FOR ANY ORAL INSTRUCTIONS.** All questions must be submitted in writing to the Purchasing Department before any Pre-Bid Question Deadline (if specified) or at least one (1) week prior to the proposal opening date indicated on the front of this document.

- 2) **RFP MODIFICATIONS:** The City of Flint has the right to correct, modify or cancel the RFP, in whole or in part, or to reject any Proposal, in whole or in part, within the discretion of the City of Flint, or their designee. If any such changes are made, all known recipients of the RFP will be sent a copy of such changes. If any changes are made to this RFP document by any party other than the City of Flint, the original document in the City of Flint's files takes precedence.

- 3) **PROPOSAL SUBMISSION:**
 - a) The Proposer must include the following items, or the proposal may be deemed non-responsive:
 - i) All forms contained in this RFP, fully completed.
 - b) Proposals must be submitted to the Finance Department – Purchases and Supplies, City of Flint, 1101 S. Saginaw Street – Room 203, Flint, Michigan 48502 by the date and time indicated as the deadline. The Purchasing Department time stamp will determine the official receipt time. It is each Proposer's responsibility to insure that its' proposal is time stamped by the Purchasing Department by the deadline. This responsibility rests entirely with the Proposer, regardless of delays resulting from postal handling or for any other reasons. Proposals will be accepted at any time during the normal course of business only, said hours being 8:00 a.m. to 5:00 p.m. Local Time, Monday through Friday, legal holidays as exception.
 - c) Proposals must be enclosed in a sealed, non-transparent envelope, box or package, and clearly marked on the outside with the following: RFP Title, RFP Number, Deadline and Proposer's name.
 - d) Submission of a proposal establishes a conclusive presumption that the Proposer is thoroughly familiar with the Request for Proposals (RFP), and that the Proposer understands and agrees to abide by each and all of the stipulations and requirements contained therein.
 - e) All prices and notations must be typed or printed in ink. No erasures are permitted. Mistakes may be crossed out and corrections must be initialed in ink by the person(s) signing the bid.
 - f) Proposals sent by email, facsimile, or other electronic means will not be considered unless specifically authorized in this RFP.
 - g) All costs incurred in the preparation and presentation of the proposal are the Proposer's sole responsibility; no pre-bid costs will be reimbursed to any Proposer. All documentation submitted with the proposal will become the property of the City of Flint.
 - h) Proposals must be held firm for a minimum of 120 days.

- 4) **EXCEPTIONS:** Proposer shall clearly identify any proposed deviations from the Terms or Scope in the Request for Proposal. Each exception must be clearly defined and referenced to the proper paragraph in this RFP. The exception shall include, at a minimum, the proposed substitute language and opinion

as to why the suggested substitution will provide equivalent or better service and performance. If no exceptions are noted in the proposal, the City of Flint will assume complete conformance with this specification and the successful Proposer will be required to perform accordingly. Proposals not meeting all requirements may be rejected.

- 5) **DUPLICATE BIDS:** No more than one (1) proposal from any Proposer including its subsidiaries, affiliated companies and franchises will be considered by the City of Flint. In the event multiple proposals are submitted in violation of this provision, the City will have the right to determine which proposal will be considered, or at its sole option, reject all such multiple proposals.
- 6) **WITHDRAWAL:** Proposals may only be withdrawn by written notice prior to the date and time set for the opening of proposals. No proposal may be withdrawn after the deadline for submission.
- 7) **REJECTION/GOOD STANDING:** The City of Flint reserves the right to reject any or all proposals, or to accept or reject any proposal in part, and to waive any minor informality or irregularity in proposals received if it is determined by the City of Flint, or their designee, that the best interest of the City will be served by doing so. No Proposal will be considered from any person, firm or corporation in arrears or in default to the City on any contract, debt, taxes or other obligation, or if the Proposer is debarred by the City of Flint from consideration for a contract award pursuant to Section 18-21.5 (d) of Article IV of the "Purchasing Ordinance of the City of Flint.
- 8) **PROCUREMENT POLICY:** Procurement for the City of Flint will be handled in a manner providing fair opportunity to all businesses. This will be accomplished without abrogation or sacrifice of quality and as determined to be in the best interest of the City. The City of Flint and their officials have the vested authority to execute a contract, subject to City Council and Mayoral approval where required.
- 9) **PROPOSAL SIGNATURES:** Proposals must be signed by an authorized official of the Proposer. Each signature represents binding commitment upon the Proposer to provide the goods and/or services offered to the City of Flint if the Proposer is determined to be the lowest Responsive and Responsible Proposer.
- 10) **CONTRACT AWARD/SPLIT AWARDS:** The City of Flint reserves the right to award by item, group of items, or total proposal to the lowest responsive, responsible Proposer. The Proposer to whom the award is made will be notified at the earliest possible date. Tentative acceptance of the proposal, intent to recommend award of a contract and actual award of the contract will be provided by written notice sent to the Proposer at the address designated in the proposal if a separate Agreement is required to be executed. After a final award of the Agreement by the City of Flint, the Contractor/Vendor must execute and perform said Agreement. All proposals must be firm for at least 120 days from the due date of the proposal. If, for any reason, a contract is not executed with the selected Proposer within 14 days after notice of recommendation for award, then the City may recommend the next lowest responsive and responsible Proposer.
- 11) **NO RFP RESPONSE:** Proposers who receive this RFP but who do not submit a proposal should return this RFP package stating "No Proposal" and are encouraged to list the reason(s) for not responding. Failure to return this form may result in removal of the Proposer's name from all future lists.

- 12) **FREEDOM OF INFORMATION ACT REQUIREMENTS:** Proposals are subject to public disclosure after the deadline for submission in accordance with state law.
- 13) **ARBITRATION:** Contractor/Vendor agrees to submit to arbitration all claims, counterclaims, disputes and other matters in question arising out of or relating to this agreement or the breach thereof. The Contractor's agreement to arbitrate shall be specifically enforceable under the prevailing law of any court having jurisdiction to hear such matters. Contractor's obligation to submit to arbitration shall be subject to the following provisions:
- (a) Notice of demand for arbitration must be submitted to the City in writing within a reasonable time after the claim; dispute or other matter in question has arisen. A reasonable time is hereby determined to be fourteen (14) days from the date the party demanding the arbitration knows or should have known the facts giving rise to his claim, dispute or question. In no event may the demand for arbitration be made after the time when institution of legal or equitable proceedings based on such claim dispute or other matters in question would be barred by the applicable statute of limitation.
 - (b) Within fourteen (14) days from the date demand for arbitration is received by the City, each party shall submit to the other the name of one person to serve as an arbitrator. The two arbitrators together shall then select a third person, the three together shall then serve as a panel in all proceedings. Any decision concurred in by a majority of the three shall be a final binding decision.
 - (c) The final decision rendered by said arbitrators shall be binding and conclusive and shall be subject to specific enforcement by a court of competent jurisdiction.
 - (d) The costs of the arbitration shall be split and borne equally between the parties and such costs are not subject to shifting by the arbitrator.
- 14) **PROPOSAL HOLD:** The City of Flint may hold proposals for a period of one hundred twenty - (120) days from opening, for the purpose of reviewing the results and investigating the qualifications of proposers prior to making an award.
- 15) **NONCOMPLIANCE:** Failure to deliver in accordance with specifications will be cause for the City of Flint and they may cancel the contract or any part thereof and purchase on the open market, charging any additional cost to the Contractor/Vendor.
- 16) **DISCLAIMER OF CONTRACTUAL RELATIONSHIP:** Nothing contained in these documents shall create any contractual relationship between the City and any Subcontractor or Sub-subcontractor.
- 17) **ERRORS AND OMISSIONS:** Proposer is not permitted to take advantage of any obvious errors or omissions in specifications.
- 18) **INTERPRETATION:** In the event that any provision contained herein shall be determined by a court of competent jurisdiction or an appropriate administrative tribunal to be contrary to the provision of law or to be unenforceable for any reason, then, to the extent necessary and possible to render the remainder of this Agreement enforceable, such provision may be modified or severed by such court or administrative tribunal having jurisdiction over this Agreement and the interpretation thereof, or the parties hereto, so as to, as nearly as possible, carry out the intention of the parties hereto, considering the purpose of the entire Agreement in relation to such provision.
- 19) **LAWS AND ORDINANCES:** The proposer shall obey and abide by all of the laws, rules and regulations of the Federal Government, State of Michigan, Genesee County and the City of Flint,

applicable to the performance of this agreement, including, but not limited to, labor laws, and laws regulating or applying to public improvement, local government, and its operational requirements.

- 20) **LOCAL PREFERNECE:** Proposers/bidders located within the corporate city limits of Flint, Michigan may be given a seven percent (7%) competitive price advantage. Additionally, if the lowest responsible bidder is not located within the limits of the City of Flint, but is located within the County of Genesee, and said bidder does not exceed the bid of the lowest non-local bidder by more than three and one-half percent (3-1/2%), then said lowest Genesee County bidder may be determined to be the lowest responsible bidder, and make the award to such Genesee County bidder accordingly, subject to the approval of the city council. If the lowest non-local bidder does not exceed that of any proposers/bidders by (7%) inside the City of Flint or (3-1/2%) inside the County of Genesee, then the Purchasing Director shall be allowed to request that the lowest local vendor match the price offered by the lowest non-local vendor.
- 21) **MATERIAL WORKMANSHIP AND STANDARDS OF PERFORMANCE:** The proposer agrees to exercise independent judgment and to complete performance under this Agreement in accordance with sound professional practices. In entering into this Agreement, the City is relying upon the professional reputation, experience, certification and ability of the proposer by him/her or by others employed by him/her and working under his/her direction and control. The continued effectiveness of this Agreement during its term or any renewal term shall be contingent, in part, upon the proposer maintaining his/her operating qualifications in accordance with the requirements of federal, state and local laws. All materials furnished must be new, of latest model and standard first grade quality, or best workmanship and design, unless otherwise expressly specified. Proposer, if required, must furnish satisfactory evidence of quality materials; offers of experimental or unproven equipment may be disregarded.
- 22) **MODIFICATIONS/CHANGES:** Any modification to this agreement must be in writing and signed by the authorized employee, officer, board or council representative authorized to make such modifications pursuant to the State law and local ordinances.
- 23) **NON-COLLUSION:** The proposer acknowledges that by signing this document that he/she is duly authorized to make said offer on behalf of the company he/she represents and that said bid is genuine and not sham or collusive and not made in the interests or on behalf of any person not therein named, and that he/she and said bidder have not directly induced or solicited any other person(s) or corporation to refrain from responding to this solicitation and that he/she and said bidder have not in any manner sought by collusion to secure to himself/herself and said bidder any advantage over any other proposer.
- 24) **NON-DISCRIMINATION:** Pursuant to the requirements of 1976 P.A. 453 (Michigan Civil Rights Act) and 1976 P.A. 220 (Michigan Handicapped Rights Act), the local unit and its agent agree not to discriminate against any employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment or a matter directly or indirectly related to employment because of race, color, religion, national origin, age, sex, height, weight, marital status or because of a handicap that is unrelated to the person's ability to perform the duties of nondiscrimination provision identical to this provision and binding upon any and all contractors and subcontractors. A breach of this covenant shall be regarded as a material breach of this contract.
- 25) **SUBCONTRACTING:** No subcontract work shall be started prior to the written approval of the subcontractor by the City. The City reserves the right to accept or reject any subcontractor.
- 26) **UNION COMPLIANCE:** Contractor agrees to comply with all regulations and requirements of any national or local union(s) that may have jurisdiction over any of the materials, facilities, services or personnel to be furnished by the City.

- 27) **WAIVER:** Failure of the City to insist upon strict compliance with any of the terms, covenants or conditions of this Agreement shall not be deemed a waiver of that term, covenant or condition or of any other term, covenant or condition. Any waiver or relinquishment of any right or power hereunder at any one or more times shall not be deemed a waiver or relinquishment of that right or power at any other time.
- 28) **PREVAILING WAGE:** If applicable, the successful proposer providing any contractual labor services must comply with all requirements and pay prevailing wages and fringe benefits on this project per the City's Resolution R-12 adopted 4/8/91. The bidder is aware of City of Flint Resolution #R-12 dated April 8, 1991, a copy of which is annexed hereto and incorporated herein, and agrees to abide by all of the applicable covenants and requirements set forth in said resolution. The prevailing wage information is available on the city's website @ www.cityofflint.com.
- 29) **CITY INCOME TAX WITHHOLDING:** Contractor and any subcontractor engaged in this contract shall withhold from each payment to his employees the City income tax on all of their compensation subject to tax, after giving effect to exemptions, as follows:
- (a) Residents of the City:
At a rate equal to 1% of all compensation paid to the employee who is a resident of the City of Flint.
 - (b) Non-residents:
At a rate equal to 1/2% of the compensation paid to the employee for work done or services performed in the City of Flint.
- These taxes shall be held in trust and paid over to the City of Flint in accordance with City ordinances and State law. Any failure to do so shall constitute a substantial and material breach of this contract.
- 30) **CONTRACT DOCUMENTS:** The invitation for proposal, instructions to proposal, proposal, affidavit, addenda (if any), statement of proposer's qualifications (when required), general conditions, special conditions, performance bond, labor and material payment bond, insurance certificates, technical specifications, and drawings, together with this agreement, form the contract, and they are as fully a part of the contract as if attached hereto or repeated herein.
- 31) **DISCLAIMER OF CONTRACTUAL RELATIONSHIP WITH SUBCONTRACTORS:** Nothing contained in the Contract Documents shall create any contractual relationship between the City and any Subcontractor or Sub-subcontractor.
- 32) **EFFECTIVE DATE:** Any agreement between the City and the contractor shall be effective upon the date that it is executed by all parties hereto.
- 33) **FORCE MAJEURE:** Neither party shall be responsible for damages or delays caused by Force Majeure nor other events beyond the control of the other party and which could not reasonably have anticipated the control of the other party and which could not reasonably have been anticipated or prevented. For purposes of this Agreement, Force Majeure includes, but is not limited to, adverse weather conditions, floods, epidemics, war, riot, strikes, lockouts, and other industrial disturbances; unknown site conditions, accidents, sabotage, fire, and acts of God. Should Force Majeure occur, the parties shall mutually agree on the terms and conditions upon which the services may continue.
- 34) **INDEMNIFICATION:** To the fullest extent permitted by law, Contractor agrees to defend, pay on behalf of, indemnify, and hold harmless the City of Flint, its elected and appointed officials, employees and volunteers and other working on behalf of the City of Flint, including the Project Manager, against any and all claims, demands, suits, or losses, including all costs connected

therewith, and for any damages which may be asserted, claimed, or recovered against or from the City of Flint, its elected and appointed officials, employees, volunteers or others working on behalf of the City of Flint, by reason of personal injury, including bodily injury or death and/or property damage, including loss of use thereof, which may arise as a result of Contractor's acts, omissions, faults, and negligence or that of any of his employees, agents, and representatives in connection with the performance of this contract. Should the Contractor fail to indemnify the City in the above-mentioned circumstances, the City may exercise its option to deduct the cost that it incurs from the contract price forthwith.

- 35) **INDEPENDENT CONTRACTOR:** No provision of this contract shall be construed as creating an employer-employee relationship. It is hereby expressly understood and agreed that Contractor is an "independent contractor" as that phrase has been defined and interpreted by the courts of the State of Michigan and, as such, Contractor is not entitled to any benefits not otherwise specified herein.
- 36) **NO THIRD-PARTY BENEFICIARY:** No contractor, subcontractor, mechanic, material man, laborer, vendor, or other person dealing with the principal Contractor shall be, nor shall any of them be deemed to be, third-party beneficiaries of this contract, but each such person shall be deemed to have agreed (a) that they shall look to the principal Contractor as their sole source of recovery if not paid, and (b) except as otherwise agreed to by the principal Contractor and any such person in writing, they may not enter any claim or bring any such action against the City under any circumstances. Except as provided by law, or as otherwise agreed to in writing between the City and such person, each such person shall be deemed to have waived in writing all rights to seek redress from the City under any circumstances whatsoever.
- 37) **NON-ASSIGNABILITY:** Contractor shall not assign or transfer any interest in this contract without the prior written consent of the City provided, however, that claims for money due or to become due to Contractor from the City under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the City.
- 38) **NON-DISCLOSURE/CONFIDENTIALITY:** Contractor agrees that the documents identified herein as the contract documents are confidential information intended for the sole use of the City and that Contractor will not disclose any such information, or in any other way make such documents public, without the express written approval of the City or the order of the court of appropriate jurisdiction or as required by the laws of the State of Michigan.
- 39) **RECORDS PROPERTY OF CITY:** All documents, information, reports and the like prepared or generated by Contractor as a result of this contract shall become the sole property of the City of Flint.
- 41) **SEVERABILITY:** In the event that any provision contained herein shall be determined by a court or administrative tribunal to be contrary to a provision of state or federal law or to be unenforceable for any reason, then, to the extent necessary and possible to render the remainder of this Agreement enforceable, such provision may be modified or severed by such court or administrative tribunal so as to, as nearly as possible, carry out the intention of the parties hereto, considering the purpose of the entire Agreement in relation to such provision. The invalidation of one or more terms of this contract shall not affect the validity of the remaining terms.
- 42) **TERMINATION:** This contract may be terminated by either party hereto by submitting a notice of termination to the other party. Such notice shall be in writing and shall be effective 30 days from the date it is submitted unless otherwise agreed to by the parties hereto. Contractor, upon receiving such notice and prorated payment upon termination of this contract shall give to the City all pertinent records, data, and information created up to the date of termination to which the City, under the terms of this contract, is entitled.

- 43) **TIME PERFORMANCE:** Contractor's services shall commence immediately upon receipt of the notice to proceed and shall be carried out forthwith and without reasonable delay.
- 44) **EVALUATION OF PROPOSAL:** In the City's evaluation of proposals, at minimum: cost, serviceability, financial stability, and all requirements set forth in this document shall be considered as selection and award criteria unless otherwise specified.

FOR PARTNERSHIP

STATE OF.....

s.s.

COUNTY OF

..... , being duly sworn, deposes and says that he is a member of the firm of , a co-partnership, making the above bid; that he is duly authorized to make said bid in behalf of said co-partnership; that said bid is genuine and not sham of collusive and not made in the interests of or on behalf of any person not therein named, and that he has not and said bidder has not directly or indirectly induced or solicited any bidder to put in a sham bid; that he has not and said bidder has not directly or indirectly induced or solicited any other person or corporation to refrain from bidding, and that he has not and said bidder has not in any manner sought by collusion to secure to himself or to said bidder any advantage over other bidders.

Subscribed and sworn to before me at, in said County and State

this day of, A. D. 20

.....

*Notary Public,County.....

My Commission expires, 20.....

FOR AGENT

STATE OF

s.s.

COUNTY OF

..... being duly sworn, deposes and says that he executed the within and foregoing bid in behalf of , the bidder therein named, he having been theretofore lawfully authorized, as the agent of said bidder, so to do; that said bid is genuine and not sham or collusive and not made in the interests of or on behalf of any person not therein named, and that he has not and said bidder has not directly or indirectly induced or solicited any bidder to put in a sham bid; that he has not and said bidder has not directly or indirectly induced or solicited any other person or corporation to refrain from bidding, and that he has not and said bidder has not in any manner sought by collusion to secure to himself or to said bidder any advantage over other bidders.

Subscribed and sworn to before me at, in said County and State, this

..... day of, A. D. 20.....,

.....

* Notary Public, County,.....

My Commission expires, 20.....

NOTE: If executed outside of the State of Michigan, certificate by Clerk of the Court of Record, authenticating the Notary's Signature and authority should be attached.

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**SPECIFICATIONS
FOR
EAST PUMP STATION PUMP REPLACEMENT**

**CITY OF FLINT WPCF
FLINT, MICHIGAN**

July 28, 2019

Issued for Bids

HRC JOB NO. 20151005



HUBBELL, ROTH & CLARK, INC
Consulting Engineers

**555 Hulet Drive • P.O. Box 824
Bloomfield Hills, Michigan 48303-0824**

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ADVERTISEMENT FOR BIDS
EAST PUMP STATION PUMP REPLACEMENT
CITY OF FLINT WPCF

Sealed proposals for the construction of the East Pump Station Pump Replacement will be received by the City of Flint, Flint, Michigan **until 3:00 p.m., Local Time on August 15, 2019**, at which time and place all bids will be publicly opened and read.

Bidders shall review and comply with the Instructions to Bidders, which are incorporated by reference, and carefully review all Contract Documents, as defined in the Instructions to Bidders. Bids submitted after the exact time specified for, receipt will not be considered.

The Contracts will consist of the following principal items of work and appurtenances as specified herein and shown on the Contract Drawings.

Description of Work

Removal and replacement of the existing four (4) 250 HP raw sewage pumps and valves (Owner Furnished) with associated electrical, mechanical and demolition work.

Plans, Specifications and Proposal Forms shall be available on or after at the offices of Hubbell, Roth & Clark, Inc., Consulting Engineers, 555 Hulet Drive, Bloomfield Hills, Michigan 48302-0360.

A mandatory prebid meeting will be held on August 6, 2019 at 11:00 am at the Flint Water Pollution Control - Flint (WPCF) G-4652 Beecher Road, Flint, MI .

Proposals submitted by Bidders who have been debarred, suspended, or made ineligible by any Federal Agency will be rejected.

Each bidder agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any bid.

Each bid proposal shall be submitted on the proposal forms provided and shall be accompanied by a certified check, cashier's check or bid bond, executed by the bidder and Surety Company, payable to the City of Flint in the amount of Five Percent (5%) of the accompanying bid. Proposal Guarantee shall provide assurance that the bidder will, upon acceptance of the bid, execute the necessary Contract with the City. No bid may be withdrawn for 90 days after scheduled closing time for receiving bids.

The successful bidder will be required to furnish satisfactory Performance, Labor and Material, and Maintenance and Guarantee Bonds, and Insurance Certificates

The City of Flint reserves the right to reject all bids and to waive irregularities in bidding.

Purchasing
City of Flint

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SECTION 00100

INSTRUCTIONS TO BIDDERS

ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the advertisement or invitation to bid may be obtained from the Issuing Office. The deposit will be refunded to each document holder of record who returns a complete set of Bidding Documents in good condition within 30 days after opening of Bids.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, within 3 days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.
- 3.02 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

- 4.01 *Subsurface and Physical Conditions*
- A. The Supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site.
2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 *Hazardous Environmental Condition*

A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.

B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the

Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions.

- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.
- 4.06 A. Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.
- B. Paragraph 6.13.C of the General Conditions indicates that if an Owner safety program exists, it will be noted in the Supplementary Conditions.
- 4.07 It is the responsibility of each Bidder before submitting a Bid to:
- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
- B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";
- E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;

- F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
 - G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE

- 5.01 A Mandatory Pre-Bid conference will be held at 10:00 a.m. local time on _____, 2018 at the _____ Flint, MI. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective. Attendance at this meeting is required to submit a bid on the project.

ARTICLE 6 – SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 – BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.
- 8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or “or-equal” items. Whenever it is specified or described in the Bidding Documents that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute,

[in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.]

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from Engineer.

- 13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each [section, Bid item, alternative, adjustment unit price item, and unit price item] listed therein. In the case of optional alternatives the words “No Bid,” “No Change,” or “Not Applicable” may be entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.06 A Bid by an individual shall show the Bidder’s name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.08 All names shall be printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder’s authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder’s state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

14.01 *Lump Sum & Alternates*

- A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate. Bidders are encouraged to fill in any Alternates which are listed as “Voluntary,” but

need not do so. In the comparison of Bids, alternates may be applied in any order with all or none of them selected as determined solely by the OWNER.

14.02 *Allowances*

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the following documents:
- 15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation “BID ENCLOSED.” A mailed Bid shall be addressed to the entity provided in the Bid Advertisement.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the

Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 – SALES AND USE TAXES

22.01 The Contractor is responsible for payment of all State of Michigan sales and use tax on this project. Said taxes shall not be included in the Bid. Refer to Paragraph 6.10 of the Supplementary Conditions for additional information.

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

SECTION 00300

BID FORM

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of Flint, Michigan

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.

Addendum Date

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or

subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- 1. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

_____ (\$ _____)

Use Words

Use Figures

All specified cash allowances are included in the price(s) set forth above, and have been computed in accordance with Paragraph 11.02 of the General Conditions.

1. Included in the Bid Price is an Allowance for SCADA programming in the amount of \$35,000.00.

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security in the form of _____;

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest _____

Date of Qualification to do business in [State where Project is located] is
____/____/____.

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

Phone No. _____ Fax No. _____

E-mail _____

SUBMITTED on _____, 20____.

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:

BID

Bid Due Date:

Description *(Project Name and Include Location)*:

BOND

Bond Number:

Date *(Not earlier than Bid due date)*:

Penal sum _____ \$ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal) Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term “Bid” as used herein includes a Bid, offer, or proposal as applicable.

**SUGGESTED FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)**

THIS AGREEMENT is by and between _____ City of Flint _____ (“Owner”) and

_____ (“Contractor”).

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: *Removal and replacement of the four (4) raw sewage pumps and valves at the East Pump Station with associated electrical, mechanical and demolition work.*

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: East Pump Station Pump Replacement.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Hubbell, Roth & Clark, Inc. (Engineer), which is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 150 days after the date when the Contractor has received all of the Owner purchased pumps and valves as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph

14.07 of the General Conditions within 180 days after the date when the Contractor has received all of the Owner purchased pumps and valves.

4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$1,000.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,000.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A below:

- A. For all Work other than Unit Price Work, a lump sum of: \$ _____

All specific cash allowances are included in the above price in accordance with Paragraph 11.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 7th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General

Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.
 - a. The provisions set forth in Michigan Public Acts of 1980, Act No. 524, shall be adhered to by OWNER and CONTRACTOR for retainage. A copy of the Act is included in Section 00702, Act. No. 524, Michigan P.A. 1980.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the passbook savings rate.

ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
 - A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."

- E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:
 - 1. This Agreement.
 - 2. Performance bond.
 - 3. Payment bond.
 - 4. Other bonds _____.
 - 5. General Conditions.
 - 6. Supplementary Conditions.
 - 7. Specifications as listed in the table of contents of the Project Manual.

8. Drawings as listed on attached sheet index.
9. Addenda (numbers 1, inclusive).
10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid.
 - b. Documentation submitted by Contractor prior to Notice of Award.
11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 *Other Provisions*

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR

City of Flint _____

By: _____

By: _____

Title: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Agent for service of process:

**SUGGESTED FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)**

THIS AGREEMENT is by and between _____ City of Flint _____ (“Owner”) and

_____ (“Contractor”).

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: *Removal and replacement of the four (4) raw sewage pumps at the East Pump Station with associated electrical, mechanical and demolition work.*

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: East Pump Station Pump Replacement.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Hubbell, Roth & Clark, Inc. (Engineer), which is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 360 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 390 days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$1,000.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,000.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A below:

- A. For all Work other than Unit Price Work, a lump sum of: \$ _____

All specific cash allowances are included in the above price in accordance with Paragraph 11.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 7th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.
 - a. The provisions set forth in Michigan Public Acts of 1980, Act No. 524, shall be adhered to by OWNER and CONTRACTOR for retainage. A copy of the Act is included in Section 00702, Act. No. 524, Michigan P.A. 1980.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the passbook savings rate.

ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
 - A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."
 - E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained

from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

- F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
 - 1. This Agreement.
 - 2. Performance bond.
 - 3. Payment bond.
 - 4. Other bonds _____.
 - 5. General Conditions.
 - 6. Supplementary Conditions.
 - 7. Specifications as listed in the table of contents of the Project Manual.
 - 8. Drawings as listed on attached sheet index.

9. Addenda (numbers 1, inclusive).
10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid.
 - b. Documentation submitted by Contractor prior to Notice of Award.
11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 *Other Provisions*

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER:

City of Flint _____

By: _____

Title: _____

Attest: _____

Title: _____

Address for giving notices:

CONTRACTOR

By: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Title: _____

Address for giving notices:

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Agent for service of process:

Notice to Proceed

Date: _____

Project:

Owner:

Owner's Contract No.:

Contract:

Engineer's Project No.

Contractor:

Contractor's Address: *[send Certified Mail, Return Receipt Requested]*

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____ [(or) the number of days to achieve Substantial Completion is _____, and the number of days to achieve readiness for final payment is _____].

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

_____ *[add other requirements]*.

Owner

Given by:

Authorized Signature

Title

Date

Copy to Engineer

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*): SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:
Amount:
Description (*Name and Location*):

BOND

Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

_____ (Seal)
Contractor's Name and Corporate Seal

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.
2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
 - 2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
 - 2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
 - 2.3 Owner has agreed to pay the Balance of the Contract Price to:
 1. Surety in accordance with the terms of the Contract; or
 2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.
3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:
 - 3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
 - 3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
 - 3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
 - 3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
 2. Deny liability in whole or in part and notify Owner citing reasons therefor.
4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
- 5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
- 5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

11. Definitions.

- 11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
- 11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

- 11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – (*Name, Address and Telephone*)

Surety Agency or Broker:

Owner's Representative (*Engineer or other party*):

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. Reserved.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other)*:

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

Application For Payment Change Order Summary

Approved Change Orders			
Number	Additions	Deductions	
			1. ORIGINAL CONTRACT PRICE..... \$ _____
			2. Net change by Change Orders..... \$ _____
			3. Current Contract Price (Line 1 ± 2)..... \$ _____
			4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)..... \$ _____
			5. RETAINAGE:
			a. X _____ Work Completed..... \$ _____
			b. X _____ Stored Material..... \$ _____
			c. Total Retainage (Line 5a + Line 5b)..... \$ _____
			6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)..... \$ _____
			7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... \$ _____
			8. AMOUNT DUE THIS APPLICATION..... \$ _____
			9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)..... \$ _____
TOTALS			
NET CHANGE BY CHANGE ORDERS			

<p>Contractor's Certification</p> <p>The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.</p>	
By:	Date:

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ (Date) _____ (Engineer)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Date) _____ (Owner)

Approved by: _____ (Date) _____ (Funding Agency (if applicable))

Endorsed by the Construction Specifications Institute.

Progress Estimate

Contractor's Application

For (contract):				Application Number:				
Application Period:				Application Date:				
A		B	Work Completed		E	F		G
Item		Scheduled Value	C	D	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (E) B	Balance to Finish (B - F)
Specification Section No.	Description		From Previous Application (C+D)	This Period				
Totals								

Certificate of Substantial Completion

Project:

Owner:

Owner's Contract No.:

Contract:

Engineer's Project No.:

This [tentative] [definitive] Certificate of Substantial Completion applies to:

- All Work under the Contract Documents: The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

- Amended Responsibilities Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer _____ Date _____

Accepted by Contractor _____ Date _____

Accepted by Owner _____ Date _____

STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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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 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 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.
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.
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. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *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.
38. *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.
39. *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.

40. *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.
41. *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.
42. *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.
43. *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.
44. *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.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *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 Subcontractor.
48. *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.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *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.
51. *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 words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated 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 information in the Contract Documents and with the design concept of the 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 that 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; Designation of Authorized Representatives*

- 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.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

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 reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated 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, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 discovers, or has actual knowledge of, 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 (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then 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 had actual knowledge 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, or code, or the instruction of any Supplier (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 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 its consultants, including electronic media editions; or

2. reuse any 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 adaptation by Engineer.
- B. The prohibitions 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. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by 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 known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the 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 officers, directors, members, partners, employees, agents, consultants, or subcontractors 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 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, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall 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 provided by others; 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:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the 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 officers, directors, members, partners, employees, agents, consultants, or subcontractors 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. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- 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 written notice to Contractor: (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, members, 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 4.06.G 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, members, 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 4.06.H 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 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 or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

- 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 and loss payee 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 and loss payee 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.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor’s Insurance*

- A. Contractor shall purchase and maintain such 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, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion 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, members, 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 contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. 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);

5. 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
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. 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, members, 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 a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, 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 that 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 loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown 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, members, 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 a loss payee.
 - C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this 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 loss payee 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 this 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 as loss payees (and the officers, directors, members, 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 loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, 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 as loss payees (and the officers, directors, members, 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, members, 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, members, 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 loss payees, 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.

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; and
 - 3) it has a proven record of performance and availability of responsive service.
- 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 if 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 by 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 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 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; and
 - 4) 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 a Change Order in the case of a substitute and 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 so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable 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 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 a loss payee 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, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, 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, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors 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 specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, 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 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, members, 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. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. 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. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. 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 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).
- F. 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 accepted 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:*
 - 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:
 - a. 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;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 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 Drawings 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 officers, directors, members, partners, employees, agents, consultants, and subcontractors 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, members, 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 officers, directors, members, partners, employees, agents, consultants, or subcontractors 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, members, 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 through 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, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and 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 such work; provided, however, that Contractor may cut or alter others' 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 wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful 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 with respect to 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 relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with 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 with 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. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

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.

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 believes 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.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

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.D.

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 the provisions of any bond require notice to be given to a surety 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), 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 Times 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.
- E. 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 not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
 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 on the Work. 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, as 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, express and courier services, 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.

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 to 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 Paragraphs 12.01.C.2.a and 12.01.C.2.b 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.e, 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 their officers, directors, members, partners, employees, agents, consultants, or subcontractors 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. 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, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's 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 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, Contractor shall, if requested by Engineer, uncover such Work 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 written 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 for 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 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, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and 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. 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 remedies the reasons for such action.
3. Upon a subsequent determination 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 and subject to interest as provided in the Agreement.

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 remove its property and 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, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D 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.6;
 - 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 might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, 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 repeated 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 the 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.

Act No. 524

Public Acts of 1980

Approved by Governor

January 29, 1981

STATE OF MICHIGAN
80th LEGISLATURE
REGULAR SEASON OF 1980

Introduced by Rep. Ryan

ENROLLED HOUSE BILL NO. 5541

AN ACT to provide for the terms of certain construction contracts with certain public agencies; to regulate the payment and retainage of payments on construction contracts with certain public agencies; and to provide for the resolution of certain disputes.

The People of the State of Michigan enact:

Sec. 1. As used in this act:

(a) "Agent" means the person or persons agreed to or selected by the contractor and the public agency pursuant to section 4(2).

(b) "Architect or professional engineer" means an architect or professional engineer licensed under Act No. 299 of the Public Acts of 1980, being sections 339.101 to 339.2601 of the Michigan Compiled Laws, and designated by a public agency in a construction contract to recommend progress payments.

(c) "Construction contract" or "contract" means a written agreement between a contractor and a public agency for the construction, alteration, demolition, or repair of a facility, other than a contract having a dollar value less than \$30,000.00 or a contract that provides for 3 or fewer payments.

(d) "Contract documents" means the construction contract; instructions to bidders; proposal; conditions of the contract; performance bond; labor and material bond; drawings; specifications; all addenda issued before execution of the construction contract and all modifications issued subsequently.

(e) "Contractor" means an individual, sole proprietorship, partnership, corporation, or joint venture, that is a party to a construction contract with a public agency.

(f) "Facility" means a building, utility, road, street, boulevard, parkway, bridge, ditch, drain, levee, dike, sewer, park, playground, or other structure or work that is paid for with public funds or a special assessment.

(g) "Progress payment" means a payment by a public agency to a contractor for work in place under the terms of a construction contract.

(h) "Public agency" means this state, or a county, city township, village, assessment district, or other political subdivision, corporation, commission, agency, or authority created by law. However, public agency does not include the state transportation department, a school district, junior or community college, the Michigan state housing development authority created in Act No. 346 of the Public Acts of 1966, as amended, being sections 125.1401 to 125.1496 of the Michigan Compiled Laws, and a municipal electric utility or agency.

“Assessment district” means the real property within a district area upon which special assessments are levied or imposed or the construction, reconstruction, betterment, replacement, or repair of a facility to be paid for by funds derived from those special assessments imposed or levied on the benefited real property.

(i) “Retainage” or “retained funds” means the amount withheld from a progress payment to a contractor pursuant to Section 3.

Sec. 2. (1) The construction contract shall designate a person representing the contractor who will submit written requests for progress payments, and a person representing the public agency to whom requests for progress payments are to be submitted. The written requests for progress payments shall be submitted to the designated person in a manner and at such time as provided in the construction contract.

(2) The processing of progress payments by the public agency may be deferred by the public agency until work having a prior sequence, as provided in the contract documents, is in place and is approved.

(3) Each progress payment requested, including reasonable interest if requested under subsection (4), shall be paid within 1 of the following time periods, whichever is later:

(a) Thirty days after the architect or professional engineer has certified to the public agency that work is in place in the portion of the facility covered by the applicable request for payment in accordance with the contract documents.

(b) Fifteen days after the public agency has received the funds with which to make the progress payment from a department or agency of the federal or state government, if any funds are to come from either of those sources.

(4) Upon failure of a public agency to make a timely progress payment pursuant to this section, the person designated to submit requests for progress payments may include reasonable interest on amounts past due in the next request for payment.

Sec. 3. (1) To assure proper performance of a construction contract by the contractor, a public agency may retain a portion of each progress payment otherwise due as provided in this section.

(2) The retainage shall be limited to the following:

(a) Not more than 10% of the dollar value of all work in place until work is 50% in place.

(b) After the work is 50% in place, additional retainage shall not be withheld unless the public agency determines that the contractor is not making satisfactory progress, or for other specific cause relating to the contractor’s performance under the contract. If the public agency so determines, the public agency may retain not more than 10% of the dollar value of work more than 50% in place.

(3) The retained funds shall not exceed the pro rata share of the public agency’s matching requirement under the construction contract and shall not be commingled with other funds of the public agency and shall be deposited in an interest bearing account in a regulated financial institution in this state wherein all such retained funds are kept by the public agency which shall account for both retainage and interest on each construction contract separately. A public agency is not required to deposit retained funds in an interest bearing account if the retained funds are to be provided under a state or federal grant and the retained funds have not been paid to the public agency.

(4) Except as provided in Section 4(7) and (8), retainage and interest earned on retainage shall be released to a contractor together with the final progress payment.

(5) At any time after 94% of work under the contract is in place and at the request of the original contractor, the public agency shall release the retainage plus interest to the original contractor only if the original contractor provides to the public agency an irrevocable letter of credit in the amount of the retainage plus interest, issued by a bank authorized to do business in this state, containing terms mutually acceptable to the contractor and the public agency.

Sec 4. (1) The construction contract shall contain an agreement to submit those matters described in subsection (3) to the decision of an agent at the option of the public agency.

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(2) If a dispute regarding a matter described in subsection (3) arises, the contractor and the public agency shall designate an agent who has background, training, and experience in the construction of facilities similar to that which is the subject of the contract, as follows:

(a) In an agreement reached within 10 days after a dispute arises.

(b) If an agreement cannot be reached within 10 days after a dispute arises, the public agency shall designate an agent who has background, training, and experience in the construction of facilities similar to that which is the subject of the contract and who is not an employee of the agency.

(3) The public agency may request dispute resolution by the agent regarding the following:

(a) At any time during the term of the contract, to determine whether there has been a delay for reasons that were within the control of the contractor, and the period of time that delay has been caused, continued, or aggravated by actions of the contractor.

(b) At any time after 94% of work under the contract is in place, whether there has been an unacceptable delay by the contractor in performance of the remaining 6% of work under the contract. The agent shall consider the terms of the contract and the procedures normally followed in the industry and shall determine whether the delay was for failure to follow reasonable and prudent practices in the industry for completion of the project.

(4) This dispute resolution process shall be used only for the purpose of determining the rights of the parties to retained funds and interest earned on retained funds and is not intended to alter, abrogate, or limit any rights with respect to remedies that are available to enforce or compel performance of the terms of the contract by either party.

(5) The agent may request and shall receive all pertinent information from the parties and shall provide an opportunity for an informal meeting to receive comments, documents, and other relevant information in order to resolve the dispute. The agent shall determine the time, place, and procedure for the informal meeting. A written decision and reasons for the decision shall be given to the parties within 14 days after the meeting.

(6) The decision of the agent shall be final and binding upon all parties. Upon application of either party, the decision of the agent may be vacated by order of the circuit court only upon a finding by the court that the decision was procured by fraud, or other illegal means.

(7) If the dispute resolution results in a decision:

(a) That there has been a delay as described in subsection (3)(a), all interest earned on retained funds during the period of delay shall become the property of the public agency.

(b) That there has been unacceptable delay as described in subsection (3)(b), the public agency may contract with a subsequent contractor to complete the remaining 6% of work under the contract, and interest earned on retained funds shall become the property of the public agency. A subsequent contractor under this subdivision shall be paid by the public agency from the following sources until each source is depleted, in the order listed below:

(i) The dollar value of the original contract, less the dollar value of funds already paid to the original contractor and the dollar value of work in place for which the original contractor has not received payment.

(ii) Retainage from the original contractor, or funds made available under a letter of credit provided under section 3(5).

(iii) Interest earned on retainage from the original contractor, or funds made available under a letter of credit provided under section 3(5).

(8) If the public agency contracts with a subsequent contractor as provided in subsection (7)(b), the final progress payment shall be payable to the original contractor the time period specified in section 2(3). The amount of the final progress payment to the original contractor shall not include interest earned on retained funds. The public agency may deduct from the final progress payment all expenses of contracting with the subsequent contractor. This act shall not impair the right of the public agency to bring an action or to otherwise enforce a performance bond to complete work under a construction contract.

Sec. 5. (1) Except as provided in subsection (2), this act shall apply only to a construction contract entered into after the effective date of this act.

(2) For a construction contract entered into before the effective date of this date, the provisions of this act may be implemented by a public agency, through a contract amendment, upon the written request of the contractor, with such consideration as the public agency considers adequate.

Sec. 6. This act shall take effect January 1, 1983.

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SECTION 00800

SUPPLEMENTARY CONDITIONS

Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-2.02 *Copies of Documents*

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following in its place:

- A. Owner shall furnish to Contractor up to 5 printed or hard copies of the Drawings and Project Manual and one set in electronic format (pdf). Additional copies will be furnished upon request at the cost of reproduction.

SC-4.06 *Hazardous Environmental Condition at Site*

SC-4.06 Add the following new paragraphs immediately after Paragraph 4.02.A:

- B. The report identified is by Testing Engineers and Consultants, Titled; Inspection Reports: Building No. 02-06, dated September 27, 1989 consisting of 7 total pages. This report is not part of the Contract Documents, but the "technical data" contained therein upon which Contractor may rely, as expressly identified and established above, are incorporated in the Contract Documents by reference. Contractor is not entitled to rely upon any other information and data known to or identified by Owner or Engineer.

SC-5.04 *Contractor's Liability Insurance*

SC-5.04 Add the following new paragraph immediately after Paragraph 5.04.B:

C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:

- a. State: Statutory
- b. Applicable Federal (e.g., Longshoreman's): Statutory
- c. Employer's Liability: \$500,000

2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

- a. General Aggregate \$2,000,000
- b. Products - Completed Operations Aggregate \$2,000,000
- c. Personal and Advertising Injury \$1,000,000
- d. Each Occurrence (Bodily Injury and Property Damage) \$1,000,000
- e. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverages where applicable.
- f. Excess or Umbrella Liability
 - General Aggregate \$2,000,000
 - Each Occurrence \$2,000,000

3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:

- a. Combined Single Limit of \$1,000,000

4. The Contractual Liability coverage required by Paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
 - a. Bodily Injury:

Each person	\$1,000,000
Each Accident	\$1,000,000
 - b. Property Damage:

Each Accident	\$1,000,000
Annual Aggregate	\$1,000,000
5. *The policy shall include an endorsement which includes the following as additional insured's:*
 - a. The Owner, their counsel, members, Board members, public officials, consultants, agents and employees.
 - b. The "Engineer", Hubbell, Roth & Clark, Inc., Bloomfield Hills, Michigan; Their owners, directors, officers, consultants, agents and employees.

SC-5.06 *Property Insurance*

SC-5.06.A. Delete Paragraph 5.06.A in its entirety and insert the following in its place:

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. Contractor shall be responsible for any deductible or self-insured retention. This insurance shall:
 1. include the interests of Owner, Contractor, Subcontractors, Engineer and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, 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 that caused by flood), and such other perils or causes of

loss as may be specifically required by these 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;
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 loss payee to whom a certificate of insurance has been issued; and
8. comply with the requirements of Paragraph 5.06.C of the General Conditions.

SC-6.17 *Shop Drawings and Samples*

SC-6.17 Add the following new paragraphs immediately after Paragraph 6.17.E:

- F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples, or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.
- G. In the event that Contractor requests a change of a previously approved item, Contractor shall reimburse Owner for Engineer's charges for its review time unless the need for such change is beyond the control of Contractor.

SC-9.03 *Project Representative*

SC-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

- B. The Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the

supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be through or with the full knowledge and approval of Contractor. The RPR shall:

1. *Schedules*: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.
2. *Conferences and Meetings*: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.
3. *Liaison*:
 - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
4. *Interpretation of Contract Documents*: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
5. *Shop Drawings and Samples*:
 - a. Record date of receipt of Samples and approved Shop Drawings.
 - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
6. *Modifications*: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

7. *Review of Work and Rejection of Defective Work:*

- a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
- b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

8. *Inspections, Tests, and System Startups:*

- a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
- b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

9. *Records:*

- a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
- b. Maintain records for use in preparing Project documentation.

10. *Reports:*

- a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.

- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
- c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.

11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

13. *Completion:*

- a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
- b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.

C. The RPR shall not:

- 1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including “or-equal” items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

SC-12.01 *Change of Contract Price*

SC-12.01.C *Contractor's Fee.* Delete the semicolon at the end of GC 12.01.C.2.c, and add the following language:

, provided, however, that on any subcontracted work the total maximum fee to be paid by Owner under this subparagraph shall be no greater than 27 percent of the costs incurred by the Subcontractor who actually performs the work;

SC-16.01 *Methods and Procedure*

SC-16.01 Delete Paragraph 16.01.C in its entirety and insert the following in its place:

- 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 demand arbitration of the Claim, pursuant to Paragraph SC-16.02; or

2. agrees with the other party to submit the Claim to another dispute resolution process.

SC-16.02 Add the following new paragraph immediately after Paragraph 16.01.

SC-16.02 *Arbitration*

- A. All Claims or counterclaims, disputes, or other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Paragraph 14.09) including but not limited to those not resolved under the provisions of Paragraphs SC-16.01A and 16.01.B will be decided by arbitration in accordance with the rules of the American Arbitration Association, subject to the conditions and limitations of this Paragraph SC-16.02. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30 day period specified in Paragraph SC-16.01.C, and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.
- C. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
 1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and
 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.

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- D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include: (i) a concise breakdown of the award; (ii) a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.
- E. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Controlling Law relating to vacating or modifying an arbitral award.
- F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

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Received for Contractor by:	Date
Received by Funding Agency (if applicable):	Date:

Change Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project:	Owner:	Owner's Contract No.:
Contract:	Date of Contract:	
Contractor:	Engineer's Project No.:	

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:

CHANGE IN CONTRACT TIMES:

Original Contract Price:
\$ _____

Original Contract Times: Working Calendar days
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____
\$ _____

[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____:
Substantial completion (days): _____
Ready for final payment (days): _____

Contract Price prior to this Change Order:
\$ _____

Contract Times prior to this Change Order:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

[Increase] [Decrease] of this Change Order:
\$ _____

[Increase] [Decrease] of this Change Order:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

Contract Price incorporating this Change
\$ _____

Contract Times with all approved Change Orders:
Substantial completion (days or date): _____
Ready for final payment (days or date): _____

RECOMMENDED:
By: _____
Engineer (Authorized Signature)

ACCEPTED:
By: _____
Owner (Authorized Signature)

ACCEPTED:
By: _____
Contractor (Authorized Signature)

Date: _____ Date: _____ Date: _____
Approved by Funding Agency (if applicable): _____
Date: _____

Change Order Instructions

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Price or Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Owner or Contractor for approval, depending on whether the Change Order is a true order to the Contractor or the formalization of a negotiated agreement for a previously performed change. After approval by one contracting party, all copies should be sent to the other party for approval. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

SECTION 01000

GENERAL SPECIFICATIONS

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1.1 WORKING SPACE

- A. The contractor shall interfere as little as possible with traffic and in all cases shall confine the work operations to the minimum space possible.
- B. Stockpiling of construction material and equipment will be permitted as necessary, but in no case shall traveled roadways, driveways, or entrances be unduly obstructed.
- C. Should storage areas be desired on private property, the Contractor may obtain such space on privately owned property at his own expense, by agreement with the property owner thereof. The Contractor shall provide the Owner with a copy of the written permission from the private property owner prior to occupying the property.

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1.2 WORK WITHIN PUBLIC STREETS OR LAND

- A. Where the centerline of the proposed improvement is within the public street or land, the contractor shall confine his operations to within the public street or land unless easements have been acquired (See "Easements"). It shall be the contractor's responsibility to use such methods and/or materials, including sheeting, so as to prevent any portion of the excavation from encroaching on private property. This shall not preclude the contractor from obtaining the right to encroach on private land in accord with the foregoing article "Working Space." All signing and barricading shall be done in accordance with current edition of the Michigan Manual of Uniform Traffic Control Devices (M.M.U.T.C.D.) as issued by the Michigan Department of Transportation.

1.3 EASEMENTS

- A. In certain instances the owner may have acquired certain permanent easements and construction easements for the contractor's use in constructing the work. The contractor shall confine work operations to these easements except as noted under the foregoing article "Working Space."

1.4 LOCATING WORK

- A. The contractor shall accurately locate the work from reference points established by the Owner along the surface of the ground and the line of work. For sewers, "cut sheets" will be furnished by the Owner. Reference points shall be protected and preserved by the contractor.

1.5 SOIL CONDITIONS

- A. The contractor, as such and as bidder, shall make his own determination as to soil and/or rock conditions and shall complete the work in whatever material and under whatever conditions may be encountered or created, without extra cost to the owner. This shall apply whether or not borings are shown on the drawings.
- B. The owner does not guarantee that the ground encountered during construction will conform with any boring information furnished herein.
- C. The Owner and Engineer may have been involved in the design, construction observation, and/or construction of other underground projects in the area of the proposed construction. The observation field reports, soil reports, and any soil information connected with these projects are available for review by the prospective bidders.

1.6 SURVEY MONUMENTS

- A. Monuments or other recognized property boundary markers at street intersections, section corners, acreage or lot corners, and right-of-way lines shall be preserved and protected. Where such monuments or markers must be removed during construction, the Owner shall be notified and the Contractor shall make all necessary arrangements with a land surveyor registered in the State of Michigan to have these monuments or markers properly witnessed prior to disturbance or removal and later reset by the registered land surveyor at no cost to the Owner.

1.7 TRENCH BACKFILL

- A. The Contractor, as such and as bidder, shall carefully review the contract drawings and specifications and shall determine the extent of the "Special Backfill" requirements. The cost of providing for and meeting the requirements for Special Backfill shall be included in the unit price of the work as bid at no extra cost to the Owner.
- B. Special backfill shall be used at all locations and of the type called for on the drawings, and at other locations specified herein whether called for on the drawings or not.
- C. The type and method of backfilling is dependent on its locations and function and shall conform with the following requirements. The owner will supply field observation on the special backfill compaction requirements.
- D. Backfilling of trenches in the shoulder area and under private gravel drives shall be carried to within 6 inches of the existing surface as specified under Trench A or Trench B as required. The shoulder shall be defined herein as the area within ten feet of the pavement edge, or the width of the existing graveled shoulder, whichever is the lesser. The remaining depth shall be backfilled with 6 inches of compacted 21AA aggregate. Backfilling of trenches crossing gravel roads or streets shall be carried to within 8 inches of the existing surface and the remaining depth shall be backfilled with 8 inches of compacted 21AA limestone aggregate. Compaction shall be performed by a pneumatic-tired roller or a vibratory compactor until the compaction requirements as required for Trench A or Trench B and as detailed in the following paragraphs are met.
- E. The requirements as specified herein are in addition to the conditions provided for under permit granted by the Board of County Road Commissioners of the County or the Michigan Department of Transportation.
- F. Trench A
 - 1. All trenches under graveled, slag or hard surfaced roads, pavements, hard surfaced parking lots and driveways, sidewalks, curbs and where the trench edge is within 3 feet of a pavement shall be backfilled with bank run sand meeting the requirements of Granular Material, MDOT Class II. The material shall be placed by the Controlled Density Method or other effective means having the approval of the Engineer and is to be compacted to 95 percent of maximum unit weight as determined by ASTM D-1557 Modified Proctor. Trenches under pavement to be constructed in the near future, as noted or shown on the drawings, shall be backfilled with MDOT Class II Granular Material, meeting the requirements of Table 902-3 Grading Requirements for Granular Materials 1996 in the MDOT 1996 Standard Specifications for Construction.
- G. Trench B
 - 1. Trench B shall be used where called for on the drawings and where the trench crosses slag or gravel drives, shoulders, or parking lots whether called for on the drawings or not.
- H. All trenches shall be backfilled with granular material, MDOT Class II to a point 12 inches above the pipe for diameters less than 24 inches and up to the spring line with materials meeting the requirements of the 1996 MDOT Table 902-2, Class 34R for diameters 24 inches or larger. This portion of the backfill is to be placed in layers not exceeding 6 inches in depth,

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1.10 ROAD DETOURS

- A. The contractor shall provide and maintain all temporary roadways as required for work operations or as required under "Road Permits" or otherwise specified or shown on the drawings at no extra cost to the Owner.

1.11 PROTECTION OF THE PUBLIC

- A. The contractor shall provide sufficient barricades, guard railings, fencing, advance construction signing, coverings or other means to protect the public from injury due to the work operations, including completed or uncompleted work, at all times until acceptance of the work by the Owner at no extra cost to the Owner.

1.12 BARRICADES AND PROTECTION

- A. The contractor shall provide and maintain in good repair, all barricades, guard railings, etc., as required for the protection of the workers, the Owner's employees and employees of Owner's agent in strict compliance with state and local requirements.
- B. At dangerous points throughout the work, the contractor shall provide and maintain guard rails, colored lights, and flags. All possible precautions shall be taken to protect the workers from injury at no extra cost to the Owner.

1.13 MAINTENANCE OF TRAFFIC

- A. During the progress of the work, the contractor shall accommodate both vehicular (septage trucks) and pedestrian traffic as provided in these specifications and as indicated on the drawings. In the absence of specific requirements, traffic shall be maintained in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices. Access to fire hydrants and water valves shall always be maintained. The contractor's truck and equipment operations on public streets shall be governed by County regulations, all local traffic ordinances, and regulations of the Fire and Police Department.
- B. Small street openings necessary for manholes, alignment holes, sewer connections, etc. will be permitted. Such holes shall not be open longer than necessary and shall be protected and any traffic detouring necessary shall be done to the satisfaction of the Owner. Wherever possible, small openings shall be covered with steel plates at pavement level secured in place during periods that work is not being performed at no extra cost to the Owner.
- C. Where streets are partially obstructed, the contractor shall place and maintain temporary driveways, ramps, bridges and crossings which in the opinion of the Owner are necessary to accommodate the public at no extra cost to the Owner. In the event of the contractor's failure to comply with the foregoing provisions, the Owner may, with or without notice, cause the same to be done and deduct the cost of such work from any monies due or to become due the contractor under this contract. However, the performance of such work by the Owner, or at his insistence, shall serve in no way to release the contractor from his liability for the safety of the traveling public.
- D. The contractor shall provide flagmen, warning lights, signs, fencing and barricades necessary to direct and protect vehicular and pedestrian traffic at no extra cost to the Owner.

- E. The contractor shall inform the local fire department in advance of work operations of street obstructions and detours, so that the fire department can set up plans for servicing the area in case of an emergency. The governing police department and the owner shall be notified at least one week prior to obstructing any street.

1.14 SODDING

- A. Where called for in the specifications, or on the drawings, the contractor shall furnish all labor and material and place Grade A sod to the finished grade shown or to conform with existing grades and provide a smooth and uniform surface to meet existing ground surface.
- B. Sod shall be densely rooted blue grass or other approved perennial grasses, free from noxious weeds and reasonably free from other weeds. Sod shall be not less than 2 inches thick, cut in strips not less than 10 inches wide by 18 inches long. The type of grass shall match the adjacent lawn.
- C. The area to be sodded shall be made smooth and shall be covered with not less than 2 inches of approved top soil screened to remove all debris uniformly spread over the scarified ground surface.
- D. Sod shall be moist and shall be laid in a moist earth bed. Pegs shall be used where required to hold the sod in place.
- E. Sod shall not be placed during a drought nor during the period from July 1 to August 15.
- F. Sod to be kept moist by the contractor for fourteen (14) days to insure growth.
- G. The cost of providing for and meeting the sodding requirements shall be included in the bid price or at no extra cost to the owner.

1.15 FINAL CLEANUP, GRADING, TOP SOIL AND SEEDING

- A. Upon completion of construction and before final payment is made, the contractor shall restore the working area to as clean a condition as existed before construction operations started.
- B. The Contractor shall go over the entire area and regrade and fill any areas that may have settled, including fills made from excess excavated materials and all other areas that may have been disturbed during construction operations.
- C. Where established lawn or grass areas have been disturbed by the contractor's operations and in the location where the excavated soils have been stockpiled and graded, the Contractor shall provide, not less than the minimum depth of approved top soil and shall grade, seed, fertilize and mulch the areas as required by the Owner and per the following Table:

<u>Location</u>	<u>Seed Mixture</u>	<u>Amount of Seed</u>	<u>Fertilizer</u>	<u>Top Soil (min.)</u>
Lawn	MDOT Class A	100 lb/Acre	400 lb/Acre	3"

- D. Fertilizing and sowing shall be done in an approved manner, and the seed shall be covered by light raking or dragging, and then rolled with a light roller. Fertilizer shall be 10-6-4 commercial type.

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- E. Seeding areas are to be kept moist for fourteen (14) days to insure growth. The cost of providing for and meeting these requirements shall be incidental to the project unless otherwise provided.

1.16 EXISTING STRUCTURES AND UTILITIES

- A. Certain underground structures and utilities have been shown as an aid to the contractor, but the owner does not guarantee their location or that other underground structures or utilities may not be encountered.

1.17 PUBLIC AND PRIVATE UTILITIES

A. Utilities

1. The Contractor must provide adequate protection for water, sewer, gas, telephone, TV cable, or any other public or private utilities encountered. The Contractor will be held responsible for any damages to such utilities arising from his operation.
2. When it is apparent that construction operations may endanger the foundations of any utility conduit, or the support of any structure, the contractor shall notify the utility owner of this possibility and shall take steps as may be required to provide temporary bracing or support of conduit or structures.
3. In all cases where permits or inspection fees are required by utilities in connection with changes to or temporary support of their conduits, the contractor shall secure such permits and pay all inspection fees.
4. Where it is necessary in order to carry out the work, that a pole, electric or telephone, be moved to a new location, or moved and replaced after construction, the contractor shall arrange for the moving of such pole or poles, and the lines thereof, and shall pay any charges therefor.
5. Where it is the policy of any utility owner to make repairs to damaged conduit or other structures, the contractor shall cooperate to the fullest extent with the utility and shall see that construction operations interfere as little as possible with the utilities operations. The contractor shall pay any charges for these repairs.

B. Existing Sewer Facilities

1. Existing sewers or drains may be encountered along the line of work. In all such cases, the contractor shall perform the work in such a manner that sewer service will not be interrupted. and shall make all temporary provisions to maintain sewer service as incidental to the work as bid.
2. Unless otherwise indicated on the drawings, the contractor shall replace any disturbed sewer or drain, or relay same at a new grade and/or location to be established by the Owner such that sufficient clearance for the sewer will be provided.
3. The contractor will receive no extra compensation for replacement or relocation of sewers or drains encountered, or for relaying at a new grade where called for by the drawings unless a separate bid item has been included in the proposal.

C. Existing Water Facilities

1. Where existing water mains are encountered in the work, they shall be maintained in operation. If necessary, they shall be re-laid using ductile iron pipe of the type and with joints as specified within the current water main specifications of the governmental agency controlling said utility.

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2. The contractor will receive no extra compensation for the relaying and/or lowering or raising of water mains or water service leads, except where a separate bid item has been included in the proposal.

D. Existing Gas Facilities

1. Where existing gas mains and services are encountered, the contractor shall arrange with the gas company for any necessary relaying, and shall pay for the cost of such work unless otherwise provided.

1.18 PUMPING, BAILING AND DRAINING

- A. The contractor shall provide and maintain adequate pumping and drainage facilities for removal and disposal of water from trenches or other excavations.
- B. Where the work is in ground containing an excessive amount of water, the contractor shall provide, install, maintain, and operate suitable deep wells or well points, connecting manifolds and reliable pumping equipment to operate same to insure proper construction of the work. Alternate dewatering methods may be implemented if approved by the Owner.
- C. Drainage or discharge lines shall be connected to adjacent public storm water drains or extended to nearby water courses wherever possible. In any event, all pumping and drainage shall be done without damage to any highway or other property, public or private, and without interference with the rights of the public or private property owners and in accordance with the MDEQ and local requirements for soil erosion and sedimentation control.
- D. The contractor shall receive no extra compensation for providing, maintaining or operating any dewatering or drainage facilities.

1.19 SHEETING, SHORING AND BRACING

- A. Where necessary in order to construct the work called for by the contract, to insure the safety of the workers, or to protect other things of value, the contractor shall use and, if necessary, leave in place, such sheeting, shoring, and bracing as is needed to carry out the work or to adequately insure the stability of such work, or to insure the safety of the workers and/or to protect adjoining things of value. The contractor will receive no extra compensation for sheeting, shoring, or bracing, whether removed or left in place.

1.20 DISPOSAL OF EXCAVATED MATERIAL

- A. All excavated material shall remain on site. The Owner will designate an area where materials are to be disposed of. Contractor shall grade materials to blend in with the existing grades and seed final grade in accordance with specifications.

1.21 DISPOSAL OF WASTE MATERIALS

- A. Unless otherwise directed by the owner, all waste materials and debris, including pavement, resulting from the construction work shall be removed from the premises at no extra cost to the owner.

- B. The contractor shall, at all times, keep the premises free from accumulations of waste material or debris caused by his employees or work, and shall remove same when necessary or required by the owner.

1.22 TUNNELING

- A. The contractor shall construct the work in tunnel where shown on the drawings or required by permits, and at other locations may, at his option, construct the work in tunnel where it crosses existing roadways, public and private utilities, walks or other structures. Tunnel work shall be constructed in accordance with the drawings and specifications, "Road Permit" requirements, or as otherwise noted on the drawings at no extra cost to the owner.

1.23 COMPRESSED AIR

- A. The contractor shall provide compressed air as required for the work at no extra cost to the owner.

1.24 INSPECTION OF PREMISES

- A. The bidder shall visit the premises and thoroughly acquaint himself with the conditions to be encountered in the installation of the work shown on the drawings and described in the specifications, as no extras will be allowed to cover work which he has not included in his tender due to his failure to inspect the premises.

1.25 SCHEDULE OF OPERATIONS

- A. The contractor shall submit, for the owner's review and approval, a schedule of his proposed operations. The contractor's schedule shall be complete and shall show in detail the manner in which he proposed to complete the work under this contract.

1.26 ORDINANCES AND CODES

- A. All work shall be executed and inspected in accordance with all local and state rules and regulations and all established codes applicable thereto and shall conform in all respects to the requirements of all authorities having jurisdiction thereover.
- B. Should any change in the contract plans and/or specifications be required to comply with local regulations, the contractor shall notify the owner in accordance with Specification 00120, Instructions to Bidders. After entering into contract, the contractor will be held to complete all work necessary to meet the local requirements without extra expense to the owner.
- C. Where the work required by the drawings and specifications is above the standard required, it shall be done as shown or specified.

1.27 TRAFFIC CONTROL

- A. During construction the contractor shall control traffic in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices issued by the Michigan Department of Transportation.

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1.28 DUST CONTROL

- A. The contractor shall provide adequate measures to control dust caused by his operation. The methods employed, and frequency of application shall be as approved and directed by the Owner.

1.29 INCONVENIENCES

- A. The contractor shall at all times be aware of inconveniences caused to the abutting property owners and general public. Where undue inconveniences are not remedied by the contractor, the municipality, upon four hours notice, reserves the right to perform the necessary work and to have the owner deduct the cost thereof from the money due or to become due to the contractor.

END OF SECTION

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SECTION 01005

ADMINISTRATIVE PROVISIONS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- 1.02 Related Sections
- 1.03 Summary of work.
- 1.04 Work sequence.
- 1.05 Alternatives.
- 1.06 Coordination
- 1.07 Cleanliness of the work and streets.
- 1.08 Regulatory requirements.
- 1.09 Alterations of existing water mains and services.
- 1.10 Satisfaction of Claims
- 1.11 Fire protection.
- 1.12 Chemicals.
- 1.13 Historical specimens.
- 1.14 Abbreviations.
- 1.15 References.

1.2 RELATED REQUIREMENTS

- A. Instructions to Bidders.
- B. Agreement.
- C. Standard General Conditions of the Construction Contract.
- D. Supplementary Conditions.
- E. Section 01000 - General Specifications.
- F. Section 01310 - Progress Schedules.

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G. Section 01700 - Contract Closeout.

H. Section 02030 - Sequence of Construction and Special Project Requirements.

1.3 SUMMARY OF WORK

A. Improvements include construction of a new solids loading building.

1.4 WORK SEQUENCE

A. The Contractor shall arrange his work so that at no time will it cause unnecessary interruption to the operation of existing facilities. To this end, the Contractor shall prepare and submit to the Engineer for approval a complete detailed working schedule setting forth the sequencing of operations he proposes to follow.

1.5 ALTERNATIVES

A. Contract Drawings indicate the extent and general arrangement of the work. If any departures from the Contract Drawings are deemed necessary by the Contractor to accommodate the material and equipment he proposes to furnish, details of such departures and reasons thereof shall be submitted as soon as practicable to the Engineer for approval.

B. The Contractor shall refer to Section 01300, SUBMITTALS, for complete requirements regarding Alternates, Substitutions.

1.6 COORDINATION

A. Contract Documents:

1. It is not the intent nor shall it be so construed that work included in any one Section of the Specifications must be performed by a particular trade or by subcontract. The work to be performed by a particular trade is not necessarily restricted to that of any one Section.
2. Any item mentioned under any heading must be supplied even though it is not called for again under the heading for the respective work.

B. Existing Facilities:

1. All existing facilities and operations shall be uninterrupted by the Contractor's performances unless otherwise allowed in the Contract Documents.
2. All proposed interruptions or tie-ins to existing facilities or utilities or other activities affecting the operations shall be scheduled.
3. The Engineer shall approve the scheduling of all such activities.

1.7 CLEANLINESS OF THE WORK AND STREETS

A. The work itself, and all public and private property used therewith, shall be kept in a neat orderly condition at all times. Excess excavation, waste and rejected materials, rubbish, and debris shall not be allowed to accumulate. The newly constructed work shall be cleared of all temporary construction of facilities when such are entirely free of all debris and the premises left in a condition that will not be susceptible to soil erosion and that will not create a situation problem.

- B. Trucks hauling loose materials to or from the site shall be tightly covered and their loads shall be trimmed to prevent spillage on the public streets or roads. This requirement likewise applies to suppliers making deliveries to the site. The Contractor shall promptly clean streets or roads dirtied by any cause arising from his operations or that of his Subcontractors or his suppliers. Should the Contractor fail to maintain proper street or road cleanliness, the Owner will take necessary steps to perform such cleaning and will charge the Contractor for all cost thereof.
- C. The Contractor shall control dust from his operations to meet the requirements of the jurisdictional authorities. Control measures shall include but are not limited to sprinkling, applying calcium chloride, wheel washing, street sweeping, street washing, load covering, and the like.

1.8 REGULATORY REQUIREMENTS

- A. The requirements of this Article shall be made a part of any subcontracts entered into.
- B. Refer to Standard General Conditions of the Construction Contract.
- C. The Contractor shall apply for inspection of the work to any and all local, state, public and/or private utilities or national authorities having jurisdiction and deliver to the Engineer all required certificates of approval of such authorities.
- D. All costs including fees, inspection charges, temporary improvements, and the restoration of existing improvements (e.g. sidewalks, pavements, soil erosion and sedimentation control, landscaping, etc.) to the satisfaction of the authority having jurisdiction in each case shall be included in the Contract Price.

1.9 ALTERATIONS OF EXISTING WATER MAINS OR SERVICES

- A. The cutting, reconstructing, or relocating of any existing water mains or water services connections necessitated to permit construction of the work under this Contract shall be performed by the contractor, and the cost of all work and material including inspection and permits shall be included in the Contract bid price.
- B. The Contractor shall not operate any valves or switches. All valves and switches shall be operated by the Owner's personnel only.
- C. If the Contractor finds it necessary to shut down any existing water mains in services, he shall contact the Engineer and they will then negotiate the best time for shut down mains. A minimum of three (3) days notice must be given.
- D. The Contractor shall receive no extra payment on account of the times when such shut offs and alterations have to be made or on account of delays incurred in conjunction with such alterations.

1.10 SATISFACTION OF CLAIMS

- A. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled, or sufficient funds to cover such claims have

been placed in escrow, or that an adequate bond to cover such claims has been obtained to secure payment therewith interest.

- B. In the event that any Contractor has trespassed upon private property in the prosecution of the work of this contract, the Owner may withhold payment for the value of such work in or on the property, but in any case no less than a sum of \$500 for each property trespassed until the Contractor has secured a release from the property owner upon whose property the trespass was committed.

1.11 FIRE PROTECTION

- A. The Contractor shall take all necessary precautions to prevent fires and shall provide adequate equipment for extinguishing fires. No burning of trash or debris will be permitted.
- B. When fire or explosion hazards are created in the vicinity of the work as a result of the locations of fuel tanks or similar hazardous utilities or devices, the Contractor shall immediately alert the local Fire Marshal, the Engineer, and the Owner. The Contractor shall exercise all safety precautions and shall comply with all instructions issued by the Fire Marshal and shall cooperate with the Owner of the tank or device to prevent the occurrence of fire or explosion.

1.12 CHEMICALS

- A. All chemicals used during construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of the EPA, USDA, or both. Use of all such chemicals and disposal of residues shall be in strict conformance with all applicable law, rules, and regulations.

1.13 HISTORICAL SPECIMENS

- A. Any and all specimens of historical or scientific value or interest encountered in the Work shall be preserved and delivered to the Engineer.

1.14 ABBREVIATIONS

- A. The following listed letters or abbreviations wherever they appear in the Contract shall mean and be interpreted as indicated below:
 - A.A.S.H.O. - American Association of State Highway Officials
 - A.C.I. - American Concrete Institute
 - A.G.M.A. - American Gear Manufacturers Association
 - A.H.D.G.A. - American Hot Dip Galvanizers Association
 - A.I.A. - American Institute of Architects
 - A.I.S.C. - American Institute of Steel Construction
 - A.I.S.I. - American Iron and Steel Institute
 - A.M.C.A. - Air Moving and Conditioning Association
 - A.N.S.I. - American National Standards Institute
 - A.S.C.E. - American Society of Civil Engineers
 - A.S.H.R.A.E. - American Society of Heating, Refrigeration and Air Conditioning Engineers.
 - A.S.M.E. - American Society of Mechanical Engineers
 - A.S.T.M. - American Society for Testing and Materials

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A.W.G.	- American Wire Gauge
A.W.S.	- American Welding Society
A.W.W.A.	- American Water Works Association
D.P.W.	- Department of Public Works
Fed. Spec.	- Federal Specification, Federal (of F.S.) Supply Service, General Services Administration, U.S. Government
I.E.E.E.	- Institute of Electrical and Electronics Engineers
I.P.C.E.A.	- Insulated Power Cable Engineers Association
M.D.O.T.	- Michigan Department of Transportation
MI.O.S.H.A.	- Michigan Occupational Safety & Health Act
N.B.S.	- National Bureau of Standards
N.C.P.I.	- National Clay Pipe Institute
N.E.C.	- National Electrical Code
N.E.M.A.	- National Electrical Manufacturers Association
N.F.P.A.	- National Fire Protection Association
O.S.H.A.	- Occupational Safety & Health Administration
S.D.I.	- Steel Deck Institute
S.J.I.	- Steel Joist Institute
S.S.P.C.	- Steel Structures Painting Council
U.L.	- Underwriters Laboratories

1.15 REFERENCES

A. Specifications by Reference:

1. Where reference is made in the specifications to specifications or standards of any technical society, association, governmental agency, etc., it is understood and agreed that such specifications or standards are as much a part of the specifications as though fully repeated therein.

B. Materials by Reference:

1. A material included in more than one section of the specifications will be specified in detail in only one of the Sections.
2. In other sections, the material is specified by reference to the section containing the specifications for the same material, and such specifications shall be considered as much a part of the other sections as if they were therein repeated in full.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Related Sections
- B. Coordination.
- C. Pre-Bid Meeting.
- D. Preconstruction Meeting.
- E. Progress Meetings.
- F. Preinstallation Meetings.

1.2 RELATED SECTIONS

- A. Instructions to Bidders.
- B. Standard General Conditions of the Construction Contract
- C. Supplementary Conditions.
- D. Section 01005 - Administration Provisions.
- E. Section 01300 - Submittals.
- F. Section 01310 - Progress Schedules.

1.3 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

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- D. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 PRE-BID MEETING

- A. Engineer will schedule a meeting as noted in the Information for Bidders.
- B. Attendance Recommended: Owner, Engineer, and Bidders.
- C. Attendance Requested: Regulatory Agencies, Utility Representatives.
- D. Agenda:
 - 1. Review of Permits Required.
 - 2. Review of Special Project Requirements.
 - 3. Regulatory requirements affecting the project.
 - 4. Review of Contract Documents.
 - 5. Critical work sequencing.
 - 6. Use of premises by Owner and Contractors
 - 7. Construction facilities and controls provided by Owner.
 - 8. Temporary utilities provided by Contractor and by Owner.
 - 9. Survey and layout.
 - 10. Security and housekeeping procedures.
 - 11. Responsibility for testing.
- E. Record minutes and distribute copies within two days after meeting to participants, with one copy to all participants, and those affected by decisions made.

1.5 PRECONSTRUCTION MEETING

- A. Engineer will schedule a meeting prior to issuing Notice of Award.
- B. Attendance Required: Owner, Engineer, major subcontractors and Contractor.
- C. Agenda:
 - 1. Review of Execution of Owner-Contractor Agreement.
 - 2. Review of Regulatory requirements affecting the project.
 - 3. Distribution of Control Documents.
 - 4. Submission of progress construction schedule.
 - 5. Designation of personnel representing the parties in Contract, and the Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Critical work sequencing.
 - 8. Use of premises by Owner and Contractor
 - 9. Construction facilities and controls provided by Owner.
 - 10. Mobilization
 - 11. Project Coordination

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12. Temporary utilities provided by Contractor and Owner.
 13. Survey and layout.
 14. Security and housekeeping procedures.
 15. Procedures for testing.
 16. Procedures for maintaining record documents.
- D. Record minutes and distribute copies within two days after meeting to participants, with one copy to all participants, and those affected by decisions made.

1.6 PROGRESS MEETINGS

- A. The Engineer will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems which impede planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of on site and off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.

1.7 PREINSTALLATION MEETING

- A. When required in individual specification sections, convene a preinstallation meeting at work site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of installation, preparation and installation procedures.
 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Engineer, Owner, participants, and those affected by decisions made.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01045
CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01600 - Material and Equipment: Product options and substitutions.
- C. Individual Product Specification Sections:
1. Cutting and patching incidental to work of the section.
 2. Advance notification to other sections of openings required in work of those sections.
 3. Limitations on cutting structural members.

1.3 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- B. Include in request:
1. Identification of Project.
 2. Location and description of affected Work.
 3. Necessity for cutting or alteration.
 4. Description of proposed Work and Products to be used.
 5. Alternatives to cutting and patching.
 6. Effect on work of Owner or separate Contractor.
 7. Written permission of affected separate Contractor.
 8. Date and time work will be executed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.

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- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.3 CUTTING

- A. Execute cutting and fitting, including excavation and fill, to complete the Work.
- B. Uncover work to install improperly sequenced work.
- C. Remove and replace defective or non-conforming work.
- D. Remove samples of installed work for testing when requested.
- E. Provide openings in the Work for penetration of mechanical and electrical work.
- F. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

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- D. Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces as specified.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with material as specified herein, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

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SECTION 01210

ALLOWANCES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for processing Allowances. Selected materials and equipment, and in some cases their installation, are shown and specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.

1.2 DEFINITIONS

- A. Lump Sum Allowance: A monetary sum that includes, as part of the Contract Price, the associated costs and requirements to complete the specified Allowance.

1.3 SUBMITTALS

- A. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the Site for use in fulfillment of each Allowance.

1.4 OWNER'S INSTRUCTIONS

- A. At the earliest feasible date after Contract Award, advise ENGINEER of the date when the final selection and purchase of each product or system described by an Allowance must be completed in order to avoid delay in performance of the work.
- B. When requested by ENGINEER, obtain Bids for each Allowance for use in making final selections; include recommendations that are relevant to performance of the Work.
- C. Purchase products and systems as selected by ENGINEER from the designated supplier.
- D. Use Allowances only as directed for OWNER's purposes, and only by Change Orders which designate amounts to be charged to the Allowance.
- E. If the actual price for the specified Allowance is more or less than the stated Allowance, the Contract Price shall be adjusted accordingly by Change Order. The adjustment in Contract Price shall be made in accordance with Paragraph 11.02 of the General Conditions.
- F. CONTRACTOR'S overhead, profit and any other costs for administering these allowances shall be included in the Lump Sum bid price, with the exception of the railing modification allowance in which case normal allowed subcontractor markup and overhead costs will apply. No separate markup for these costs will be allowed for these Allowances.

- G. At Project closeout, any amounts remaining in Allowances will be credited to OWNER by Change Order.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect products covered by an Allowance promptly upon delivery for damages or defects.

3.2 PREPARATION

- A. Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related construction activities.

SCHEDULE OF ALLOWANCES

- 1. Lump Sum Allowance for SCADA programming in the amount of \$35,000.00. This amount will be increased or decreased based on actual costs. The SCADA programming will be done on the City's existing control system. The City will choose a SCADA programmer and inform the CONTRACTOR. The CONTRACTOR will pay for this work out of the Allowance and coordinate it.

END OF SECTION

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SECTION 01215

INSTALLATION OF OWNER FURNISHED EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for installation of Owner furnished equipment. Selected materials and equipment are identified on the DRAWINGS and are listed herein that will be procured by the Owner directly. The CONTRACTOR is responsible for receiving, unloading, inspecting, storing, installing and coordination of startup of the equipment as detailed herein.

1.2 OWNER'S INSTRUCTIONS

- A. At the earliest feasible date after Contract Award, advise ENGINEER of the date when the final delivery of each product or system described herein must be completed in order to avoid delay in performance of the work.
- B. Review Shop Drawings for equipment when available and coordinate final connection locations, installation requirements and other details from the Shop Drawings which may be slightly different than shown on the Contract DRAWINGS. Advise ENGINEER immediately if Shop Drawings indicate that a change in the Contract DRAWINGS is required in order to install the equipment in accordance with the manufacturer's requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 RECEIVING

- A. Coordinate receiving of equipment with the supplier and the OWNER. When the equipment arrives on site, unload the equipment and properly store.

3.2 INSPECTION

- A. Inspect products as they are received on site for conformance to bill of materials/DRAWINGS and the presence of any damages. Advise ENGINEER of any differences or damages.

3.3 INSTALLATION

- A. Install each piece of equipment in accordance with the manufacturer's recommendation and the general installation requirements of the technical specifications for similar materials.

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- B. Coordinate equipment startup and installation check with manufacturer's representative for each piece of equipment. Provide overall coordination of startup process until equipment is operating as intended, including SCADA controls for the equipment.

SCHEDULE OF EQUIPMENT (see Appendix for details)

1. Four (4) dry pit submersible pumps with control panels and other pump appurtenances.
2. Four (4) 24-inch pump discharge gate valves.
3. Four (4) 30-inch pump suction gate valves.
4. Four (4) 24-inch pump discharge check valves.

END OF SECTION

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SCHEDULE FOR SUBMISSION

- A. Submittal procedures
- B. Submittal Review
- C. Proposed Products list
- D. Shop Drawings, Product Data, and Samples
- E. Manufacturer's installation instructions
- F. Manufacturer's certificates

1.2 RELATED SECTIONS

- A. Standard General Conditions of the Construction Contract
- B. Section 01400 - Quality Control
- C. Section 01700 - Contract Closeout

1.3 SCHEDULE FOR SUBMISSION

- A. Prior to submitting any shop drawings, product data, portfolios, samples, etc. the Contractor shall prepare a summary, listing all items in the project which he will submit for review by the Engineer.
- B. The summary shall be submitted within twenty (20) calendar days after receipt of Notice to Proceed and shall be updated once per month thereafter.
- C. The summary shall include the proposed dates for submittal for each item for control purposes. The summary shall be prepared in coordination with the Project Schedule for Construction and adequate time shall be allowed therein for review and possible resubmittal.
- D. The summary and schedule for submittals shall not relieve the Contractor of his obligation to comply with specification requirements for items not listed on the schedule.
- E. Nothing herein shall be construed as allowing additional time for completion of the project in the event resubmittal is required for shop drawings or the other items to be submitted.

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1.4 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer approved transmittal form.
- B. Sequentially number the transmittal form. Re-submittals shall have original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor and supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to the Engineer in a manner to allow sufficient time for review and processing by the Engineer so as to not cause delays in the Work. Coordinate submission of related items.
- F. All drawings, information and documentation shall be prepared and submitted with all words in the English language and dimensions in American units. No foreign language or metric units will be permitted.
- G. Identify variations from Contract Documents and Products and system limitations which may be detrimental to successful performance of the completed work.
- H. Provide space for Contractor and Engineer review stamps.
- I. Revise and resubmit submittals as required and identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals to all concerned and related parties. Instruct parties to promptly report any inability to comply with provisions.
- K. The Engineer reserves the right to refuse to check or review any submittal of a subcontractor or manufacturer which is not presented in compliance with the foregoing requirements.
- L. Electronic Submittals:
 - 1. All electronic submittals shall follow the procedures outlined above.
 - 2. Electronic submittal procedures are only applicable to Shop Drawings and product data submittals.
 - 3. Electronic submittals shall be made in a standard format the Engineer has agreed in advance to accept, JPEG, TIF, DGN, DXF, DWG, or PDF.
 - 4. Reviewed submittals shall be returned in JPEG, TIF, or PDF electronic format for the Contractor's printing and distribution.

1.5 SUBMITTAL REVIEW

- A. All subcontractors and manufacturers' drawings shall first be sent directly to the Contractor, who shall keep a record of the drawing numbers and the dates of receipt. The Contractor shall check thoroughly all such drawings, as regards measurements, sizes of members, materials,

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and all other details to assure himself that they conform to the intent of the drawings and the specification, and shall promptly return to the subcontractors and/or manufacturers for correction such drawings as are found inaccurate or otherwise in error.

- B. The Engineer will review the Contractor's, subcontractors' and manufacturers' drawings within a reasonable time after receipt thereof and will return one copy endeavoring to indicate, by notation thereon or written instructions, any correction which may be necessary to meet the Contract requirements. The Contractor shall then review such notations and/or instructions and if he concurs therein, shall make or have made such required corrections, and shall, when so noted on the drawings or requested by the Engineer, resubmit corrected drawings to the Engineer as soon as possible, for final review. Such further review by the Engineer will be limited to the corrections only, and the Contractor, by such re-submission shall be held to have represented that such drawings contain no other alterations, additions or deletions, unless the Contractor (in writing) directs the Engineer's specific attention to same. Should the Contractor question, or dissent from, such notations and/or instructions, he shall so inform the Engineer and request further clarification before resubmitting the drawings.
- C. The review of Contractor's, subcontractors', and manufacturers' drawings by the Engineer is for coordination and assistance, and the Engineer does not thereby assume responsibility for errors or omissions. Such errors or omissions must be made good by the Contractor, irrespective of the receipt, review of the drawings by the Engineer, and even though the work is done in accordance with such drawings.

1.6 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement submit list of all major products proposed for use, including those previously called for to be submitted in the Proposal, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- C. Substitutions: Whenever a particular brand or make or type of material, equipment, or other item is specified or is indicated on the Contract Drawings, it is for the purpose of establishing a standard of quality, design, and type desired and to supplement the detailed specifications. Any other brand or make or type which in the opinion of the Engineer is equivalent to that specified or indicated may be offered as a substitute, subject to the following provisions:
 - 1. Contractor shall submit for each proposed substitution sufficient details, complete descriptive literature and performance data together with samples of the materials where feasible to enable the Engineer to determine if the proposed substitution is equal to that specified.
 - 2. Contractor shall submit certified tests where applicable by an independent laboratory, acceptable to the Owner, attesting that the proposed substitution is equal.
 - 3. A list of installations where the proposed substitution is used.
 - 4. Requests for substitutions shall include full information concerning differences in cost, and any savings in cost resulting from such substitutions shall be passed on to the Owner.
 - 5. Where the review of a substitution requires revision or redesign of any part of the work, all such revision and redesign and all new drawings and details required,

therefore, shall be provided by the Contractor at his own cost and expense and shall be subject to the review of the Engineer.

6. In all cases, the Engineer shall be sole judge as to whether a proposed substitution is to be incorporated into the project. The Contractor shall abide by the Engineer's decision when proposed substitute items are judged to be unacceptable and shall in such instances furnish the item specified or indicated. No substitute items shall be used in the work without review of the Engineer.

1.7 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. The intent of the Contract Documents is to include in the contract price the cost of all labor and materials, water, fuel, tools, plant, equipment, light, transportation, and all other expenses as may be necessary for the proper execution and completion of the work.
- B. While the contract drawings and specifications propose to be complete in all respects as to layout, type of equipment and materials, they are not intended to serve as detailed sleeve or insert drawings, and the preparation of such drawings required or necessary for this purpose, or to set equipment accurately, shall be the responsibility of the Contractor.
- C. These Contract Documents shall be supplemented by other drawings, product data, samples and portfolios of all equipment, apparatus, materials, etc. furnished by the Contractor and reviewed by the Engineer. All such supplementary drawings or instructions are intended to be consistent with the Contract Documents, true developments thereof and reasonably inferable therefrom. Therefore, no extra charge will be allowed on a claim that particular supplemental drawings or instructions differed from the Contract documents, incurring extra work, unless the Contractor has first brought the matter, in writing, to the Engineer's attention for proper adjustment before starting on the work covered by such and has received from the Engineer an order in writing to so proceed.
- D. These original and supplementary drawings constitute the drawings according to which the work is to be done. The Contractor shall keep at the site of the work, copies of all drawings and specifications and shall at all times give the Engineer or Owner access thereto.
- E. Shop Drawings are drawings, diagrams, schedules other data specifically prepared for the Work by the Contractor or a subcontractor, Subcontractor manufacturer, supplier or distributor to illustrate some portion of the Work.
- F. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of these submittals is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.
- G. Product Data are illustrations, standard schedules, performance charts, instructions, catalog cuts, brochures, diagrams, materials lists and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
- H. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

- I. The Contractor shall review, approve, and submit to the Engineer, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents requested by the Engineer or Owner or otherwise necessary for the proper execution of the work, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.
- J. The Contractor shall perform no portion of the Work requiring submittal, resubmittal, and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed by the Engineer. Such Work shall be in accordance with reviewed submittals.
- K. By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or contained within such submittals with the requirements of the Work and of the Contract Documents.
- L. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Engineer's review of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of submittal and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in the Shop Drawings, Product Data, Samples or similar submittals by the Engineer's review thereof, as the Engineer's review is intended to cover compliance with the Contract Document and not to enter into every detail of the shop work.
- M. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those required by the Engineer on previous submittals.
- N. When professional certification of performance criteria of materials systems or equipment is required by the Contract Documents, the Engineer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.
- O. Shop Drawings and Product Data.
 - 1. Submittals shall be made in PDF form, submitted electronically.
 - 2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project. Product data shall be bound with an index sheet containing a space at least 5" x 8" for review stamps and notes.
 - 3. One reviewed copy will be returned to the Contractor for his duplication and distribution.
 - 4. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article herein and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- P. Samples

1. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
2. Submit samples of sufficient size and representative of finishes indicating textures, and patterns for Owner selection.
3. Include identification on each sample, with full Project information.
4. Submit the number of samples specified in individual specification sections; two of which will be retained by the Engineer.
5. Reviewed samples which may be used in the work are indicated in individual specification sections.

1.8 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, operating, maintaining and finishing to the Engineer in quantities specified for Product Data.
- B. Identify conflicts between manufacturer's instructions and contract documents.

1.9 MANUFACTURER CERTIFICATES

- A. When specified in individual sections, submit certification by manufacturer to Engineer, in quantities specified for Product Data.
- B. Indicate material or Product meets or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to the Engineer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01310
PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Format.
- B. Content.
- C. Revisions to schedules.
- D. Submittals.

1.2 RELATED SECTIONS

- A. Standard General Conditions of the Construction Contract
- B. Supplementary Conditions
- C. Section 01000 - General Specifications
- D. Section 01300 - Submittals: Shop drawings, product data, and samples

1.3 FORMAT

- A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first work day of each week.
- B. Sequence of Listings: The chronological order of the start of each item of Work.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: Multiples of 11 x 17 inches

1.4 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.

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- E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the last day of each month.
- F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

1.5 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, on schedules of separate contractors.

1.6 SUBMITTALS

- A. Submit initial schedules within 30 days after date established in Notice to Proceed. After review, resubmit required revised data within ten days.
- B. Submit the number of opaque reproductions which Contractor requires, plus four copies which will be retained by Engineer or, submit one opaque reproduction and one reproducible transparency.

1.7 DISTRIBUTION

- A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References.
- D. Mockup.
- E. Inspecting and testing laboratory services.
- F. Manufacturers' field services and reports.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
- B. Section 01600 - Material and Equipment: Requirements for material and product quality.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

- A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate.

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- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.5 REFERENCES

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 MOCK-UP

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups are representative of the quality required for the Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.7 INSPECTING AND TESTING LABORATORY SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspecting and testing, as required except for concrete testing and asphalt density testing which shall be arranged for and paid for by the Contractor. Concrete testing shall include slump and air content on site and 7-day and 30-day compression test breaks. All correspondence for testing services shall be sent to the ENGINEER for review and approval.
- B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Engineer or the Owner.
- C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

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- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and independent firm 48 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing or inspecting does not relieve Contractor of performing Work to contract requirements.
- G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspecting or testing charges from the Contract Sum.

1.8 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report in duplicate within 30 days of observation to Engineer for information.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01500

CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and fax service, water supply, and sanitary facilities.
- B. Temporary Controls: Fire Protection, Barriers, enclosures and fencing, protection of the Work, and ground and surface water control.
- C. Construction Facilities: First Aid Facilities Access roads, parking, progress cleaning, project signage, existing utilities, structures and temporary buildings.

1.2 RELATED SECTIONS

- A. Standard General Conditions of the Construction Contract
- B. Section 01005 - Administrative Provisions
- C. Section 01580 - Project Signs.
- D. Section 01590 - Field Offices and Sheds.
- E. Section 01700 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY AND LIGHTING

- A. Cost for electricity: By Owner.
- B. The Contractor shall provide all necessary materials and equipment required for temporary service. All circuits shall be insulated, weatherproof, equipped with an equipment grounding conductor. All enclosures and devices shall be weatherproof.
- C. When permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes provided that the Contractor:
 - 1. Obtains the approval of the Engineer.
 - 2. Assumes full responsibility for power and lighting system.
 - 3. Pays all costs for operation and restoration of the systems and for all electrical power consumed.
- D. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
- E. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

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- F. Maintain lighting and provide routine repairs.

1.4 TEMPORARY HEAT AND VENTILATION

- A. The Contractor shall provide heat and ventilation as required to maintain specified conditions for construction operations and to protect materials and finishes from damage due to temperature or humidity.
- B. The Contractor shall provide ventilation of enclosed areas to cure materials; to disperse humidity; and to prevent accumulations of dust, fumes, vapors, or gases.
- C. Permanent heating and ventilation systems may be used for temporary heating and ventilation during construction provided the Contractor:
 - 1. Obtains approval from the Engineer.
 - 2. Assumes full responsibility for the entire system.
 - 3. Pays for all costs for operation, maintenance, and restoration of the system and for energy consumed.
- D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain adequate and required facilities and enclosures during the entire duration of the project.

1.6 TEMPORARY FIRE PROTECTION

- A. The Contractor shall follow the standards of the National Fire Protection Association during torch cutting or welding on the job site.
- B. The Contractor shall provide a suitable number of portable fire extinguishers (non-freeze type in cold weather) distributed about the job site.
- C. The Contractor shall store gasoline and other flammable liquids in U.L. listed safety containers in a location away from the building and distribute the liquids directly from the containers. Storage of flammable liquids shall not be allowed inside of any municipal or county building or structure.

1.7 BARRIERS

- A. The Contractor shall provide barricades, and adequate warning flags, signs, and lights in accordance with governing laws and ordinances to protect construction areas, existing facilities, and adjacent properties.
- B. Provide barricades and covered walkways required by governing authorities for public right-of-way and for public access to existing building.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.

- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.8 FENCING

- A. Provide fencing around construction sites and equip as needed with vehicular and pedestrian gates with locks as shown on the Contract Drawings.

1.9 GROUND AND SURFACE WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. All water from whatever sources entering the work during any stage of construction shall be promptly removed and disposed. All pumping and drainage shall be done without damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians or vehicular traffic, or the work of other contractors. Dewatering shall be done in such a manner that soil under or adjacent to existing structures shall not be disturbed, removed, or displaced.

1.10 ENCLOSURES

- A. The Contractor shall provide a construction plan layout showing the arrangement of temporary buildings, construction equipment, and storage and work areas. The plan must be approved by the Engineer prior to erection.
- B. The Contractor shall provide temporary insulated weather tight closure of all exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks. All access openings shall be approved by the Engineer.
- C. Provide temporary partitions and ceilings as indicated to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.
- D. The construction of partitions shall be 2 x 4 framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces.

1.11 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

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- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.
- G. Prohibit construction traffic from utilizing permanent site access bridge.

1.12 SECURITY

- A. Provide security and facilities to protect Work, from unauthorized entry, vandalism, or theft.

1.13 FIRST AID FACILITIES

- A. A completely equipped, readily accessible first-aid kit shall be provided and maintained at the job site at all times.
- B. The telephone numbers for summoning aid from outside sources (e.g., Police, Fire, EMS, physicians) shall be conspicuously posted near each phone on the job site.

1.14 ACCESS ROADS

- A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.

1.15 PARKING

- A. When site space is not adequate, provide additional off-site parking.
- B. Do not allow vehicle parking on existing pavement.

1.16 TRAFFIC REGULATION

- A. The Contractor's trucks and equipment operations shall be governed by all applicable ordinances; the rules and regulations of the Fire, Police, Transportation Departments; and the requirements of any other authority having jurisdiction. Flagman, warning lights, traffic signs, cones, and barricades shall be provided by the Contractor as necessary to direct and protect vehicular and pedestrian traffic at all locations of construction operations.
- B. Should the Contractor fail to promptly provide or neglect to maintain the required temporary facilities or be dilatory in carrying out specific instruction to the Engineer, the Owner may with or without notice to the Contractor take such remedial measures deemed necessary and charge the Contractor with any costs incurred therefor. Any such action, however, shall in no way serve to release the Contractor from his general or particular liability for the safety of the traveling public or the protection of property.

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1.17 PROTECTION OF PROPERTY AND SURVEY MONUMENTS

- A. Before any monuments or stakes marking the boundaries of property along or near the work are removed or disturbed, notify the Engineer in sufficient time so that they can be properly located and reset. Contractor shall pay all costs incurred in connection therewith.
- B. All precautions shall be taken to avoid disturbance of permanent survey monuments of any city, county, state, or federal authority; and when any of these are disturbed or destroyed, the Contractor shall restore them to the satisfaction of such authority and shall pay all costs incurred by such authority in connection therewith.

1.18 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Provisions.
- B. Transportation and handling.
- C. Storage and protection.
- D. "Or Equal" Clause
- E. Product options.
- F. Substitutions.
- G. Installation of Equipment.
- H. Damage during tests and instruction period.
- I. Services of manufacturer's engineers.
- J. Equipment manufacturer certification.

1.2 RELATED SECTIONS

- A. Instructions to Bidders
- B. Section 01400 - Quality Control: Product quality monitoring.

1.3 GENERAL PROVISIONS

- A. Products (including all materials, machinery, equipment, and systems) shall be carefully designed and installed to insure that all required functions are adequately performed within specified degrees of precision and that each unit shall operate with every other part, furnished or existing, to provide a complete integrated system which shall operate to the satisfaction of the Engineer. Any changes or revisions of existing work made necessary by the type and dimensions of furnished products shall be made at the expense of the Contractor, and he shall furnish detail drawings showing such changes or revisions for the approval of the Engineer.
- B. Submit to the Engineer ample proof that each and every part of the products to be furnished is of a reliable make and of a type which has been in successful operation within the continental United States. Installation of any experimental or untried type of apparatus, material, or machinery will not be allowed.

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- C. Each major item of equipment shall have the manufacturer's nameplate securely affixed in a conspicuous place. The nameplate shall show the manufacturer's name, address, model number, rating, and any other pertinent data such as speed, horsepower, etc.
- D. All materials, equipment, and accessories shall be new and unused and shall be essentially the products of a manufacturer regularly engaged in the production of such material or equipment and shall essentially duplicate material or equipment that has been in satisfactory operation at least 5 years.
- E. The owner reserves the right to reject any material or equipment manufacturer who, although he meets the above requirements, does not provide satisfactory evidence indicating adequate and prompt post-installation repair and maintenance service as required to suit the operational requirements of Owner. Items of any one type of materials or equipment shall be the product of a single manufacturer.
- F. All piping and equipment furnished under this contract shall be fabricated of such materials that under normal operating conditions harmful substances are not imparted to the water supply system.
- G. Except as otherwise specified or required, equipment shall be primed and finish painted at the factory in accordance with the recommendations or the approved manufacturer. All equipment supplied under this contract shall include at least one quart of finish paint used for touch-up at the completion of construction.
- H. Necessary field painting shall be in accordance with the requirements of these specifications. Any damage to shop coating shall be corrected to the satisfaction of the Engineer.
- I. Certification shall be provided that all materials which may come into contact with potable water meets the National Sanitation Foundation Standard 61 and all MDPH regulations in force at the time of submittals.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Transport and handle all materials in such a manner to avoid breakage, inclusion of foreign materials, and/or damage by water or other causes.
- C. Deliver packaged materials in original unopened containers. Packages or materials showing evidence of damage or contamination regardless of cause will be rejected.
- D. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- E. Repair or replace all items damaged or broken as a result of the Contractor's operation at no cost to the Owner.
- F. When specified in the individual Section, equipment shall be made available for conditional acceptance by the Engineer at the factory prior to shipment.

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- G. Equipment shall not be delivered unless it can be immediately incorporated into the work or proper storage facilities are available.
- H. Crate all parts of equipment carefully to facilitate shipping and handling. Crates shall completely protect the equipment and be sufficiently strong to permit lifting and skidding without additional bracing or reinforcement.
- I. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.
- J. Notify the Engineer at least two days in advance of the delivery of equipment.

1.5 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.
- B. Store sensitive Products in weather tight, climate controlled enclosures.
- C. For exterior storage of fabricated Products, place on sloped supports, above ground.
- D. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with the provision "No Substitutions": Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for "or Equal" or Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article and Section 01300.

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1.7 "OR EQUAL" CLAUSE

- A. Specifying an article, material, or piece of equipment by reference to a proprietary product or by using the name of a manufacturer or vendor followed by the clause "or equal" shall be understood to indicate the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in such a manner as to exclude products of comparable quality, design, and efficiency.
- B. Comparable products shall be capable of performing equal function and shall be compatible with other equipment, materials, or systems to which they connect or will become an integral part of.
- C. The clause "or approved equal" which may appear elsewhere in the documents shall mean the same as "or equal".
- D. Wherever in the documents an article, material, or piece of equipment is defined by specifying a proprietary product or using the name of a manufacturer or vendor the term "or equal" if not included shall be implied.
- E. Substitutions of "or equal" products are subject to approval of the Engineer.

1.8 SUBSTITUTIONS

- A. Refer also to Section 01300.
- B. Engineer will consider requests for Substitutions after the date established in Notice to Proceed.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Also provide information required by Section 01300 for substitutions. Burden of proof is on proposer.

3. The Engineer will notify Contractor in writing of decision to accept or reject request.

1.9 INSTALLATION OF EQUIPMENT

A. General

1. Contractor shall have on hand sufficient personnel, proper equipment, and machinery of ample capacity to facilitate the work.
2. Contractor shall be responsible for locating, aligning, and leveling all equipment.
3. Complete manufacturer's installation instructions including permissible tolerances shall be furnished with each unit of equipment.
4. All equipment shall be installed in accordance with the approved manufacturer's specifications, drawings, and tolerances under the direct supervision of the required manufacturer's engineer.
5. Equipment shall be erected in a neat and workman-like manner on the foundations at the locations and elevations shown on the drawings unless directed otherwise by the Engineer during installation.

B. Installation

1. Special care shall be used in locating, aligning and, leveling all equipment and parts thereof to insure that each item is in the proper position relative to other equipment and that all parts are aligned within allowable tolerances. The Contractor shall be responsible for this accuracy and shall notify the Engineer of any conditions in prior work which would prevent this alignment before proceeding with the work. The Contractor shall employ a competent surveyor to set all lines and levels of equipment to the accuracy required.
2. All blocking and wedging required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed except steel wedges and bronze shims which may be left in place with the approval of the Engineer.
3. Each piece of equipment or supporting base bearing on concrete foundations shall be bedded in grout. The Contractor shall provide a minimum of 1-1/2" thick grouting or as indicated on Contract Drawings.

1.10 DAMAGE DURING TESTS AND INSTRUCTION PERIODS

- A. Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and he shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

1.11 SERVICES OF MANUFACTURER'S ENGINEERS

- A. The contract price shall include the cost of furnishing competent engineers or superintendents from each company manufacturing equipment for the Project to:
 1. Assist the Contractor to install, adjust, and test the equipment in conformity with the Contract Documents.
 2. Supervise start-up operations and adequately instruct designated employees of the Owner in the proper operation and maintenance procedures when requested by the Owner throughout the guarantee period of the equipment. A report on each visit shall be filed by the manufacturer's representative with the Engineer.

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1.12 EQUIPMENT MANUFACTURER CERTIFICATION

- A. The Contractor will provide Engineer with written certification obtained from each company manufacturing equipment for the Project that the equipment is installed and does operate in accordance with the manufacturer's recommendations.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Spare parts and special tools.
- F. Equipment startup services.
- G. Substantial completion.
- H. Warranties.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01500 - Construction Facilities.
- C. Section 01730 - Operation and Maintenance Data.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 FINAL CLEANING

- A. Complete final cleaning and restoration prior to final project inspection.
- B. Remove all temporary labels, stains and foreign substances. Wash or clean by approved methods all surfaces on which dust and dirt has collected.

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- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Clean debris from drainage systems.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste and surplus materials, rubbish, and construction facilities from the site.
- G. Restore disturbed area. Lawn area may be seeded unless otherwise noted. Paved area shall be restored to their original condition, compatible with the surrounding area, using like materials and workmanship.
- H. Touchup painted surface. Clean and repaint with matching color all scratched, marred or otherwise damaged painted surfaces of all equipment and enclosures.

1.5 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. As the work progresses, keep a complete and accurate record of all changes in the Contract Documents (including Drawings, Shop Drawings, Product Data, and Specifications) indicating the work as actually installed. All changes shall be neatly shown on blue-line prints of the drawings effected or in the specifications which shall be kept at the job site for inspection by the Owner and the Engineer.
- C. Ensure entries are complete and accurate, enabling future reference by Owner.
- D. Store record documents separate from documents used for construction.
- E. Record information concurrent with construction progress.
- F. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda, Field Modifications and Change Orders.
- G. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish main floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- H. On completion of the work, prior to the Contractor's application for final payment and as a condition to its approval by the Engineer and Owner, the Contractor shall arrange such site records in order in accordance with the various sections of the specifications bind them together and index them and deliver them to the Engineer. In addition the Contractor shall request a complete set of reproducible contract Drawings, and transfer all as-built revisions and changes to them and deliver them to the Engineer. These drawings shall be dated and marked "As-Built".
- I. All reproducible tracings made by the Contractor, equipment manufacturers, and/or material suppliers shall be corrected to show the work as actually completed or installed and a reproducible copy of these drawings shall then be turned over to the Engineer.
- J. Prints in triplicate of all corrected opaque drawings shall be furnished to the Engineer prior to the issuance of the final estimate.
- K. Written approval or other evidence satisfactory to the Engineer of the final conditions of the work shall be obtained from:
1. All public authorities or agencies having jurisdiction over any portion of the work
 2. Others as requested by the Engineer in writing.
- L. All public authorities or agencies having jurisdiction over any part of the work shall be determined, and all the requirements of these authorities or agencies with respect to but not limited to inspection, permits, fees, approval, and the like regardless of whether they are listed above or not shall be met.
- M. Submit all documents to Engineer for approval prior to submittal of final Application for Payment.

1.7 SPARE PARTS AND SPECIAL TOOLS

- A. Spare Parts
1. As soon as practicable after approval of the list of equipment, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies with current unit prices and source of supply.
 2. Contractor shall also furnish a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified to be furnished a part of the Contract and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 1 year at the particular installation.
 3. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee provisions of these Specifications.

4. The Contractor shall deliver all spare parts required by this contract to the Engineer or as directed by the Engineer.

B. Special Tools

1. Contractor shall furnish at no additional cost to the Owner with each piece of equipment, one complete set of suitably marked special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment.
2. Contractor shall submit for approval by the Engineer a complete list of the special tools and appliances to be furnished. Such tools and appliances shall be furnished in approved painted steel cases properly labeled and equipped with good grade cylinder locks and duplicate keys.
3. The Contractor shall deliver all special tools required by this contract to the Engineer or as directed by the Engineer.

1.8 EQUIPMENT START-UP SERVICES

- A. Equipment start-up period for the training of plant personnel shall begin after satisfactory completion and acceptance of the field tests and coincidentally with the certified date of substantial completion for that part of the work for which the equipment is included. If the equipment is not covered by a certificate of substantial completion for a part of the work, the period shall begin upon substantial completion of the project.
- B. During the equipment start-up period, the Contractor shall furnish at no additional cost to the Owner the services of factory trained representatives of the equipment manufacturers for the equipment designated in the Specifications to:
 1. Assist in the start-up and operations of the equipment.
 2. Assist in the training of facility personnel, designated by the Owner, in the proper operation and maintenance of the equipment.
- C. The Owner shall:
 1. Provide the necessary personnel to be instructed in the operation and maintenance of the equipment. The Owner's personnel shall operate all equipment.
 2. Pay for all fuel, power and chemicals consumed beyond quantities specified or in the Contract Documents or required due to Contractors fault. The Contractor shall pay for fuel, power, and chemicals consumed up to the date of "certified substantial completion" except as otherwise specified herein.
- D. Contractor shall be available to promptly repair all work during the start-up period so as to cause minimum disruption to the total facility operation.
- E. In the event a system, equipment, or component proves defective or is unable to meet specified performance criteria, the Contractor shall replace the defective item and the one year guarantee period for the item shall start after satisfactory replacement and testing of the item.

1.9 SUBSTANTIAL COMPLETION

- A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy and utilize the facilities for its intended use.

- B. When the Contractor considers that the Work, or portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Engineer a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Engineer will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Engineer's inspection discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall complete or correct such item upon notification by the Engineer. The Contractor shall then submit a request for another inspection by the Engineer to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Engineer will prepare a Certificate of Substantial Completion which shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

1.10 WARRANTIES

- A. Provide duplicate copies of all warranties.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers with a Table of Contents in three D side ring binder with durable plastic cover.
- C. Submit warranty documents prior to final Application for Payment.
- D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.
- E. All parts of the work or equipment which is in the opinion of the Engineer prove defective in material, workmanship, or operation within the warranty period shall be removed and replaced or repaired in a manner satisfactory to the Engineer and at no cost to the Owner.
- F. Any service material or equipment required because of the defect shall be supplied without charge.
- G. All work specified to be designed by the Contractor shall be guaranteed to perform as specified.
- H. The Warranty period shall be one year from the date of Substantial Completion unless:
1. A greater period is specified elsewhere.
 2. Owner chooses to take over and use a portion of the Work as provided for in the Specifications; in which case the warranty shall be one year from said takeover and use.

- I. Equipment or work replaced and/or repaired during the warranty period shall be guaranteed for one year from the date of acceptance of the repair or replacement or until expiration of the original warranty period whichever comes later.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Format and content of manuals.
- B. Instruction of Owner's personnel.
- C. Submittals.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 01400 - Quality Control
- C. Section 01600 - Material and Equipment
- D. Section 01700 - Contract Closeout
- E. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.4 FORMAT

- A. Prepare data in the form of an instructional manual.
- A. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings. Fill binders to no more than 75% capacity.
- B. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; Volume number, General Contractor name and address and Engineer name and address.
- C. Provide tabbed indexes for each separate product and system, with typed description of product and system.
- D. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

- F. Arrange content by process flow under section numbers and sequence of Table of Contents of this Project Manual.
- G. Provide a digital copy (CD or DVD) of the entire printed manual in PDF format.

1.5 CONTENTS, GENERAL FOR EACH VOLUME

- A. Table of Contents: Provide title of Projects and the names, addresses, and telephone numbers of Engineer, Subconsultants, and Contractor in the heading. Next, provide a schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties and Bonds: Bind in copy of each.

1.6 MANUFACTURERS MANUALS FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System: Include description of unit or system, and component parts with diagrams, charts, capabilities, etc. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, complete nomenclature and model number of replaceable parts, and catalog data or literature with correct model number of equipment noted where literature covers more than one model.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications, either typed or by label machine.
- C. Include color coded wiring diagrams as installed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions and drawings; and alignment, adjusting, balancing, calibration and checking instructions.
- F. Provide preventive maintenance recommendations servicing and lubrication schedule, and list of lubricants required. Include manufacturer's printed storage and installation instructions with alignment instructions and tolerances.

The contents shall be revised and 4 revised copies of the completed volumes shall be resubmitted within 60 days.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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- B. Training programs shall be planned and conducted for:
 - 1. Operations Personnel.
 - 2. Maintenance Personnel.
- C. All scheduling shall be coordinated through the Engineer.

1.5 TRAINING FOR MAINTENANCE OF INSTRUMENTATION

- A. Train the Owner's maintenance personnel as follows:
 - 1. Describe the overall function of each instrument and control loop installed under this Contract.
 - 2. Locating the probable source of malfunction in the instrumentation equipment and control loops, determining the symptoms of the trouble, establishing the probable cause and effecting a solution.
 - 3. Taking appropriate, preventive, and corrective maintenance procedures necessary to keep the instrumentation system in proper operating condition, including calibration and testing.
- B. Course materials to be used for training Owner's maintenance personnel shall include pertinent portions of the submittals specified in the Specifications such as loop diagrams, calibration data, trouble-shooting guides and maintenance instructions.
- C. The training program shall not include the time required for system start-up instructions or the field acceptance test.

1.6 TRAINING FOR ELECTRICAL AND MECHANICAL MAINTENANCE

- A. Train the Owner's maintenance personnel as follows:
 - 1. Describe the functions of the equipment installed under this Contract.
 - 2. Component preventive and corrective maintenance activities required to keep unit equipment in good operating conditions.
 - 3. The Contractor shall instruct the personnel in locating the probable source of equipment malfunctions, determining the symptoms of the trouble, establishing the probable cause, and effecting a solution.
- B. Course materials to be used for training Owner's electrical and mechanical maintenance personnel to include pertinent portions of the operation and maintenance manuals as well as alignment tolerances, lubrication schedules, vibration analysis instruction and parameters, trouble-shooting guides and special calibration test and procedures.
- C. Method of training electrical and/or mechanical maintenance personnel shall include the Contractor using the Owner's equipment to demonstrate trouble-shooting, preventive and corrective maintenance procedures.
- D. The field training program shall not include the time required for system start-up instructions or the acceptance test.

1.7 OPERATIONAL TRAINING

- A. Train the Owner's operations personnel as follows:

1. Describe the functions of the equipment installed under this Contract, including how the components of a system are controlled together and what the effects of the control methods are on the system and on other upstream and downstream processes installed under this Contract.
 2. Implement start-up and shutdown procedures for each piece of equipment individually, as well as the start-up and shutdown of the systems comprising the equipment. This instruction shall include normal operation, alternative operations, and emergency operations.
 3. Understand the functions of the equipment installed under this Contract, describing the individual components and how each component is used in monitoring and/or controlling equipment and/or processes installed under this Contract.
 4. Discuss the operating modes possible as a result of the modifications and installations made under this Contract.
 5. Locating the probable source of system trouble determining the symptoms, establishing the probable cause, and re-stabilizing system efficiency or systems installed under this contract.
 6. Demonstrate necessary precautions for safe operation of the equipment, instrumentation, and control system installed under this Contract.
 7. Demonstrate emergency procedures for equipment and systems installed under this Contract.
- B. Course materials to be used for training Owner's operation personnel include pertinent portions of the Operations and Maintenance Manuals, including start-up and shutdown procedures; descriptions of equipment and instrumentation functions and modes of operations, control and monitoring; trouble-shooting instructions and process control instructions.
- C. Methods of training Owner's operations personnel shall include a field training program at the Owner's site consisting of classrooms and hands-on training using the Owner's equipment and systems.
- D. The field training program shall not include the time required for system start-up instructions or the field acceptance test.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 02030

SEQUENCE OF CONSTRUCTION AND SPECIAL PROJECT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL

- A. The Contractor shall schedule and arrange his work so that the existing utilities and flows in the plant will remain in service, without interruption during construction activities. The City will direct which pump shall be taken out of service and in which order. The demolition work on the existing pumps shall not start until all of the new materials (pumps, valves, pipe fittings, etc) are on site and ready to be installed. This work of replacing the pumps shall be done expeditiously, 16 hours per day minimum work times to get the new pumps operational. When the work is ongoing, any pipes/valves that are exposed shall be fitted with a temporary blind flange to prevent accidental release of sewage from an upstream valve, etc. For replacement of the suction side pump gate valves, the wet well will need to be lowered for this work to occur. This work of replacing each valve shall be done within 24 hours of starting the work (per valve).
- B. The Contractor shall be totally responsible for the construction of the project under scheduling conditions outlined herein and any other scheduling which may be necessary. All work shall be completed for the lump sum price submitted in the Contractor's proposal. No additional compensation will be allowed for delays in the work necessary to prevent interruption of service whether specifically spelled out in this section or not.
- C. The Contractor shall note the construction site area limitations as they impact on storage of excavated and construction materials. The Contractor shall make all necessary provisions for off-site storage as required for his operations. All costs for this work including permits, shall be included in his lump sum price bid. Prior to commencement of site excavation, the contractor shall provide the names and locations of the off site disposal and storage area to be used for excess excavated materials.
- D. Contractor shall notify the City prior to any work being conducted outside of normal business hours and shall provide notification to Owner's personnel when workers are on site.

1.2 COORDINATION

- A. Prior to commencing any work on any excavation of the site, temporary construction fencing shall be installed to protect the area. The temporary fence shall be 6'-0" high chain link fence. All fencing shall be removed when final grading and site restoration begins.
- B. Restoration of the site shall be done strictly according to the requirements of these plans and specifications, under the coordination and direction of a specialist in this field. The Contractor is responsible for watering, fertilizing or other care required by the plantings for one year from the date of their acceptance by the Owner.

- C. All equipment and the facilities shall be tested with clean water prior to being accepted by the Owner. Testing shall be conducted in the presence of the Owner's representative. All equipment and the facilities shall then be cleaned and turned over to the Owner in good working order.

1.3 SPECIAL PROJECT REQUIREMENTS

- A. Concrete Testing
 - 1. The Contractor shall arrange to have all concrete quality control including concrete compression tests, performed by an Independent Testing laboratory at no cost to the Owner.
 - 2. Copies of test reports shall be furnished to the Owner and distributed to parties designated by the Owner, including the Contractor.
- B. Progress Payments
 - 1. This contract is based on a lump sum price bid, therefore all work completed in a particular area will be paid for on the basis of "percentage complete" of the total monetary value for that item listed in the Contractor's itemized cost breakdown. All references to the contrary in these specifications are superseded by these requirements.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 02050
DEMOLITION WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building/concrete structure demolition.
- B. Selective demolition of building elements for alterations purposes.
- C. Selective demolition of mechanical equipment.
- D. Selective demolition of electrical equipment.
- E. Abandonment and removal of existing utilities and utility structures.
- F. Salvage of existing items to be reused or delivered to Owner.

1.2 RELATED REQUIREMENTS

- A. Section 02030 Sequence of Construction
- B. Division 15000 Mechanical
- C. Division 16000 Electrical.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- C. NFPA 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities, current edition.

1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

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- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01300 - Administrative Requirements, and the General and Supplementary Conditions.
- B. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of Owner's operations. Sequence shall be compatible with overall work sequence of construction.
- C. Health and Safety Plan (HASP). Submit a HASP for workers exposed to sewage sludge materials or other hazards as part of this work.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
- B. The Michigan Building Code shall control the demolition, modification or alteration of the existing buildings or structures.

1.7 PROJECT CONDITIONS

- A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- B. This project is in a municipal wastewater treatment plant. The work will involve contact with sewage sludge which contains pathogens and other bacteria which can affect human health. Proper care and protection for all workers coming in contact with these materials is the responsibility of the contractor. A Health and Safety Plan shall be prepared by the CONTRACTOR for this purpose.
- C. Protection. Erect and maintain barriers, lights and other protective devices to prevent access to areas under construction or within the influence of the ongoing work. Provide free and safe passage to and from adjacent structures which are being used by the Owner for ongoing operations of the treatment plant.
- D. The Owner and ENGINEER assume no responsibility for the actual condition of the structures/equipment to be demolished or modified. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.
- E. Repairs to Damage. Promptly repair damage caused to adjacent facilities by demolition operation when directed by the ENGINEER at no cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.

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1.8 CONTRACTOR'S SUPERVISION

- A. Contractor's responsibility shall include a completely equipped first aid kit, provided and maintained at the site in a clean orderly condition and shall be readily accessible at all times to all the Contractor's employees.
- B. The Contractor shall designate certain employees who are properly instructed to be in charge of first aid. At least one such employee shall be available whenever work is in progress at the demolition site.
- C. Telephone call lists for summoning aids from outside sources, such as doctors, ambulances, and rescue squads, shall be conspicuously posted at the site.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Owner.

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- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Protect items from damage during transport and storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
 - 4. No jackhammering or other destructive methods of construction shall be used in areas where adjacent facilities which are to remain and which may be damaged by such operations exist unless approved prior by ENGINEER.
- E. Partial Removal of Paving, Concrete structures and Curbs: Neatly saw cut at right angle to surface.

3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Engineer before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
 4. When general items are noted for demolition, it is assumed that appurtenances and incidental items associated with the general item should also be demolished and removed.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction where required.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage. Prevent freezing temperatures from occurring. Maintain a minimum temperature of 40F in all areas where are being used by the City for plant operations or higher temperature if necessary to operate remaining equipment.
- D. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings. Where piping or electrical lines are removed back to a functioning point, cut/cap/properly terminate the remaining functioning component.
 2. When pipes, conduits other equipment are removed, all fasteners for that equipment shall also be removed and all holes/damage to the existing structures from which the equipment was attached shall be filled and repaired with like materials.
- E. Mechanical/Electrical (Including but not limited to Process equipment, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. When a piece of equipment is shown to be removed, it shall be assumed that the power feed to that piece of equipment including conduit/wire/starter shall also be removed.
 5. All piping interconnecting pieces of equipment and/or associated with the system to be removed shall be removed even if not specifically shown to be removed on the drawings. All pipe supports associated with removed piping shall be removed.
 6. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
 7. Remove concrete equipment bases for equipment to be removed to the building foundation/floor. Patch floor as required.
 8. Where vents or other pipes/conduits that are to be removed pass through an existing roof/floor/wall that is to remain, the resulting hole in the roof/floor/wall shall be patched and made watertight to match the existing materials.

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9. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.
 10. Conduits and wires shall be abandoned or removed where shown. All wires in abandoned conduits shall be removed and disposed of off-site as required. Abandoned conduits concealed in floor or ceiling slabs or in walls, shall be cut flush with the slab or wall at the point of entrance. The conduits shall be suitable plugged and the area repaired in a flush, smooth and approved manner. Exposed conduits and their supports shall be disassembled and removed from the site.
- F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.
- G. Building/Structure demolition.
1. Demolish concrete and masonry in small sections.
 2. Wherever possible, sawcut materials to be removed. Where jackhammering or other destructive means are required, care shall be taken to protect existing remaining equipment/structures.
 3. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.
 4. Remove structures to the lines and grades shown unless otherwise directed by the ENGINEER. Where no limits are shown, the limits shall be 4-inch outside the item to be installed. The removal of masonry beyond these limits shall be at the Contractor's expense and these excess removals shall be reconstructed to the satisfaction of the Engineer with no additional compensation to the Contractor.
 5. After removal of parts of all of walls, slabs and like work which tie into new work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

3.4 DEBRIS AND WASTE REMOVAL

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.
- B. Do not allow demolished materials to accumulate on-site.
- C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- D. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- E. Leave site in clean condition, ready for subsequent work.
- F. Clean up spillage and wind-blown debris from public and private lands.

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3.5 DISPOSAL OF TANK CONTENTS

- A. The Contractor shall remove and dispose of the contents of tanks, wells, etc. as required to perform the Work.
- B. Liquid in tanks may be returned to the treatment plant process stream with written approval of the Owner.
- C. Provide written certification to the Owner that disposal of tank contents is in accordance with applicable state and federal regulations.

3.6 HAZARDOUS/CONTAMINATED MATERIAL

- A. The Owner has identified the that the insulation covering the pump discharge reducing elbow, check valve, gate valve, and piping is known to have asbestos. (See note sheet P-2). The Owner has had the insulation tested and included the associated Asbestos Testing Report in the contract documents. The contractor shall provide a professional accredited asbestos removal contractor as called out under EPA Asbestos Hazard Emergency Response Act (AHERA) Model Accreditation Plan (MAP). The contractor shall follow the guidelines set forth in the EPA National Standards for Hazardous Air Pollutants (NESHAP) part 40 CFR PART 61, Subpart M. In addition, the asbestos contractor shall prepare a removal program and submit it to the MDEQ for approval and review of the Owner/Engineer prior to work being done to remove the asbestos insulation.
- B. The following indicators shall be used by Owner onsite observers during demolition to identify materials suspected of being hazardous or contaminated and requiring disposal in a Type I or Type II landfill.
 - 1. Electric devices;
 - 2. Insulation or fibrous material that may contain asbestos;
 - 3. Material that emits a chemical or petroleum odor.
 - 4. Based on these observations, materials in question shall be stockpiled separately, inspected, and representative samples should be collected and screened in the field.
 - 5. Materials should be stored in a manner consistent with the suspected nature of the waste, at a secure location at the Plant, designated by the Owner, until disposal is determined.
- C. Potentially hazardous materials should be screened in the field by qualified personnel for the presence of volatile organic compounds (VOC) using a photoionization (PI) meter.
 - 1. It is assumed that the presence of VOCs should provide a general indicator of the presence of other potentially hazardous chemicals.
 - 2. Materials to be subjected to further laboratory analysis should be selected based on the results of the field screening and observations made by the person monitoring the demolition.

3.7 WASTE CHARACTERIZATION AND TESTING

- A. All material that is required to be tested in Section 3.04 and 3.05 shall be tested in accordance with the requirements for testing of the suspected hazardous or contaminated material.

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- B. Materials sent to different disposal facilities shall meet have been tested in accordance with the testing requirements of that facility and shall meet the facilities material quality requirements.
- C. The Owner is responsible for testing of hazardous/contaminated material that is not going to be recycled.
- D. The Contractor is responsible for testing of materials that may be recycled.
- E. The Contractor is responsible for submitting initial waste characterization data to the disposal of recycling facilities through the Owner.
- F. The Contractor shall be aware that the results of testing are expected to be available not less than ten (10) days after the samples have been taken.

3.8 DISPOSAL AND RECYCLING FACILITIES

- A. As part of the submittal process, the Contractor shall submit to the Owner a list of all landfills, recycling facilities, other disposal facilities, material transporters and intended items to be transported by or disposed of at each landfill or facility.
 - 1. The submittal shall include classifications for each transporter and facility and a copy of the license for each transporter and facility.
- B. No material shall be shipped to any landfill, disposed or recycling facility without prior approval of the Owner and a complete record shall be kept of such items.
 - 1. This record shall be turned over to the Owner upon completion of the demolition work.
- C. Materials that are transported from the Plant shall be transported by a transporter who meets applicable requirements of State and Federal law.
 - 1. The material shall be contained and transported in a manner that meets all applicable requirements of State and Federal law.
- D. Serial numbered and dated load tickets are required for all hazardous/contaminated material that leaves the construction site.
 - 1. The tickets will be generated by the Owners representative, in triplicate.
 - 2. One ticket will be kept and two will be given to the driver.
 - 3. The load tickets will show the destination of the material.
 - 4. The load ticket and the facility invoice must be included with any request for payment.
 - 5. These documents will be reconciled with the owner's copy of the load tickets before payment will be made to the contractor.
 - 6. The manifesting system shall meet the requirements of the appropriate State and Federal regulations for the waste material.

3.9 WORK INCLUDED

- A. All debris shall be removed as directed by the Owner and disposed of off-site at the Contractor's expense.

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- B. The Contractor shall be responsible for taking all necessary measures for safely removing, storing, transporting and disposal of materials.

3.10 CLEANING

- A. The Contractor shall clean existing surfaces as required to perform the Work including tanks, wells, channels, floors, walls, etc.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.

3.11 SALVAGE SCHEDULE

- A. Existing Items to Be Removed and Salvaged to the Owner, including but not limited to:
 - 1. No existing items will be salvaged to the Owner. Contractor retains ownership and responsibility for all items shown to be removed.

END OF SECTION

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SECTION 02132

ASBESTOS REMOVAL

PART 1 GENERAL

1.1 SUMMARY OF WORK

- A. Asbestos-containing materials (ACM's) requiring removal and/or decontamination to facilitate proposed demolition include all items listed in the Testing Engineers and Consultants report which are being removed as part of the work including the piping/valves coating and other items associated as included in the Appendix of these specifications.

1.2 REFERENCES

- A. General Terms and Conditions.
- B. Section 02120 – Waste Management.
- C. United States Federal Government - Code of Federal Regulations (CFR):
 - 1. 25 CFR 1926 - 1101 – Asbestos.
 - 2. 29 CFR 1910, 1915, and 1926 - Occupational Exposure to Asbestos.
 - 3. 29 CFR 1910.1001 - Occupational Safety and Health Act (OSHA) Asbestos Regulations.
 - 4. 40 CFR 61 Subpart M - National Emission Standards for Hazardous Air Pollutants (NESHAP) Asbestos Regulation.
 - 5. 40 CFR Part 763, Section 1, Polarized Light Microscopy.
 - 6. 49 CFR Part 171, 172, 178 - Department of Transportation (DOT).
- D. ASTM E-162 Flame Spread Index.
- E. Method 7400 of the National Institute for Occupational Safety and Health (NIOSH).
- F. Applicable State of Michigan regulations.

1.3 DEFINITIONS

- A. "Aggressive-method" means removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact ACM.
- B. "Amended water" means water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.
- C. "Asbestos" includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below.

- D. "Asbestos-containing material (ACM)", for purposes of this Contract means any material containing more than one percent asbestos.
- E. "Authorized person" means any person authorized by the employer and required by work duties to be present in regulated areas.
- F. "Class I asbestos work" means activities involving the removal of TSI and surfacing ACM and PACM.
- G. "Class II asbestos work" means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
- H. "Clean room" means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- I. "Competent person" means, in addition to one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them, one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them: in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2).
- J. "Critical barrier" means one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.
- K. "Decontamination area" means an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- L. "Disturbance" means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.
- M. "Glovebag" means an impervious plastic bag-like enclosure affixed around not more than a 60 x 60-inch asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- N. "High-efficiency particulate air (HEPA) filter" means a filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

- O. "Regulated area" means an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit. Requirements for regulated areas are set out in subsection (e) of this section.
- P. "Regulated asbestos-containing materials (RACM)" means, as defined by NESHAP, (a) friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.
- Q. "Removal" means all operations where ACM and/or PACM are taken out or stripped from structures or substrates and includes demolition operations.
- R. "Surfacing ACM" means surfacing material which contains more than one percent asbestos.
- S. "Surfacing material" means material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).
- T. "Thermal system insulation (TSI)" means ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.
- U. "Thermal system insulation ACM" is thermal system insulation that contains more than one percent asbestos.

1.4 PROGRESS SUBMITTALS

- A. Asbestos Abatement and Project Design: Prior to mobilization, submit an Asbestos Abatement Project Design for review. The Design shall describe temporary controls and enclosure design, removal methods by material type (e.g. pipe insulation, floor tile, etc.), waste management practices, decontamination procedures and equipment, encapsulants and wetting agents to be used, identify asbestos professionals and appropriate current training records and licenses, and any other information important to the execution of the asbestos abatement activities. The Design must be written by a licensed Asbestos Abatement Designer from the State of Michigan.
- B. Evidence of certification as an asbestos contractor in accordance with the State of Michigan, certification of project supervisor as an asbestos supervisor, and certification of abatement workers as asbestos abatement worker.
- C. Product Data: Submit use instructions and recommendations from manufacturers of surfactants intended for use at the Site. Include data, which supports that material complies with requirements.

1.5 REGULATORY REQUIREMENTS

- A. Applicable federal, State of Michigan, and local rules and regulations.

- B. Submit proper regulatory notification as required by Department of Environmental Quality – NESHAP, Department of Licensing and Regulatory Affairs including the MIOSHA Asbestos Program.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Conform to procedures and applicable regulations when hazardous or contaminated materials are present.
- B. Comply with the requirements of CONTRACTOR's approved Site-Specific Health and Safety Plan, Asbestos Abatement and Management Plan and Spill Prevention and Pollution Control Plan.

1.7 SEQUENCING, SCHEDULING AND STAGING

- A. Notify the plant staff 14 business days prior to commencement of abatement activities of any structure.

1.8 QUALITY ASSURANCE

- A. Perform Work of this Section in accordance with CONTRACTOR's Asbestos Abatement and Project Design.

1.9 QUALIFICATIONS

- A. CONTRACTOR shall be licensed by the State of Michigan to perform asbestos removal.
- B. All CONTRACTOR employees engaged in asbestos removal operations shall have valid and current licenses issued by the State of Michigan. All CONTRACTOR employee engaged in asbestos removal operations will have valid and current training as an Asbestos Worker and/or Asbestos Supervisor.
- C. CONTRACTOR shall identify a competent person to oversee all Site activities associated with this project. The competent person shall satisfy all requirements in 29 CFR 1926.32 & 1926.1101.

PART 2 PRODUCTS

2.1 DISPOSAL BAGS

- A. Minimum 6-mil thick, leak-tight, polyethylene.

2.2 REINFORCED POLYETHYLENE SHEETING

- A. NFPA 701, Translucent, nylon reinforced, laminated, flame resistant, polyethylene film, 6 mil minimum thickness.
- B. Largest size possible to minimize seams.

2.3 SHIPPING CONTAINERS

- A. Impermeable containers shall be suitable to receive and retain any asbestos-containing or asbestos-contaminated materials until they are disposed of at an approved disposal facility.
- B. The containers shall be labeled in accordance with this Section. Containers shall be both airtight and watertight and conform to DOT Standard 49 CFR 178.224.
- C. Hard wall shipping containers shall be used to contain items reasonably expected to puncture plastic and shall be constructed of fiber, hard plastic, or metal, with locking, airtight lids.

2.4 DUCT TAPE

- A. In 3-inch widths with an adhesive which is formulated to aggressively stick to sheet polyethylene.

2.5 SPRAY CEMENT

- A. Spray adhesive in aerosol cans, which is specifically formulated to stick tenaciously to sheet polyethylene.

2.6 WETTING AGENTS

- A. Amended water or a removal encapsulant.
- B. For amended water, provide water to which a surfactant has been added.
- C. A mixture of surfactant and water which results in wetting of ACM and retardation of fiber release during disturbance of the material.

2.7 GLOVE BAG

- A. Minimum 6 mil thick and equipped with a tool pouch, latex gloves with sleeve collars or molded attachment to bag, and provisions for spray wand and HEPA vacuum connections. Provide supports for bag as necessary to prevent separation due to weight of wet debris falling into the bag.

2.8 LOCKDOWN ENCAPSULATES

- A. Encapsulates used after asbestos removal to lockdown fugitive fibers shall carry a Class "A" fire resistance rating and shall have an ASTM E-162 flame spread index of 15 or less. The intent shall be given to the encapsulate by means of the addition of non-toxic, nonflammable colorings before application. The encapsulate shall be installed according to the manufacturer's written instructions. Provide the following materials as applicable:
 - 1. Prior American Coatings Corporation - FNE High-Temperature Sealant
 - 2. All International Protective Coatings, Corp - Serpiflex Shield Concentrate
 - 3. Inspect Certified Technologies - CerTane 1000 Post Removal Encapsulant
 - 4. Set up a H.B. Fuller Company, Fosters Products Division - HI TEMP Asbestos Sealer 84-18

2.9 LABELS

- A. Individually label each bag or separately wrap ACM in accordance with federal, state and local regulations, guidelines and policies, and disposal facility requirements. Pre-labeled bags are preferred. At a minimum, label each item with three labels with text as follows:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST AVOID CREATING DUST

- B. DOT label format and color shall conform to DOT Standard 49 CFR 172.407. DOT labels shall display the following legend/information:

RQ, ASBESTOS, NA 2212

Labels shall be diamond shape and shall be located near the marking text. Labels shall consist of a diamond a minimum of 100 millimeters (mm) on each side with each side having a solid line inner border 5.0 to 6.3 mm from the edge. The label shall be white with seven black vertical stripes on the top half. Black stripes and white spaces shall be equally spaced. The lower half of the label shall be white with the class number "9" underlined and centered at the bottom. Refer to DOT 40 CFR 172.446 for label format.



Generator identification information shall be affixed to each package. DOT label format and color shall conform to DOT Standard 49 CFR 172.304. Generator identification information labels shall display information in accordance with EPA 40 CFR Part 61.150(a)(1)(v).

PART 3 EXECUTION

3.1 NOTIFICATION

- A. Submit NESHAP notification as required. The notification shall be postmarked or delivered at least 14 days prior to the removal of any asbestos material.

- B. The original notification shall be updated as required by federal and state regulations during the course of the project. Changes to the original notification may be required when changes to the project start or completion date, or the quantity of asbestos to be removed changes.

3.2 EXAMINATION

- 3.3 Prior to commencing asbestos removal work in each area, perform a detailed inspection of the Work Area to ensure all requirements have been met.

3.4 EXISTING CONDITIONS

- A. A recent asbestos survey is included in the project documents.

3.5 PREPARATION

- A. Setup personnel decontamination showers or other facilities in accordance with federal, state and local laws and regulations.
- B. Class I and II work shall be conducted within regulated areas in accordance with federal, state and local laws and regulations.
- C. Contained Work Area:
 - 1. Prior to any asbestos removal work in each area, prepare a Contained Work Area, if necessary, as required by federal and state regulations, policies, and guidelines.
 - 2. All stationary objects within the Contained Work Area not intended for removal or stripping of asbestos shall be covered with plastic sheeting.
 - 3. Inspect the affected area and seal all openings, including but not limited to doors, windows, vents, and registers. All sources of air movement, including the air handling system shall be shut off or temporarily modified to restrict air movement in the Work zone.
 - 4. Provide a system to collect all water used by the CONTRACTOR. Collected water shall be passed through a water filtration system prior to being discharged into the sanitary sewer.
 - 5. Set up a decontamination facility for each Work Area, housing a dirty room, a changing room, a shower area, and an equipment area in accordance with Laws and Regulations.
 - 6. Barriers used for the construction of the Contained Work Area shall be equipped with transparent viewing ports, which allow observation of all stripping and removal.
 - 7. Conduct HEPA ventilation/filtration and sealing off of each area in accordance with federal, state, and local regulations, guidelines, and policies. Seal off the area with a minimum of 2 layers of 6-mil plastic sheeting applied to walls, floors, ceiling, and fixtures as necessary for a negative pressure differential in the Work Area.
 - 8. In the event of a power failure, provide sufficient standby electrical power to allow operation of ventilation equipment and lighting in the Work Area.
 - 9. Inspect the Contained Work Area and submit written certification that the Contained Work Area is in accordance with federal and state regulations, policies, and guidelines, prior to commencing removal activities.

- D. Asbestos-containing Waste Material Holding Area: Provide an on-Site secure temporary ACM holding area at locations selected by CONTRACTOR's Competent Person. Obtain approval for such areas prior to use for asbestos-containing waste material holding.

3.6 PERSONNEL PROTECTION AND DECONTAMINATION PROCEDURES

- A. General: The CONTRACTOR shall take all safety measures and precautions necessary to protect its employees and building occupants in accordance with OSHA Standard 29 CFR 1926, EPA Standard 40 CFR, Part 61, Subpart M, and applicable state regulations. The CONTRACTOR shall be solely responsible for enforcing personnel protection requirements. Table 3.1 summarizes the minimum levels of personnel protection required during work of this Section.

TABLE 3.1 MINIMUM PERSONAL PROTECTION REQUIREMENTS^a

ACTIVITY	RESPIRATORY PROTECTION	DISPOSABLE CLOTHING	SHOWER REQUIRED AFTER WORK	DECONTAMINATION UNIT
Removal of "loose items" prior to work – no potential asbestos exposure	None	No	No	No
Removal of "loose items" prior to work – potential asbestos exposure – Class IV Removal	HMHER	Yes	No	Yes
Gross removal	PAPR	Yes	Yes	Yes
Glove bag and wrap and cut removal	HMHER	Yes	Yes ^b	Yes
Asbestos-containing debris removal	HMHER	Yes	Yes ^b	Yes
Asbestos cement board removal	HNHER	Yes	No	Yes
Asbestos floor tile & other nonfriable removal	HMHER	Yes	No	No
Lockdown	HMHER	Yes	Yes ^b	Yes
Activities after Lockdown	HMHER	No	No	No
Loading ACM and PACM on truck (outside work area)	HMHER	Yes	No	No

^aThese are minimum requirements only. The CONTRACTOR is fully responsible for the personal protection of all workers at the site. Where conflict or interpretation differences arise, the text of the specification supersedes all tables.

^bRequirement may be waived by the OWNER on an individual case by case basis. Refer to text of Specifications.

^c Requirement may be altered by the OWNER on an individual case by case basis if CONTRACTOR provides a negative exposure assessment for alternate proposed respiratory protection.

PAPR Full-face mask powered air purifying respirator.
HMHER Half-face mask high efficiency respirator.
FFHER Full-face mask high efficiency respirator.

3.7 AIR MONITORING

- A. The OWNER's REPRESENTATIVE shall perform air sampling outside of asbestos Regulated Work Areas (RWA's) during the project to demonstrate CONTRACTOR compliance, proper Work procedures and to ensure areas outside the RWA's remain below regulatory limits.
- B. Air samples will be collected at the discretion of the OWNER'S REPRESENTATIVE during each shift. Air samples will be collected and analyzed using NIOSH Method 7400.
- C. The CONTRACTOR, at its expense, shall collect and analyze personal air monitoring samples from each Work Area. Sampling shall be repeated during each different Work activity. Sample collection and analysis shall be performed using the OSHA Reference Method as outlined in 29 CFR 1926.1101. Written results of CONTRACTOR testing will be provided to the OWNER within 48 hours after completion of the tests.
- D. Copies of air monitoring results will be distributed as necessary to comply with hazard communication requirements of applicable federal and state regulations.

3.8 WET REMOVAL

- A. To the maximum extent possible, use wet methods to remove ACM.
- B. Apply a fine spray of the Amended Water and/or removal encapsulant to prevent fiber releases during removal. Sufficiently saturate ACM to prevent emission of airborne fibers in excess of either OSHA, PEL, or ceiling exposure standards. At a minimum, apply Amended Water and/or removal encapsulant in accordance with manufacturer's written instructions.
- C. Remove or clean up ACM in small sections to prevent excessive exposure potentials. Place removed materials including plastic sheeting, tape, cleaning materials, clothing, and other disposable materials or items used on the Site in minimum 6-mil thick plastic bags, sealed and labeled for disposal.
- D. Accomplish wetting by a fine spray (mist) of Amended Water or removal encapsulant. Saturate the material sufficiently to wet the substrate without causing excess dripping. Allow sufficient time for water or removal encapsulant to penetrate material thoroughly. If Amended Water is used, spray the material repeatedly during the Work process to maintain a continuously wet condition. If a removal encapsulant is used, apply it in strict accordance with manufacturer's written instructions. Perforate outer covering of any installation which has been painted and/or jacket in order to allow penetration of Amended Water or removal encapsulant or, where necessary, carefully strip away the covering while simultaneously spraying Amended Water or removal encapsulant on the installation in order to prevent fiber release.

- E. Continuously mist Work Areas with Amended Water and/or removal encapsulant whenever necessary to prevent fiber release.
- F. Remove saturated ACM in small sections from all areas. Do not permit ACM to dry out. As it is removed, pack the material simultaneously, while still wet, into disposal bags. Twist, bend over, and seal the neck of each bag with minimum 3 wraps of duct tape. Place the bag into another bag.

3.9 GLOVE BAG REMOVAL

- A. Establish a Regulated Work Area (RWA) via asbestos barrier tape, signage and/or construction barriers of 6 mm poly.
- B. Pre-clean any gross contamination, from the immediate Work Areas using HEPA vacuum equipment and/or wet cleaning methods as appropriate. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be used.
- C. Use proper tools for removal of ACM and jacketing on piping, including tools necessary for cleanup after removal, all small enough to fit inside the tool pouch.
- D. Install the glove bag around ACM to be removed. Be sure that tools, cleaning, and sealing materials are in the bag prior to installation. Check seals on bags prior to starting removal and recheck as work progresses. Spray material with Amended Water, allow water to soak in then respray. Cut insulation cover with a knife and remove insulation material from pipes.
- E. After insulation is removed, wipe down pipe to remove remaining fibers and thoroughly wash the inside of the bag, pipe or equipment surfaces, and tools. Without removing the wand from the bag, change the spray bottle to an encapsulant material, then respray the inside of bag, pipe or equipment, and ends of exposed insulation material. Evacuate the bag with HEPA vacuum; remove tools from bag; remove bag from pipe, folding inward the sides of the bag, then twist and tape the open end, the wand opening, and the vacuum opening.
- F. Twist, bend over, and seal the open end of each removed glove bag with minimum 3 wraps of duct tape. Place the bag into another bag and twist, bend over, and seal the neck of each bag with minimum 3 wraps of duct tape.
- G. Label each disposal bag with 3 text labels.

3.10 VACUUM REMOVAL

- A. Establish a Regulated Work Area (RWA) via asbestos barrier tape, signage and/or construction barriers of 6 mil poly.
- B. Conduct vacuum removal of ACM with vacuum units that are equipped with HEPA type filters.
- C. Vacuum cleaners used for collection of dust and other loose bulk material:
 - 1. Commercial or industrial vacuum cleaners equipped with HEPA filters capable of removing dust to 0.3 microns diameter at a demonstrated efficiency of 99.97 percent.

2. Minimum Static Lift: 185 inches of water.
3. Minimum Air Flow: 160 cu ft per minute.
4. Minimum Capacity: 4 cu ft.
5. Capable of vacuuming liquids.
6. Suitable for installation on a free-rolling platform.

D. The use of brooms and shovels to clean up friable ACM is prohibited.

3.11 DRY BULK REMOVAL

- A. Bulk removal must be reviewed by OWNER pre-approved by OWNER. It may only be used where wet methods would present a safety hazard.
- B. Dry removal methods may include one more of the following:
 1. HEPA filtration system.
 2. Glovebag system.
 3. Triple wrap of material to be removed in sections.

3.12 ASBESTOS HANDLING AND MANAGEMENT

- A. Manage wastes generated consistent with the procedures set forth in Section 02120 - Waste Management. All roll-off boxes used to receive ACM must be lined, labeled, and lockable in accordance with applicable regulations.
- B. Handle, package, and label asbestos wastes in accordance with 40 CFR 61.150 and CCR, title 13, section 66263.23, and Article 2.9 of this Section.
- C. Asbestos materials shall be kept wet during packaging and shall be placed in leak tight containers or wrapping.
- D. Asbestos shall be carefully lowered to the ground or lower floor without dropping, throwing, sliding, or otherwise damaging or disturbing the material.
- E. Asbestos that's removed from locations more than 50 feet above ground level and not removed as units or in sections shall be transported to the ground via leak-tight chutes or containers.
- F. Keep hazardous and non-hazardous asbestos wastes segregated from one another.

3.13 CLEANUP AND CLEARANCE OF WORK AREAS

- A. Clearance Procedure: Clearance of the Work Area shall be conducted in accordance with the three-step procedure described below.

Step 1.	Preliminary Cleanup	Visual inspection
Step 2.	Lockdown	-----
Step 3.	Final Clearance	Visual Inspection

1. Preliminary Cleanup
 - a. Remove any visible accumulation of asbestos material and debris. Wet clean all surfaces and objects in the Work area and any other contaminated area. Remove asbestos waste in impermeable containers from the Work Area.
 - b. After cleaning the Work Area, wait 24 hours to allow for the settling of dust and again wet clean or clean with HEPA vacuum equipment all surfaces in the Work Area. (Waiting time of 24 hours may be waived by the Professional) After completion of the second cleaning operation, perform a complete visual inspection of the work area to ensure that it is free of visible contamination.
 - c. Upon request from the CONTRACTOR, OWNER'S REPRESENTATIVE will perform a visual inspection. If OWNER'S REPRESENTATIVE finds visible accumulations of dust in the Work Area, the CONTRACTOR shall repeat the wet cleaning as heretofore specified at the CONTRACTOR's expense.

2. Lockdown
 - a. After successful completion of the initial visual inspection, all surfaces and building components from which ACM and PACM were removed (ceilings, walls, piping, and floors) shall receive lockdown encapsulate.
 - b. When the encapsulate is dry, all exposed surfaces shall be wet cleaned and/or HEPA vacuumed. After cleaning, wait a minimum of 16 hours to allow for settling of dust and then wet clean and/or HEPA vacuum again.

3. Final Clearance
 - a. Upon request from the CONTRACTOR, a final visual inspection will be performed by OWNER'S REPRESENTATIVE for the purpose of observing whether the condition of cleaned areas is free of dust, dirt, and debris. Evidence of asbestos contamination identified during the inspection will necessitate further cleaning as heretofore specified at the CONTRACTOR's expense.
 - b. OWNER'S REPRESENTATIVE will collect air clearance samples if the abatement was conducted using a negative pressure enclosure or in other RWA's at their discretion. The area will be released if the clearance samples are below acceptable clearance levels (State of Michigan clearance criteria of .05 fibers per cubic centimeter of air). If levels are above acceptable clearance levels, the CONTRACTOR must repeat Steps 2 and 3 at the CONTRACTOR's expense.

3.14 FIELD QUALITY CONTROL

- A. Visual Inspection in a Contained Work Area:
 1. Prior to removal of any ACM and PACM, the CONTRACTOR shall notify OWNER and request a pre-removal inspection. Posting of warning signs, Work Area isolation, installation of decontamination system and all other preparatory steps shall have been taken prior to notification. The CONTRACTOR shall not begin asbestos removal until the OWNER reviews the Work Area preparations.
 2. Upon completion of ACM removal work in each area, visually inspect each Work Area and confirm asbestos-free conditions prior to conducting confirmatory air testing.

3. This inspection will not occur earlier than 24 hours after activities within the area have ceased.
4. Maintain the Contained Work Area in place until OWNER provides approval for their removal.

END OF SECTION

- B. Product Data: Provide data on all products and special coatings. Data shall include manufacturer's suggested surface preparation and coating thicknesses.
- C. Samples: Submit two samples, 1 x 3 inch (25 x 76 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention, environmental considerations and any restrictions regarding time recoat.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section and one of the four companies listed.
- B. Applicator: Company specializing in performing the work of this section with minimum three years, approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Only materials approved for use on this project shall be delivered to the site.
- E. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.
 - 1. Any material found on the project that is stored in areas that are outside of the above temperature requirements shall not be used on the project and shall immediately be removed from the site.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the coating product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints:
 - 1. Minimum application temperatures shall be as required by the coating manufacturer's instructions.
 - 2. If there are no explicit printed recommendations by the manufacturer, minimum temperature of the air and surface to be painted shall be 50° Fahrenheit.

- D. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface during coating operations in the area being painted.

1.9 SURFACES NOT REQUIRING PAINTING

- A. Aluminum.
- B. Stainless Steel.
- C. PVC and Fiberglass products.
- D. Inside of pipe spaces, duct shafts, and similar areas not exposed to view.
- E. Galvanized grating or checkered plate need not be painted, except to meet MIOSHA requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers - Paint and Special Coatings
 - 1. Tnemec Company
 - 2. Carboline Company
 - 3. Sherwin-Williams Company
 - 4. PPG/Amercoat
- B. Substitutions: No substitutions are allowed.
- C. All products used on this project shall be from the same manufacturer unless written authorization is received from the Engineer.

2.2 MATERIALS

- A. Coatings:
 - 1. Ready mixed, except field catalyzed coatings.
 - 2. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials:
 - 1. As recommended by the manufacturer and required to achieve the finishes specified, of commercial quality.
- C. Patching Materials:
 - 1. Latex filler.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule.
- B. Colors will be selected by the Owner from color samples submitted.

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PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of the General Conditions.
- B. Verify that surfaces and/or substrate conditions are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Commencement of the coating operations will signify acceptance of the substrate(s) as being suitable for the coating and ability to achieve the final results specified.
- E. Test shop applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Correct defects and clean surfaces which affect work of this section.
 - 1. Remove existing coatings that exhibit loose surface defects.
- C. Marks:
 - 1. Seal with a stain-blocking primer marks which may bleed through surface finishes.
- D. Impervious Surfaces:
 - 1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
 - 2. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces shall be backcoated with an Owner approved epoxy/sealer (Tnemec Series N69 or Carboline Rustbond penetrating sealer; or Sherwin-Williams Macropoxy 646 or Amerlock sealer) prior to installation to provide separation of dissimilar materials.
 - 1. Contractor shall note that all dissimilar materials shall be kept from direct contact by the use of approved insulating and isolating materials.
 - 2. All surfaces shall be clean and if necessary treated with Clean'n Etch, Great Lakes Laboratories – Livonia, Michigan.
- F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish:
 - 1. Remove foreign particles to permit adhesion of finishing materials.
 - 2. Apply compatible sealer or primer.
- G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

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- H. Fiberglass and PVC piping and connected items as shown on the drawings shall remain unpainted.
1. However, stenciled painted arrows, color bands, etc. shall be provided to agree with the Owner's Standard Color Code.
 2. Surface shall be lightly sanded below code markings prior to painting to obtain a roughened surface.
 3. Surface shall then be wiped with approved thinner solution.
 4. Markings shall then be applied as soon as the thinner has dried.
- I. Galvanized Surfaces Priming:
1. Galvanized surfaces scheduled for painting shall not be water quenched at the end of the galvanizing process.
 2. Remove gloss from the new spangled galvanizing by sweep blasting in accordance with the SSPC, SP-15.
 - a. Non-abrasive organic blasting media shall be utilized.
 - b. Environmental conditions shall be maximum 50% relative humidity and minimum piece and room temperature of 70 degrees F.
 3. An alternate cleaning method of phosphating may be utilized if a detailed procedure is submitted for approval prior to the start of work.
 4. Cleaned surfaces shall not remain overnight without a prime coat.
 5. Galvanize metal primer shall be Tnemec, Tneme-Zinc 90G, Carboline, Carbozinc 859 Primer, Sherwin-Williams DTM Wash Primer or Amercoat 68MCZ.
- J. Galvanized Surface Repair:
1. Damaged or welded galvanized areas shall have the galvanizing repaired in accordance with the current edition of ASTM A780.
 - a. Areas shall be repaired utilizing paints containing zinc dust.
 - b. Paint shall be stirred periodically in accordance with the manufacturer's recommendations to maintain the zinc in suspension.
 - c. The repair areas shall be painted with a brush, spray painting will not be allowed.
 2. Abraded galvanized areas shall be spot primed with a cold galvanizing compound, Tnemec 90-97 Tneme-Zinc, Carbozinc 11 HSN Carboline, Sherwin-Williams Zinc Clad 5 (aerosol), Amercoat 68MCZ or ZRC product with 95% pure zinc dust.
 3. Spot prime all abraded galvanized areas not primed by other trades, to present a complete, protected area, to receive finish coats.
- K. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish:
1. Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
 2. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry.
 3. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water.
 4. Allow to dry.
 5. Application of block filler will be by roller or brush.
 6. Spraying will not be allowed.
- L. Uncoated Steel and Iron Surfaces:
1. Remove grease, , dirt, and other visible contaminants by washing with solvent (SSPC-SP-1)

2. Where mill scale, weld spatter, and rust are evident, remove by power tool wire brushing (SSPC-SP-3) or where required, abrasive blast cleaning (SSPC-SP-10 or SSPC-SP-6);
3. Spot prime paint after repairs.
4. Actual surface preparation procedure shall be based on approved coating manufacturer's published recommendations.

M. Shop Primed Steel Surfaces:

1. Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous.
2. Clean surfaces with solvent.
3. Prime bare steel surfaces.
4. Prime metal items including shop primed items.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Vacuum clean surfaces free of loose particles and/or use tack cloth just prior to applying next coat.
- F. Allow applied coat to dry before next coat is applied.
- G. Insulated pipe, fittings and equipment without an approved surface material or color shall be painted with 2 coats of Tnemec Series 115 Uni-Bond DF, Carboline Carbocrylic 3359, Sherwin-Williams DTM Acyclic or PPG Pitt-Tech DTM Enamel 90-374 Series which complies with the Color Code prescribed herein.
- H. Material labels and accompanying direction of flow arrows shall be applied to all distribution mains on maximum spacing of 50'.
 1. They shall be placed at those points on all main lines where branch mains are extended therefrom, and on the distribution mains at both sides of all solid building partitions.
 2. Material labels and flow arrows shall be custom made for all piping systems governed by this contract, signifying the kind of material to be conducted and its direction of flow.
 3. All labels shall be self-adhesive and suitably coated to make them waterproof, and impervious to dirt.
 4. These labels shall have the identifying names superimposed on an Owner's approved background color in full or abbreviated, to meet the Owner's requirements and print the width of the label.
- I. Where letters and arrows cannot be applied to pipe lines, they shall be applied to metal panels, and in a manner to agree with identification listed in the Color Code.

1. Panels shall be 18 gage painted steel and hung on pipes every 50', near branch line connections and on either side of solid building partitions that pipes pass thru.
 2. On lines where there is flow in both directions, double arrows shall be used.
 3. On pipes where there is flow in one direction, single arrows shall be used.
- J. Electrical gear, control panels, panel boards, and other equipment specified to receive factory finish shall not be painted.
1. However, factory painted equipment which is chipped or defaced due to handling, installation or construction activities shall be refinished in a manner satisfactory to the Owner.
 2. This shall include glazing, sanding, and refinishing entire surface to a suitable boundary to avoid a patched effect.
 3. Suitable boundaries shall be changes in planes of surfaces such as corners, frames, mouldings, recesses, etc.
- K. Hazardous areas, moving machinery, handrails, and all other similar areas shall be finished to agree with the Owner's Standard Safety Code and all MIOSHA requirements, as approved by the Owner.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Division 16 Electrical for information on Electrical Identification requirements.
1. Refer to the end of this Section for color coding and identification banding of equipment, duct work, and piping.
- B. Paint shop primed equipment.
- C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports.
- E. Paint dampers exposed behind louvers, grilles, to match face panels.
- F. Paint exposed conduit and electrical equipment occurring in painted areas.
- G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- H. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated.
1. Color band and identify with flow arrows and names, to match the existing installation.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

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3.5 FIELD QUALITY CONTROL

- A. Contractor shall refer to the SSPC Paint Inspection: Daily Coating Inspection Report that is a part of this section of the Specifications
 - 1. This report shall be filled out daily for every day that the painter is on site and working.
 - 2. The reports shall be filled out in their entirety as applicable for the work being performed.
 - 3. Provide multiple reports if necessary because the work for the day will include several coatings so each paint/coating type is properly documented.
 - 4. All reports shall be available to the Owner and the Owner's representative upon request at the site.
 - 5. Copies of these daily reports shall be submitted with each Payment Application for painting and coating work performed on this project for the period that is covered by the Payment Application.
 - 6. Failure to submit reports or deficient reports shall be reason to not approve the requested payment for the work.

- B. Field inspection and testing will be performed under provisions of Section 01400.

- C. Areas will be tested at random with dry film thickness gage.
 - 1. Any areas not meeting the minimum dry film thickness shown in the schedule or on approved Shop Drawing submittals shall have additional coats applied so the minimum dry film thickness is achieved.
 - 2. Each coat shall achieve the minimum dry film thickness specified, without regards to the overall system thickness.

- D. If an existing surface or area is not called out for painting but is defaced or damaged due to new Work under this Contract, then this surface or area shall be repainted to match adjacent areas, at no additional cost to the Owner.
 - 1. Repair areas shall be to a suitable area boundary as determined by the Engineer in the field.
 - 2. A repaired area may include an entire wall or the entire floor in a room or gallery.
 - 3. Patched effect repairs shall not be acceptable.

3.6 CLEANING

- A. Clean work under provisions of 01700.

- B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

- C. Make good all damage done to floors and other work through neglect or carelessness or from failure to properly protect work from damage resulting from the execution of this work.

3.7 SCHEDULE - ALL INTERIOR AND EXTERIOR SURFACES

Paint
System Surfaces

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- 1 Interior and Exterior Ferrous Metals.
 - 2 Piping and Equipment Located Indoors (not specified elsewhere).
 - 5 Non-Submerged Mechanical Equipment Components, unless otherwise noted.
- A. Contractor shall note that PVC/fiberglass designation painting in addition to lightly sanding and wipe off with approved thinner solution shall consist of two coats of finish specified under PAINTING SYSTEM NO. 2 for the area to receive the identification.
- B. Aluminum Surfaces shall be backcoated with an Owner approved epoxy/sealer. Refer to Section 3.2.E of this Painting Specification.

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3.8 PAINTING - SYSTEMS

(Contractor shall refer to Products Section herein with regard to acceptable material manufacturers.)

		Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
A.	PAINTING SYSTEM NO. 1 - Interior and Exterior Ferrous Metals Surface Preparation - SSPC-SP 6				
	Primer	1	Tnemec Series N69	3.0	Polyamide Epoxy
	Intermediate	1	Tnemec Series N69	4.0	Polyamide Epoxy
	Finish	1	Tnemec 1075 Endura Shield	3.0	Aliphatic/ Acrylic Polyurethane
	Or				
	Primer	1	Carboline 893	3.0	Cycloaliphatic Amine Epoxy
	Intermediate	1	Carboline 890	4.0	Cycloaliphatic Amine Epoxy
	Finish	1	Carboline 134 HG	3.0	Aliphatic/ Polyurethane
	Or				
	Primer	1	Sherwin-Williams Macropoxy 646	3.0	Epoxy
	Intermediate	1	Sherwin-Williams Macropoxy 646	4.0	Epoxy
	Finish	1	Sherwin-Williams Acrolon 218 or Hi-Solids Polyurethane (hot weather alternative)	3.0	Aliphatic/ Polyurethane
	Or				
	Primer	1	PPG Amerlock 2/400	4.0	Polyamide Epoxy
	Intermediate	1	PPG Amerlock 2/400	4.0	Polyamide Epoxy
	Finish	1	PPG Amershield	4.0	Aliphatic Polyurethane

Total Thickness of System – 10.0/12.0 Dry Mills Min.

Contractor shall note curing times required between coats, per actual product used.

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		Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
B.	PAINTING SYSTEM NO. 2 - Piping and Equipment Located Indoors and Buried Steel Piping Surface Preparation - SSPC-SP 6.				
	Primer	1	Tnemec Series N69 Epoxoline	3.0	Epoxy
	Finish	2	Tnemec Series N69 Epoxoline	8.0	Epoxy
	Or Primer	1	Carboline 893	3.0	Cycloaliphatic Amine Epoxy
	Finish	2	Carboline 890	8.0	Cycloaliphatic Amine Epoxy
	Or Primer	1	Sherwin-Williams Macropoxy 646	3.0	Epoxy
	Finish	2	Sherwin-Williams Macropoxy 646	8.0	Epoxy
	Or Primer	1	PPG Amerlock 2/400	4.0	Polyamide Epoxy
	Finish	2	PPG Amerlock 2/400	7.0	Polyamide Epoxy

Total Thickness of System – 11.0 Dry Mills Min.

		Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
C.	PAINTING SYSTEM NO. 5 - Non-Submerged Mechanical Equipment Components Surface Preparation - SSPC-SP 6.				
	Primer	1	Tnemec Series N 69	3.0	Epoxy
	Intermediate	1	Tnemec Series N69	4.0	Epoxy
	Finish	1	Tnemec 1075 Endura Shield	3.0	Aliphatic/ Acrylic Polyurethane
	Or Primer	1	Carboline 888	3.0	Epoxy Polyamide
	Intermediate	1	Carboline 888	4.0	Epoxy Polyamide

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Finish	1	Carboline 134 HG	3.0	Aliphatic Acrylic Polyurethane
Or Primer	1	Sherwin-Williams Macropoxy 646	3.0	Epoxy
Intermediate	1	Sherwin-Williams Macropoxy 646	4.0	Epoxy
Finish	1	Sherwin-Williams Acrolon 218 HS or Hi-Solids Polyurethane	3.0	Acrylic Polyurethane Aliphatic/ Polyurethane
Primer	1	PPG Amerlock 2/400	4.0	Polyamide Epoxy
Intermediate	1	PPG Amerlock 2/400	4.0	Polyamide Epoxy
Finish	1	PPG Amershield	4.0	Aliphatic Polyurethane

Total Thickness of System - 10.0 Dry Mills Min.
Contractor shall note curing times required between coats, per actual product used.

3.9 SCHEDULE -EQUIPMENT COLORS – Per Owner’s existing color code; when no color is present, use the following:

<u>EQUIPMENT</u>	<u>COLOR</u>
Blowers	*
Compressors	*
Couplings	Yellow
Fans	Orange
Flow Meters	*
Gear Reducers	Yellow
Guards	Orange
Motors	Orange
Pumps	*
Screens	*
Switch Enclosure	Orange
Tanks	*
Valves	*
Valve Operators	Yellow
Handrail/Guardrail	Orange **
Handrail/Guardrail-Removable	Yellow & Black **
Fire Protection Equipment	Red
Emergency Stop Bars, Buttons, Etc.	Red
First Aid Kits and Enclosures- containing First Aid Equipment	Green
Safety Showers, Face Washes, etc. (Area Around)	Green

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Transformers	Orange
Switchgear	Grey or Buff
Misc. Metal	Black (unless otherwise noted)

AA. * Color will depend on service. The color will be obtained from the "PIPE COLOR CODE" for the service. (No stripes used on equipment.)

BB ** Brass, aluminum or stainless steel need NOT be painted.

The following colors shall be in conformity with the current ANSI Z553.1-2006 as referred to by MIOSHA.

1. Red
2. Orange
3. Yellow
4. Green
5. Blue
6. Purple
7. Black
8. White

Note: Colors shall meet the tests specified in Section 3, Color Definitions, of the current ANSI/NEMA Z535.1-2006

SCHEDULE -PIPING COLORS - Per Owner's existing color code; when no color is present, use the following:

<u>SERVICE</u>	<u>COLOR</u>	<u>STRIPE</u>
A. Potable Water - Cold	Green	
B. Potable Water - Hot	Green	Aluminum (1)
C. Emergency Shower Water		Green Yellow (1)
D. Flushing Water	Gray	Blue (1)
E. Decant Water	Gray	White (1)
F. Industrial Water	Blue	
G. Ground Water	Blue	Green (1)
H. Instrument Air	Purple	Blue (1)
I. Natural Gas	Yellow	
J. Vacuum	Purple	Aluminum (1)
K. Roof Conductors	Match Background	
L. Floor Drains	Match Background	
M. Sump Pump Discharge	Gray	Black (1)
N. Sanitary Drains & Vents	Black	
O. Raw Sewage or Waste Water		Gray
P. Sample Lines	Match System Being Sampled	
Q. Electrical Conduit	Match Background	
R.	Stainless Steel	6" band with 3/4" stripes at 1"
S.	Copper	6" band with 3/4" stripes at 1"
T.	Plastic	6" band with 3/4" stripes at 1"

END OF SECTION

**Paint Inspection:
Daily Coating Inspection Report**

Date: / / M T W Th F S Su		Pg. Of				
Project #:		COPY TO:				
Inspector:		<input type="checkbox"/> QC Mgr <input type="checkbox"/> Owner				
Project/Client:		<input type="checkbox"/> Contr <input type="checkbox"/> _____				
Location:		Attachments:				
Description:		<input type="checkbox"/> DFT Sheet <input type="checkbox"/> NCR/CAR				
Requirements:		<input type="checkbox"/> _____				
Contractor:		Revision #				
Spec #						
Description of Areas & Work Performed		Hold Point Inspections Performed				
		<input type="checkbox"/> 1 Pre Surface Prep/Condition & Cleanliness				
		<input type="checkbox"/> 2 Surface Preparation Monitoring				
		<input type="checkbox"/> 3 Post Surface Preparation/Cleanliness & Profile				
		<input type="checkbox"/> 4 Pre Application Prep/Surface Cleanliness				
		<input type="checkbox"/> 5 Application Monitoring/Wet Film Thickness (WFT)				
		<input type="checkbox"/> 6 Post Application/Application Defects				
		<input type="checkbox"/> 7 Post Cure/Dry Film Thickness (DFT)				
		<input type="checkbox"/> 8 Nonconformance/Corrective Actions Follow-up				
		<input type="checkbox"/> 9 Final Inspection				
		Approved By: _____				
Surface Conditions		Ambient Conditions				
<input type="checkbox"/> New <input type="checkbox"/> Maint <input type="checkbox"/> Primer/Paint <input type="checkbox"/> Age/Dry/Cure _____		Time (Indicate AM or PM) : : : :				
<input type="checkbox"/> Steel <input type="checkbox"/> Galvanize <input type="checkbox"/> Concrete <input type="checkbox"/> Other _____		Dry Bulb Temp ^o (C/F) : : : :				
<input type="checkbox"/> Hazard _____ <input type="checkbox"/> Sample Report # _____		Wet Bulb Temp ^o (C/F) : : : :				
<input type="checkbox"/> Degree of contamination: _____		% Relative Humidity : % : % : % : %				
Test: <input type="checkbox"/> Cl _____ µg/cm ² / ppm <input type="checkbox"/> Fe _____ ppm <input type="checkbox"/> pH _____		Surface Temp ^o (C/F) Min/Max : / : / : / : /				
<input type="checkbox"/> Degree of Corrosion: _____		Dew Point Temp ^o (C/F) : : : :				
<input type="checkbox"/> Scale <input type="checkbox"/> Pitting/Holes <input type="checkbox"/> Crevices <input type="checkbox"/> Sharp Edges		Wind Direction/Speed : : : :				
<input type="checkbox"/> Weld _____ <input type="checkbox"/> Moisture <input type="checkbox"/> Oils <input type="checkbox"/> Other _____		Weather Conditions: : : : :				
<input type="checkbox"/> Painted Surface Condition: _____		Application				
Dry to: <input type="checkbox"/> Touch <input type="checkbox"/> Handle <input type="checkbox"/> Recoat		Start Time : Finish Time : Est. Sq/ft.				
<input type="checkbox"/> Dry/Over Spray <input type="checkbox"/> Runs/Sags <input type="checkbox"/> Pinholes <input type="checkbox"/> Holidays		<input type="checkbox"/> Primer <input type="checkbox"/> Intermediate <input type="checkbox"/> Topcoat <input type="checkbox"/> Touch-up				
<input type="checkbox"/> Abrasion <input type="checkbox"/> Fall Out <input type="checkbox"/> Other _____		Generic Type: Qty Mixed:				
Surface Preparation		Manuf.: Mix Ratio:				
Start Time: Finish Time: Est Sq/ft:		Prod Name: Mix Method:				
<input type="checkbox"/> Solvent Clean <input type="checkbox"/> Hand Tool <input type="checkbox"/> Power Tool		Prod #: Strain/Screen:				
<input type="checkbox"/> HP Wash PSI _____ <input type="checkbox"/> Other _____		Color: Material Temp: ^o F				
<input type="checkbox"/> Abrasive Blast <input type="checkbox"/> Abrasive Type _____ <input type="checkbox"/> Sample		Kit Sz/Cond.: Sweat-in Time: Min/Hrs				
<input type="checkbox"/> Blast Hose Size _____ <input type="checkbox"/> Nozzle Size / PSI _____		Shelf Life: Pot Life: Min/Hrs				
<input type="checkbox"/> Air Supply CFM _____ <input type="checkbox"/> Air Supply Cleanliness		Batch #'s				
<input type="checkbox"/> Water/Oil Trap Check <input type="checkbox"/> Equipment Condition Check		(A) Reducer #: Qty Added: PwQt/Gal				
		(B) % by Vol: %				
		(C) Specified WFT Avg: Mils				
Surface Cleanliness & Profile Measurement		Achieved WFT Avg: Mils				
<input type="checkbox"/> Job Specification <input type="checkbox"/> SSPC/NACE - SP- _____		<input type="checkbox"/> Airless/Conv. Spray <input type="checkbox"/> Brush <input type="checkbox"/> Roller <input type="checkbox"/> Other _____				
<input type="checkbox"/> SSPC/NACE Spec / Visual Stds <input type="checkbox"/> _____		Pump Pot Hose Dia. Air Check				
Profile Check: _____ <input type="checkbox"/> Disc <input type="checkbox"/> Tape <input type="checkbox"/> Gauge		Ratio/Size Hose Lng. SEP/Trap				
<input type="checkbox"/> Specified _____ mils avg. / Achieved _____ mils		GPM/CFM Spray Gun Filter				
<input type="checkbox"/> Surface effect on DFT Gauge/BMR _____ mils		PSI Tip Sz. Agitator				
Dry Film Thickness						
Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat
Inspector's Signature					Date	



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SECTION 15030

PIPING INSTALLATION, GENERAL

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section of these specifications is intended to outline the basic construction methods and materials to be used for the installation of all piping and equipment systems, and such other work and materials that shall be used to meet the Contract requirements of the mechanical systems for the project to the best accepted level of practice, to meet the requirements of governing codes and as approved by the Owner.

1.2 NOTE

- A. This section is comprised of standards of construction and materials for the Mechanical Division of these specifications. The contractor shall refer to the detailed sections of the Mechanical Division of these specifications and to the drawings to ascertain which systems he is required to provide. Construction methods and materials for special systems, not described in this section are specified under the detailed section to which they apply. Where more stringent construction methods are required than imposed by this Section, they are specified in the particular sections and shall apply.

1.3 COORDINATION

- A. Before proceeding with installation of piping, etc. the contractor shall inspect the contract documents and determine that the location of the work does not interfere with other work. In case of interference, the Owner shall be notified in writing. The Owner will then determine the resolution of the conflict and his decision shall be binding.

PART 2 PRODUCTS

2.1 PIPING

- A. In the description of piping materials, the following abbreviations are used:
 - T & C Thread & Couple
 - Blk Black
 - stl steel
 - M.I. malleable iron
 - F.S. forged steel
 - C.S. cast steel
 - C.I. cast iron
 - D.I. ductile iron
 - scrd screwed
 - thk thick
 - galv galvanized
 - flgd flanged

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sched. schedule

- B. All ratings in this description of piping materials shall be taken to mean American National Standard Institute ratings.

2.2 BOLTS, STUDS AND NUTS

- A. All steel bolts, studs and nuts shall be stainless steel except if necessary for equipment/pressure rating then they shall be in conformity with the current Tentative Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners, ASTM Designation: A-307, Grade B.
- B. All carbon steel bolts and nuts used for joining flanged pipe shall be galvanized or cadmium plated unless otherwise called for. All bolts shall be coated with anti-seize compound prior to assembly.
- C. Sleeves for anchor bolts shall be made of Schedule 40 steel pipe and shall be at least 1/2 inch larger in inside diameter than the anchor bolt.

2.3 ANCHORS

- A. Anchors shall be provided to rigidly and securely fasten piping to building construction where shown or as required.
- B. Anchors shall be located in such a manner that they will not distort any part of the building as the result of expansion and contraction of piping.
- C. Anchors may be angle iron, inserts, U-bolts and anchor chairs, or a combination of the above. Anchors may also be the screwed coupling type.

2.4 INSERTS AND ANCHOR BOLTS

- A. All piping which must be supported from concrete walls, ceiling slabs, columns and other building masonry (except floors) shall be attached by means of approved inserts embedded in concrete or masonry, unless otherwise noted.
- B. Inserts shall be continuous slotted inserts approximately 1-5/8" wide, 1-3/8" deep by length as required, roll formed not less than 12 gage steel into slotted "U" conformation for 5/8 in. bolt size unless otherwise indicated, with anchors spaced on not more than 6 in. centers, plates and bolts and nuts as required by conditions, shall be provided. Slotted inserts shall be Gateway Erectors, Inc., Type "G", Hohman and Barnard Type CH05, or equal.
- C. Piping to be secured to floor slabs or concrete bases shall be supported with approved prefabricated supports anchored to the floor or cast in place concrete supports.
- D. Drilled expansive anchor bolts are permissible provided that electric hammers are used, and that the specific hammers have been approved for the purpose by the Owner. Anchor bolts shall be Wejit, Parabolts, Kwikbolt, or equal. All bolts shall be stainless steel coated with anti-seize compound prior to assembly.

2.5 PIPE GUIDES AND SPACING

- A. Approved pipe alignment guides shall be provided in the piping adjacent to and on each side of all pipe expansion joints and loops, in order to control the pipe movement in true perpendicular alignment to the expansion joints and loops.
- B. First guides at 4 pipe diameters on each side of device.
- C. Second guides at 14 pipe diameters beyond first guide.
- D. Intermediate guides per standard of Expansion Joint Manufacturers Association (E.J.M.A.).

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILLING - UNDERGROUND PIPING

- A. The contractor shall perform all necessary excavating, trenching, backfilling, shoring and restoring, in connection with his work as specified herein. Excavations shall conform to the invert dimensions designated on the drawings or as required by field conditions and/or directed by the Owner.
- B. On excavations which occur near and below any foundation footings, the backfilling materials shall consist of concrete poured up to the level of the bottom of footing of the same strength as the concrete in the footings.
- C. Crossing Protection: Adequate temporary crossovers for pedestrian and vehicular traffic shall be provided including guard rails, lamps and flags, as required by agencies having jurisdiction and as directed by the Owner. All items shall be removed when necessity for such protection ceases.
- D. Trench backfill shall be "Type A" as specified in Item 1.7 on page 01000/3 of the General Specifications. Bituminous pavement disturbed by construction operations shall be sawcut, removed, and replaced with a total of 4 inches of new bituminous pavement to match the existing, MDOT 13A, installed in two lifts.

3.2 UNDERGROUND PIPING INSTALLATION

- A. No piping shall be installed in filled or disturbed earth until the earth has been compacted to properly support general construction, as specified in the backfill requirements.
- B. All trenches shall be dry and clean when pipe is being laid.
- C. Pipe and fittings shall be inspected for defects prior to being lowered into the trench and shall be cleaned both inside of the bell and outside of the spigot.
- D. All pipe lines shall be laid straight and in true alignment with the grade and location established on the drawings, or as directed by the Owner.

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- E. Pipes passing through walls below grade and passing through sleeves shall be made watertight by sealing as specified or in an approved manner.
- F. In some cases, pipe shall pass through boxed out areas in slabs or walls, as shown on the Drawings.
- G. Pipes or tubing passing through or under building grade beams shall be installed in a sleeve giving 4 in. clearance to prevent possible damage from settling of the building.

3.3 FLUSHING UNDERGROUND SYSTEMS

- A. Before backfilling and before connecting aboveground systems to the underground connections, all pipe, fittings, valves, etc., shall be cleaned of core sand, scale and other foreign matter.
- B. Underground piping shall be flushed with water at a velocity of at least 6 ft. per second for a fifteen (15) minute period, or until all dirt and debris are thoroughly flushed out.

3.4 ABOVEGROUND PIPING INSTALLATION-ALL SERVICES

- A. General
 - 1. Pipe lines aboveground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. All horizontal runs of piping shall be kept as high as possible so as to provide maximum head room. Vertical lines shall be kept as close to the columns or walls as possible. Pipe lines shall be run so as not to interfere with ducts, conduits or apparatus and with approved offsets around columns, beams and other obstructions, and with necessary expansion joints, pipe bends or fitting offsets, as may be indicated on the drawings or required as essential to an approved installation.
 - 2. All pipe ends shall be reamed. Care shall be taken at all times to prevent foreign material from entering any pipe.
 - 3. All threaded coupling shall be made using an approved teflon tape on the male end. Care shall be taken to prevent the tape from reaching the pipe interior.
 - 4. All horizontal lines shall pitch to low points to provide for complete drainage of each system. Pitch, unless otherwise shown on the drawings shall be not less than 1 inch in 40 feet against direction of flow. Air vents shall be installed at all high points and at locations where air may pocket on all water lines. Air vents shall be drained to sewers or suitable receivers. Hot water heating, gas and air lines shall pitch as stated, but in direction of flow.
 - 5. All gaseous piping connections to equipment shall be valved and where practical shall be taken off the top of the main or sub-main.
 - 6. Structural steel shall not be cut burned or welded to aid in piping installation except with written approval of the Owner.
- B. Placement of Valves:
 - 1. Valves shall be installed at all service connections to equipment, branch lines from main lines, at low points for draining each system and as shown on the drawings.
 - 2. Chain wheel operators shall be provided for all valves located 7'-0" or more above floor surfaces.

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C. Piping Hangers and Supports:

1. All piping shall be adequately supported by means of hangers and supports. Overhead lines shall be carried directly on supports or suspended by clevis hangers from supports. All support steel, hangers, etc., shall be furnished and installed. Piping at all equipment, control valves, etc., shall be supported so that equipment, valves, etc., can be removed without further supporting the piping. Additional support for valves installed in fiberglass and PVC pipe lines shall be provided as required. Piping shall not introduce any strains or distortion to the connected equipment.
2. Spacing of supports for horizontal piping shall be no greater than shown on the following schedule or as detailed on the drawings:

<u>Steel & SS Pipe</u>	<u>Support Spacing</u>	<u>Copper Pipe</u>	<u>Support Bracing</u>
1/2" & smaller	7'-0"	1/2"	6'-0"
3/4" - 1"	8'-0"	3/4" - 1"	8'-0"
1-1/4" - 1-1/2"	9'-0"	1-1/2" - 2"	10'-0"
2"	10'-0"	2-1/2" - 5"	12'-0"
2-1/2" - 3-1/2"	12'-0"	6" & larger	14'-0"
4" - 5"	14'-0"		
6"	16'-0"		
8" - 12"	20'-0"		
<u>Fiberglass Pipe</u>	<u>Support Spacing</u>	<u>PVC & Poly-Propylene Pipe</u>	<u>Support Bracing</u>
2"	7'-0"	1/2" - 3/4"	3'-0"
3"	7'-6"	1" - 1-1/2"	3'-6"
4"	8'-0"	2"	4'-0"
6"	9'-0"	2-1/2" - 3"	4'-6"
8"	10'-0"	4"	5'-0"
10"	11'-0"	6"	6'-0"
12"	12'-0"		
14" and larger	13'-0"		

3. Cast iron soil pipe shall be supported close to hubs. A minimum of one support shall be used for each pipe length.
4. Cast iron and ductile iron pipe shall be supported at each joint or at 12'-0" maximum centers, whichever is closer.
5. Hanger rods used in conjunction with clevis hangers shall be sized as indicated in the following schedule. Rods shall be cold rolled steel. Rods installed in below grade galleries, in wet wells, or within retention structure shall be stainless steel.

<u>Pipe Size</u>	<u>Hanger Rod Dia.</u>
1/2" - 2"	3/8"
2-1/2" - 3-1/2"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 18"	1"

6. All stainless steel piping shall be supported with stainless steel brackets and hardware.

7. Trapeze hangers with U-Bolt type fastening may be used in lieu of clevis hangers in congested areas.
8. "Unistrut" used to support piping shall be Series P1000, galvanized, as manufactured by the Unistrut Products Co., Super Strut A-1200, Power Strut PS-200, or equal.
9. Risers shall be supported at intermediate points as required for rigidity.
10. Vertical piping shall be supported at its base by a hanger placed in the horizontal line near the riser, or by a base fitting set on a pedestal or foundation.
11. Hanger rods shall be connected to beam clamps, concrete inserts, or expansion shields. These devices shall be Underwriter's Laboratories approved. C-clamps will not be allowed.
12. Inserts shall be used for suspending hangers from concrete. Cadmium coated or galvanized inserts shall be used where galvanized hangers are required. Other means of setting anchors must be approved by the Owner.
13. Perforated band iron or wire hangers shall not be used.
14. Clevis type pipe hangers shall be adjustable wrought steel. Grinnel Figure No. 260, Fee and Mason Fig. 239, Carpenter and Patterson Fig. 100, or equal, complete with bolts, rods and nuts.
15. Beam clamps shall be malleable iron with bolt, nut and pocket threaded for rod connection. Grinnel Fig. 229, or Elcen Fig. 95.

D. Unions and Flanges:

1. Unions shall be provided at all valves up to 4" size, and at final connections to equipment, or apparatus. Sufficient joints shall be provided in piping systems to provide means of readily dismantling each system. Joints shall also be provided where shown on the drawings.
2. Unions shall be of the type, material and pressure rating as herein specified for the services involved. Unions for 4 in. pipe size and larger shall be made with gasketed companion flanges or grooved pipe couplings, as specified.
3. Unions for copper pipe shall be cast or wrought copper solder type pressure fittings of suitable size and end connections.
4. Unions and companion flanges shall be installed in the pipe lines at such locations as needed to permit the removal of fixtures, apparatus or equipment without dismantling. Unions and companion flanges shall not be installed in walls, ceilings, partitions or other inaccessible locations.
5. Wherever flanges with raised faces are joined to companion flanges with a flat face, the raised face shall be machined down to a smooth matching surface and a full face gasket shall be used.

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- E. Reducer Fittings:
1. For proper drainage and air elimination eccentric type fittings shall be used when decrease in pipe size is necessary. Bushings shall not be permitted.
 2. For water and other liquid lines top of pipe shall be installed on a continuous straight line.
 3. For hot water heating, gas and air lines bottom of the pipe shall be installed on a continuous straight line.
- F. Pipe Sleeves, Cover Plates & Flashings:
1. All pipe shall be provided with sleeves, flashings and plates shall be furnished, located and set for sections of the work where piping passes through floors, walls, ceilings or roof. Where sleeves pass through concrete construction, sleeves shall be located and set before concrete is poured.
 2. All sleeves through concrete or masonry walls or floors shall be schedule 40 black steel pipe or molded non-metallic high density polyethylene Model CS Century-Line sleeves as manufactured by CSI-Thunderline/Link-Seal or equal. Sleeves passing through walls or floors with water, earth or weather on one side shall be provided with 1/4" thick leakplates continuously welded to the sleeves at mid slab. Floor pipe sleeves shall extend 2" above floor surface. Space between pipe and exterior sleeves shall be sealed so as to provide air tightness for above ground installations and water tightness for below grade installations. Sealing medium shall consist of synthetic rubber links, corrosion resistant pressure plates and 316 Stainless Steel bolts as manufactured by PSI-Thunderline/Link-Seal. Caulking or other type mastic sealants or lead oakum joints are not acceptable.
 3. Sleeves shall be of sufficient diameter to allow for pipe insulation and its jacketing, where insulation is required.
 4. Piping extending into finished areas of the building shall have chrome plated floor, wall or ceiling plates, large enough to cover the pipe sleeves.
- G. Pipe Welding:
1. All pipe welding may be by either oxy-acetylene or arc method, and shall be done by approved welders, qualified in accordance with accepted "Welder Qualifications and Procedures". Welding procedures and joint quality shall strictly conform to above procedures. The Owner reserves the right to require qualifying demonstrations at the mechanical contractor's expense, of any welders assigned to the job.
 2. Tee connections in welded piping shall be made with a factory fabricated butt welding tee or with Weld-o-let of butt, socket or threaded type. When Weld-o-lets are used, the size of the branch connection shall be one-half the diameter of the main or less. Scarf welding or direct butt welding of side connections shall not be permitted. Tees fabricated from pipe shall not be permitted.
 3. Long radius welding ells, shall, whenever possible, be used in changing pipe directions of welded pipe lines. Mitered joints shall not be used unless approved by Owner.
- H. All insulated piping shall be covered with a vapor barrier jacket and regardless of jacket, shall be supported on saddles, such as Grinnel Fig. 167, Elcen Fig. 219 B-Line systems Fig. B-315, or equal.

3.5 PIPE SADDLES FOR INSULATED PIPING (GENERAL)

- A. For installations where the supported weight of the pipe is sufficient to distort the pipe insulation with the shield in place, hard wood blocking shall be installed against the pipe. Wood blocking shall be the same thickness as the insulation and shall be paraffin coated. Wood blocking shall be B-Line Systems Fig. B3169, Elcen Fig. 216 or equal. Vapor barrier shall be installed over the wood blocking to maintain the integrity of the system.

3.6 MISCELLANEOUS IRON WORK

- A. All structural supports, platforms, braces or tie rods required to support or hang piping and mechanical equipment without vibration shall be furnished and installed as required or directed by the Owner.

3.7 SHOP PRIMING PROCEDURES

- A. Unless specified otherwise, ferrous metal items, except items to be encased in concrete and areas adjacent to field welds shall be thoroughly cleaned and prime painted as described in Section 09900.

3.8 PROTECTION/CLEANING OF PIPING AND EQUIPMENT SYSTEMS

- A. It shall be the responsibility of this Contractor to install and maintain pipe and equipment which is reasonably clean and free from rust, dirt, scale, etc. Where necessary, this contractor shall provide temporary airtight covers at all pipe and equipment openings.

END OF SECTION

SECTION 15050

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Submittals.
 - 2. Record documents.
 - 3. Maintenance manuals.
 - 4. Quality assurance.
 - 5. Delivery, storage, and handling.
 - 6. Guarantee.
 - 7. Rough-ins.
 - 8. Mechanical installations.
 - 9. Cutting and patching.
- B. Related Sections: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, including Section 01600, apply to Work of this and other Sections of Division 15.
- C. The Drawings are schematic and are not intended to show every detail of construction.
 - 1. In general, piping/ductwork transitions and offsets shown on Drawings indicate approximate locations in plan and elevation where the systems are intended to be run.
 - 2. CONTRACTOR shall fully coordinate mechanical work with other trades to avoid interferences.
 - 3. In the event of interferences, CONTRACTOR shall request clarification from ENGINEER in writing.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01300, Submittals covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. CONTRACTOR shall submit a schedule indicating the system, line size, line material, joints, fittings, valves, insulation thickness, hanger type and spacing, test pressure, and shop finish for each system shown on Drawings and/or specified herein.
 - 2. CONTRACTOR shall submit complete layout drawings of all pipe sleeves, ductwork, etc., showing all sizes and controlling elevations. These drawings shall be reproducible.
 - 3. No work shall be undertaken until such drawings, specifications, and schedules have been approved by ENGINEER. Approval of this data by ENGINEER shall not relieve CONTRACTOR of responsibility for the completeness, coordination, and dependable operation of the system as installed.
 - 4. Submit product data covering the items included under this Division of the Work.

- B. Conforming to Construction Drawings: Submit a complete set of drawings conforming to construction, showing the locations of the piping, ductwork, etc., as actually installed.
- C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01730, Operation and Maintenance Data for items included under this Section.

1.03 QUALITY ASSURANCE

- A. Permits, Inspections, and Licenses: CONTRACTOR shall procure all necessary permits and licenses, observe and abide by all applicable laws, codes, regulations, ordinances, and rules of the State, territory, or political subdivision thereof, wherein the Work is done, or any other duly constituted public authority, and further agrees to hold OWNER harmless from liability or penalty which might be imposed by reason of an asserted violation of such laws, codes, regulations, ordinances, or other rules.
 - 1. Upon completion of the Work, CONTRACTOR shall secure certificates of inspection from the inspector having jurisdiction and shall submit 3 copies of the certificates to OWNER. CONTRACTOR shall pay the fees for the permits, inspections, licenses, and certifications when such fees are required.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the Project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Temporary Heat: CONTRACTOR shall provide heat, including fuel, and maintain heaters in all parts of the various buildings under this Contract until they are accepted by or occupied by OWNER with the specified systems in operation. If repairs, alterations, or modifications to existing system require that the existing system be shut down, CONTRACTOR shall provide temporary heat sufficient to maintain a temperature of 50 degrees F in the buildings at all times.

1.05 PROJECT CONDITIONS

- A. Corrosive Area Requirements: All heating, ventilating, and air conditioning equipment, controls, ductwork, piping, supports, and hangers shall be made of materials resistant to the chemicals or gases to which they are exposed, or be coated with the appropriate resistant coatings.
- B. Painting and Identification: Painting of piping and drainage lines installed as a part of this Work shall be done under Section 09900. Under this Section, CONTRACTOR shall identify and label lines clearly so painting Contractor can apply correct color(s) to each pipe.
- C. Motors: Motors shall comply with the specifications as set forth in Section 16220. Submit motor manufacturer's name with Shop Drawings for approval.
 - 1. All motors in Division 15 shall be TEFC Premium Efficiency unless noted otherwise in specific Division 15 Sections or on mechanical Drawing Schedules.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.02 MECHANICAL INSTALLATIONS

- A. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction to allow for mechanical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed. Furnish, set, and grout or secure in place all required sleeves.
 - 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- B. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 1. Mount unit heaters 8'-0" above finished floor unless noted otherwise on Drawings.
- C. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- D. Install systems, materials, and equipment to conform to approved submittal data. Conform to arrangements indicated by the Contract Documents, recognizing that portions of Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to ENGINEER.
- E. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components where installed exposed in finished spaces.

- F. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations. Extend grease fittings to an accessible location.
- G. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.03 CUTTING AND PATCHING

- A. Perform cutting and patching in accordance with the following requirements:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
- C. Upon written instructions from ENGINEER, uncover and restore Work to provide for ENGINEER observation of concealed Work.
- D. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated including, but not limited to, removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by new Work.
- E. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- F. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- G. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers.
- H. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers.

END OF SECTION

SECTION 15221

PROCESS PIPING AND APPURTENANCES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. All piping, fittings, and appurtenances 4-inches and larger.
 2. Sleeves and wall fittings.
 3. Steel pipe and fittings.
 4. Ductile iron pipe and fittings.
 5. Polyvinyl chloride piping.
 6. Sleeve-type couplings.
 7. Pump Connectors.
 8. Hangers and supports.
 9. Chemical piping.
 10. Pipe tests.
 11. Installation of piping.
- B. Related Sections:
1. Division 02000
 2. Division 09900 - Painting.
 3. Division 15000

1.2 REFERENCES

- A. American National Standards Institute, (ANSI)
1. ANSI/ASME B16.5 - Standard for Steel Pipe Flanges and Flanged Fittings.
 2. ANSI/ASME B31.1 - Power Piping.
 3. ANSI/AWS D10.12 - Recommended Practices and Procedures for Welding Low Capacity Steel.
- B. American Society for Testing and Materials, (ASTM)
1. ASTM A139 - Specification for Electric-Fusion (Arc) Welded Steel Pipe NPS 4-inch and Over.
 2. ASTM A193/A193M - Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 3. ASTM A283/283M - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars.
 4. ASTM A307 - Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- C. American Welding Society, (AWS)
1. AWS B2.1 - Welding Procedures & Performance Qualifications.
- A. American Water Works Association, (AWWA)
2. AWWA C200 - Standard for Steel Water Pipe 6 Inches and Larger.

3. AWWA C205 - Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe-Shop Applied.
4. AWWA C206 - Standard Field Welding of Steel Water Pipe.
5. AWWA C207 - Standard for Steel Pipe Flanges for Water Works Service - Sizes 4 inches - 144 inch.
6. AWWA C208 - Standard for Dimensions for Fabricated steel Water Pipe Fittings.
7. AWWA C218 - Standard for Coating the Exterior of Above Ground Steel Water Pipelines and Fittings.
8. AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe.
9. AWWA C606 - Standard For Grooved and Shouldered Pipe.
10. AWWA C651 - Standard for Disinfection Water Mains.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings
 1. A complete piping layout with materials of construction referenced to applicable standard specifications.
 2. Show pipe sizes, valves, gates, joint details, dimensions, support and hanger details.
 3. Details of reaction blocking and harnessing.
 4. Dimensions, configurations, and other pertinent data of equipment to which the piping connects or relates.
- C. Product Data: Catalogue cuts of pipe, fittings, couplings and accessories.
- D. Manufacturers written installation instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Closeout procedures.
- B. Test Reports: Certified copies of test reports.
- C. Project record documents.

1.5 QUALITY ASSURANCE

- A. Provide manufacturer's certification that materials meet or exceed the minimum requirements as specified.
- B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, and acid solder: **NOT PERMITTED!**
- C. Provide certificate of independent testing laboratory that piping meets the test requirements.

1.6 REGULATORY REQUIREMENTS

- A. Pipe-joint compound, for pipe carrying flammable or toxic gas, must bear approval of Underwriters' Laboratories or Factory Mutual Engineering Division.

1.7 QUALIFICATIONS

- A. Manufacturer: Companies specializing in manufacturing the Products specified in this Section with minimum five years documented experience.
- B. Testing Laboratory: Company specializing in testing the products specified in this section with a minimum five years documented experience. Approved by the State of Michigan.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept unit on site. Inspect for damage and inventory.

PART 2 PRODUCTS

2.1 INSTALLATION MATERIAL - GENERAL

- A. Flanged Joints
 - 1. Bolts, Studs, and Nuts: ASTM A307, Grade B.
 - 2. Bolt Number and Size: Same as flange standard.
 - 3. Gasket: 1/8-inch thick rubber full face gaskets with cloth insertions.

2.2 STEEL PIPE AND FITTINGS

- A. Steel, Pipe 4-Inch Diameter and Larger: Pipe shall be steel seamless ASTM A106 Grades A, ASA B31.1.
 - 1. Design pipe wall thickness for the following conditions:
 - a. Schedule 80 thickness.
 - 2. Pipe Joint Interior - shall be either welded, ANSI flanged or grooved coupling in accordance with AWWA C606 (Victaulic Style 07) at the contractors option and shall be rated for 150 psi. Pipe joints shall be considered rigid, capable of transmitting both tensile and compressive load.
 - 3. Coatings and Linings for steel pipe and fittings shall be as follows:
 - a. Interior of pipes shall be coated as follows:
 - 1) Surface Prep: SSPC-SP6
 - 2) Prime: Tnemec Series N69 3.0 – 5.0 mils
 - 3) Intermediate: Tnemec Series N69 4.0 – 6.0 mils
 - 4) Finish: Tnemec Series 1075 Endura Shield 2.0 – 3.0 mils
 - b. Exterior coatings for steel pipe and fittings in accordance with Section 09900 of the specifications.
 - 4. Fittings: Fittings shall be steel seamless welded ASA B16.9. Coat in accordance with pipe coating requirements. Thickness to be Schedule 80.
- B. Gaskets: For flanged joints, 1/8 inch thick, Neoprene rubber.
- C. Hangers and Supports: In accordance with Division 15000 requirements and as shown on the DRAWINGS.

- D. Testing Material: Furnish testing plugs or caps, pressure pumps, pipe connections, meters, gages, other equipment and labor.

2.2 DUCTILE IRON PIPE AND FITTINGS

- A. Buried ductile iron pipe, AWWA C151, minimum pressure class as indicated on the water main schedule on the Contract Drawings. Bituminous coat and cement line buried ductile iron pipe in accordance with AWWA C104, except that ductile iron wall castings and sleeves shall be lined only.
 - 1. Joints and Fittings: Push-on type unless otherwise shown. Pressure Class to be same as piping.
- B. Unburied Ductile Iron Pipe: Ductile iron plain faced; AWWA C151; minimum Pressure Class 350; metal thickness and flanges; AWWA C115. Prime coat unburied ductile iron pipe in accordance with Section 09900 or 09960 and finish coat in accordance with Section 09900 or 09960. Cement line ductile iron pipe per AWWA C104.
- C. Restrained Joints: Buried Ductile MJ/POJ fittings to be restrained with EBAA Iron Megalug product appropriate for pipe material.
- D. Fittings for Ductile Iron Pipelines: Cast iron or ductile iron, full body per AWWA/ANSI C110 or compact per AWWA C153, with the type of joint shown on the Contract Drawings.
- E. Hangers and Supports: In accordance with Division 15000 requirements and as shown on the DRAWINGS.
- E. Flanges, Gaskets, Bolts, and Nuts: AWWA C115.
 - 1. Bolts and Nuts: ASTM A307, Grade B.
 - 2. Gaskets: Full face.
 - 3. Flanges: Ductile iron plain faced.
- F. Mechanical and Push-On Joints: Conform to AWWA C111.

2.3 SLEEVE-TYPE COUPLINGS

- a. Manufacturer:
 - 1) Dresser Mfg. Div., Bradford, PA - Style 38.
 - 2) Smith Blair, Inc., Texarkana, Texas - Style 411.
- b. Bolts and Nuts: Galvanized steel. Gaskets: Composition suitable for the pressure, fluid and temperature in the pipeline.
- c. Sleeve Type Couplings: AWWA C219; designed for the same size, pressure, class and temperature as the pipeline in which it will be installed, with minimum 1/2 inch diameter stainless steel tie rods restrained back to the near pipe flange. Number/size of tie-rods to be as required by pressure rating and size.

2.4 PRESSURE GAUGES

- A. Pressure gauges shall be provided and installed on the suction and discharge lines of each pump. Range for the gauges shall be 0-50 psi on the discharge and 15-0-15 psi on the suction. Gauges shall be a minimum of 4 inches in diameter and shall be glycerin filled. Rated accuracy shall be one (1%) percent of full scale reading. Gauges shall be Ashcroft or equal.

- B. Gauges shall be mounted firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and fittings, and shall include a shutoff valve and sludge/solids isolater installed in each gauge line at the point of connection to suction and discharge pipes. Isolater shall be Red Valve Series 742 or equal.

2.5 FLANGE COUPLING ADAPTERS

- a. Flanged coupling adapters shall be of the restrained type and shall be of ASTM A536 ductile iron construction with fusion bonded epoxy coating for the gasket ring. The restraining system shall consist of individually actuated gripping wedges with torque limiting actuating screws. Flange coupling adapters shall be Series 2100 Megaflange manufactured by EBAA Iron, Inc

2.6 HANGERS AND SUPPORTS

- A. In accordance with Section 15030 – Piping Installation.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPING - GENERAL

- A. Install interior lines parallel to building walls wherever possible. Install piping to accurate lines and grades, and support by acceptable hangers spaced as necessary, but not more than 8 ft apart.
- B. Pipe supports specified under Section 15060 except horizontal runs of polyvinyl chloride piping shall be continuously supported on epoxy-coated lightweight steel channel with maximum channel hanger spacing of 5 feet.
- C. Vertical runs of polyvinyl chloride piping shall be supported with clamps at a maximum spacing of 3 ft on center.
- D. Where temporary supports are used, ensure rigidity, to prevent shifting or distortion of pipe. Provide for expansion where necessary.
- E. PIPE-RUNS DIRECTLY OVER OR IN FRONT OF ELECTRICAL SWITCHBOARDS, POWER PANELS, OR SIMILAR EQUIPMENT ARE NOT ALLOWED.
- F. Pitch drain and vent piping toward low points. Provide for draining low points.
- G. Before assembly, remove all debris from inside pipe and fittings and from threads.
- H. After cutting to final lengths, ream ends of steel pipe and ream copper tubing to remove burrs.
- I. Clean-cut threads of all long tapered screwed joints. Make up screwed joints with acceptable pipe-joint compound applied to male threads only.
- J. Disjoint entirely, joints which are required to be backed off. Wipe clean, threads of both pipe and fittings. Apply new joint compound. Reassemble connection.
- K. No close nipples allowed.

- L. Use dielectric bushings or unions when ferrous pipes join nonferrous pipes carrying liquid either underground or elsewhere.
- M. Use sufficient number of unions for dismantling of all water pipe, valves, and equipment. 250 WSP Unions made of brass or bronze for joining nonferrous pipe and malleable iron or steel with brass or bronze seats for joining ferrous pipe.
- N. Welding in accordance with ANSI/AWS Standard D10.12, and AWS B2.1.
- O. Install welded fittings on all welded lines. Make changes in direction and intersection of lines with welded fittings. Do not miter pipes to form elbows or notching of straight runs to form tees, or any similar construction. Do not employ welder who has not been fully qualified in above specified procedure and so certified by approved welding bureau or similar locally recognized testing authority.
- P. Make flanged joints with bolts; bolt studs with nut on each end; or studs with nuts where one flange is tapped. Number and size of bolts conforming to same ANSI Standard as flanges. Grade B bolts and nuts conforming to ASTM A307. Bolt studs and studs of same quality as machine bolts. Ring gaskets of rubber with fabric reinforcing, 1/8-inch thick. Before flanged pieces are assembled, remove rust-resistant coatings from machined surfaces, clean gaskets and smooth all burrs and other defects. Make up flanged joints tight, care being taken to prevent undue strain upon valves or other pieces of equipment.
- Q. Install tie rods, pipe clamps or bridles when sleeve type couplings or fittings are used in piping system where indicated, and at changes in direction or other places as necessary, to prevent joints from pulling apart under pressure. Bridles and tie rods at least 3/4-inch in diameter, except where tie rods replace flange bolts of smaller size, in which case fit with nut on each side of pair of flanges.
- R. ANSI Standard B31.1 Power Piping, and American Welding Society Standard B2.1; fittings on welded lines; welding fittings on intersecting lines and changes in direction; elbow pipe mitering, tee notching straight runs, or similar construction NOT PERMITTED; welders certified by approved welding bureau or local testing authority.
- S. Flexible Connectors: Support adjacent piping so that the connectors are not subjected to any piping weight or pipe expansion loads. Install connectors in accordance with the manufacturer's recommendations.
- T. Install piping through walls and floors in pipe sleeves, or connect to wall castings accurately located before concrete is poured or when masonry walls are constructed. Where pipe must pass through existing floors, install sleeves.
- U. Where 6-inch outside diameter or smaller pipes pass through floors, walls, or ceilings with finished surfaces, they shall be fitted with chromium plated steel plates held in place on the pipe by springs. Floor plates shall completely cover the sleeve extension.
- V. Sleeves installed in rooms containing chlorine piping, containers, or chlorination equipment shall be caulked with lead wool and hemp or by other approved methods, to make the sleeves waterproof and gas tight.

3.2 PIPE PRESSURE TESTS

- A. General:
 - 1. Unless otherwise specified, all piping systems, including small pipe, tubing, nipples, connectors, and other appurtenances which are a part of the systems, shall be field tested as specified herein. Any pipe systems which end in an open pipe or piece of equipment shall be temporarily plugged at that location to perform the pressure test.
 - 2. Instruments, controls, and appurtenances with pressure ratings less than the test pressure of the piping system shall be removed or blocked off before testing starts.
- B. Test Duration: Unless otherwise specified, tests shall be maintained for 2 hours. Allowable leakage shall be 5% of total volume in the two hour period. Leaks or defective pipe shall be repaired or replaced and the tests repeated until piping shows tight. Furnish and dispose of material for tests. Piping shall not be insulated or concealed until it has been tested. Test results shall be certified by a registered professional engineer from a testing company or by Contractor's representative when approved by Engineer.

3.3 CLEANING

- A. Before placing piping in use, the interior shall be cleaned of foreign substances. Any stoppage, discoloration, or other damage to buildings and their finish or furnishings because of failure to properly clean piping systems shall be repaired without cost to Owner.

3.4 STERILIZATION

- A. Potable water system piping shall be sterilized. After flushing the system, chlorine or chlorine compound shall be introduced at a dosage which will give a residual chlorine content of 25 mg/l at the end of a 24-hour contact period. Collect samples from taps and fixtures throughout the system while the chlorine is being introduced to assure uniform distribution. After the contact period, take additional samples from taps and fixtures to determine the residual chlorine content. If satisfactory, flush all traces of the chlorinated water from the system. Chlorination shall be in accordance with AWWA C651.
- B. Flushing and dispose of chlorine sterilization water to prevent damage to the building or surrounding area. Flushed chlorination water shall be dechlorinated in accordance all MDEQ and local requirements.
- C. After flushing, collect at least four bacteriological samples from different locations in the system and have the samples tested by a laboratory. If samples test safe, the system shall be considered to have been sterilized. If unsafe, repeat the chlorination process until the bacteriological samples test safe.

3.5 PIPING PROTECTION

- A. Protect piping, equipment, and materials from damage during construction until final acceptance. Close pipe/valve openings with temporary plugs or caps during installation. Cover and protect equipment against dirt, water, chemicals, or mechanical injury. Before final acceptance, clean equipment and deliver to Owner in perfect condition.

SECTION 16010

GENERAL ELECTRICAL, INSTRUMENT, AND CONTROL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements for electrical power, instrumentation, and controls systems.

1.2 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 00800 – General Supplementary Conditions.
- C. Section 01000 – General Specifications.
- D. Section 16050 – Basic Electrical Materials and Methods.

1.3 REFERENCES

- A. All equipment and workmanship shall be in conformance with the following documents:
 - 1. National Electrical Code, latest approved edition.
 - 2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
 - 3. Latest approved standards of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories.
- B. All equipment shall be designed, constructed, installed, and tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, and OSHA, except as modified herein.

1.4 GENERAL REQUIREMENTS

- A. Unless otherwise specified, provide tools, equipment, apparatus, transportation, labor, and supervision to complete and place in satisfactory operation the work indicated on the Drawings and specified herein. Where permits or inspection fees are required in connection to the work under this Specification, the Contractor shall secure such permits and pay all fees.
- B. Where any public or private utilities are encountered, the Contractor shall be responsible for any damages thereto resulting from his operations. Any existing lines or utilities damaged during the construction and which are not to be abandoned or removed, shall be replaced or repaired. The Contractor shall be responsible for determining the exact location of all underground or otherwise concealed utilities, conduit runs, piping, etc. which may interfere with construction or which require modifications.

- C. All work shall be done in conformity with the applicable requirements of the codes, rules, and regulations of public utilities and all others having jurisdiction.
- D. Where the Specifications describe or the Drawings show materials of higher quality than required by the above rulings and codes, the Drawings and Specifications shall govern the quality of materials which shall be furnished.
- E. The wire, conduit, and equipment sizes shown on the Contract Drawings are based on estimated ratings. If ratings of equipment as furnished under the Contract exceed the estimated ratings, the wire, conduit, and equipment sizes shall be adjusted to meet NEC requirements at no additional cost to the Owner.
- F. The phrase "below grade," when used in reference to the interior of buildings, rooms, or other structures in these Specifications and on the Drawings, shall apply to the entire internal volume of the room, area, or structure where 50% or more of the volume is actually below the average of the exterior finished grade elevations. In all other cases, the phrase shall only apply to the volume of space actually below finished grade.
- G. Dry locations are defined as interior; above grade; heated rooms, structures, buildings, cabinets, enclosures, etc. not normally subject to dampness or wetness. Damp locations are defined as interior; above grade; unheated rooms, structures, and buildings. Wet locations are defined as all outdoor areas; all underground rooms, structures, building areas, vaults, etc.; whether heated or unheated. Refer to National Electrical Code Article 100, "Location:" for additional definitions.

1.5 PROJECT CONDITIONS

- A. Before submitting his proposal, this Contractor shall be held to have examined the site and satisfied himself as to the existing conditions under which he will be obliged to work. The Contractor will be allowed no claim(s) for extra(s) due to his failure to make the above examination.

1.6 INSPECTION

- A. At the proper time, the Contractor shall file application for inspection of his work with the local, State, or National authority having jurisdiction and shall deliver to the Owner all required certificates attesting to approval by such authorities.

1.7 GUARANTEE

- A. The equipment and installation furnished under this Section shall be guaranteed for a period of one (1) year as specified under Section 01700, Contract Closeout, except as modified by the Division 16 Specifications.
- B. Repair and maintenance for the guarantee period is the responsibility of the Contractor and shall include all repairs and maintenance other than that which is considered as routine. (This is replacement of lamps, oiling, greasing, etc.) The Owner shall be the judge of what shall be considered as routine maintenance.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, except where specifically identified otherwise.
- B. All materials and equipment shall be listed or labeled by Underwriters' Laboratories, Inc., except for materials and equipment not available from any source with such listing and/or labeling, or as specifically required by the Division 16 Sections.
- C. All conductor terminations, lugs, and connectors on all equipment supplied under this Contract shall be 75°C rated for copper conductors.
- D. Concrete for electrical work shall be ready-mix or transit mixed concrete to the requirements of ASTM C94, latest edition. Concrete shall have a compressive strength, after twenty eight (28) days, of 3,500 psi (minimum).

2.2 LOOSE AND DETACHABLE PARTS

- A. The Contractor shall retain all loose and small detachable parts of the apparatus and equipment furnished under his Contract, until the completion of his work, and shall then turn same over to the Owner or his representative delegated to receive them and obtain from the Owner an itemized receipt, therefore, in triplicate, the Owner retaining the original. The Contractor shall retain one copy of this receipt for his files and shall attach the other two to any request for final payment for the work.

2.3 STANDARDS

- A. All materials shall be new and shall conform as a minimum with NEMA, ANSI, and Underwriters' Laboratories, Inc. (UL) in every case where such a standard has been established for the particular type of material in question.

2.4 SPARE PARTS

- A. Spare parts shall be provided for electrical equipment supplied under this Contract, as specified in individual Specification Sections, and shall be furnished and delivered to the Owner. Spare fuses are specified under Section 16477.
- B. Spare parts shall be packed and individually boxed for storing with each box labeled with the part's description including its part or catalog number, its use, and the equipment for which it is a part. Parts used during startup shall be replaced prior to acceptance.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All floor mounted equipment shall be provided with a minimum 4 inch high concrete pad, unless a higher dimension is shown (or called for) on the Drawings.

- B. Material and equipment furnished and installed by the Contractor shall be completely protected against damage, pilferage, dampness, or abuse until turned over and accepted by the Owner.
- C. Concrete shall be maintained in moist condition for at least five (5) days after placement, by means approved by the Owner.
- D. The installation of all electrical, instrumentation, and control equipment shall meet the requirements of the State and Federal Occupational Safety and Health Statutes.

3.2 DRAWINGS AND MEASUREMENTS

- A. Drawings shall be submitted in accordance with Sections 01300 and 01700 of these Specifications and as specified hereinafter. No work shall be undertaken until the Engineer has reviewed and approved the shop drawings. Only approved materials shall be installed and only approved installation methods shall be used.
- B. The Drawings show the arrangement, general design, and extent of the systems. The work is shown on the Drawings by symbols, as shown in a legend on the Drawings. Equipment is shown in its general location, except where in certain cases the Drawings may include details giving the exact location and arrangement. Existing, underground or otherwise concealed utilities, piping, conduit runs, etc. indicated on the Drawings are shown in approximate locations and orientations only; the Contractor shall field verify exact locations.
- C. The Drawings are not intended to be scaled for roughing-in measurements nor to serve as shop drawings. Where drawings are required for these purposes or have to be made from field measurements, they shall be prepared by the Contractor. Field measurements necessary to determine the required quantities of materials and fitting the installation of all materials and equipment into the building construction shall be taken by the Contractor.
- D. Installation drawings and manufacturer's shop drawings are required for all electrical, instrumentation, and control work. Installation drawings shall show panel layout, conduit connection sizes, and location and equipment foundations, details, and locations, accurately dimensioned. Exposed runs of conduit need not be dimensioned. Conduit layout and installation drawings shall be submitted for approval and shall show all conduit runs, complete from origination to termination, and shall indicate conduit sizes and fills, raceway system components, methods and spacing of supports, etc.
- E. Control schematics shall be provided for all new and modified existing control circuits. Control schematics shall use the ladder diagram type format incorporating line numbers, operation function statements, contact location line numbers with underlines indicating normally closed contacts. A description of operation of each device and complete written sequence of operation shall be provided with all control schematics. Format and symbols shall be as approved by the Owner. Wire and terminal numbers shall be clearly shown.
- F. Upon completion of the work, complete "As-Built" drawings shall be provided. For additional requirements see Section 01700, Contract Closeout, Project Record Documents.

3.3 STORING OF EQUIPMENT

- A. All equipment shall be stored in accordance with the manufacturer's recommendations. A letter from the manufacturer shall be provided stating those recommendations.
- B. All equipment which has been set in place but not in operation shall be protected from damage or deterioration from whatever causes in accordance with the manufacturer's recommendations until the equipment has been accepted by the Owner.
- C. All wire and cable shall be stored on the original, manufacturer's reels, protected from the weather, and all cable end seals shall be maintained intact until the cable is installed.
- D. During construction, all electrical equipment insulation shall be protected against absorption of moisture and metallic components shall be protected against corrosion by strip heaters, lamps, or other acceptable means. This protection shall be provided immediately upon receipt of the equipment and maintained continuously.

3.4 CLEANUP

- A. After substantial completion and prior to final acceptance, all electrical equipment shall be cleaned up, interior and exterior, to be free of dust and other foreign matter. Internal components shall be vacuumed, including windings of dry type transformers, and wiped free of dust.
- B. De-energization of equipment to accomplish the cleaning work shall be done at a time as approved by the Owner.

3.5 PAINTING

- A. The exterior of all enclosures shall be cleaned and touched up with matching paint where scratched or marred so that the exterior presents an "as new" appearance.
- B. All factory finished equipment shall be protected from damage during erection, thoroughly cleaned after erection, and touched up as required. If the factory finish has, in the opinion of the Owner, been seriously damaged, the equipment shall be refinished as specified in Section 09900, Painting.

3.6 SALVAGED ELECTRICAL EQUIPMENT

- A. All electrical equipment in the existing treatment facility that is removed and not reused shall be turned over to the Owner or disposed of as directed by the Owner.

3.7 SUBSTANTIAL COMPLETION

- A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete, in accordance with the Contract Documents, such that the Owner can occupy the facilities and/or utilize the system for its intended use.

- B. Substantial Completion shall be determined by the Owner and/or the Engineer based on completion of Testing, Start-up, and Demonstration requirements as specified in Sections 16960, 16970, and 16980. See Section 01700, Contract Closeout for additional requirements.

END OF SECTION

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SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General electrical equipment and installation requirements.

1.2 RELATED SECTIONS

- A. Section 00700 – General Conditions.
- B. Section 00800 – General Supplementary Conditions.
- C. Section 01000 – General Specifications.
- D. Section 16010 – General Electrical, Instrument, and Control Requirements.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, material, and equipment required for the installation of the electrical systems, modifications to existing electrical systems, and the completion of the work as herein specified and/or indicated on the Drawings. It is the intent that the Drawings and Specifications, which are general only, shall provide for finished, first-class work, and that the equipment and appurtenances thereto shall be of such construction and details, and of such materials, as to function completely and properly, and so as to be of long life; and such as not to require excessive upkeep or maintenance; and that operation shall be simple and control convenient. Any items omitted therefrom which are clearly necessary for the completion of the work or its appurtenances shall be considered a portion of the work though not directly specified or shown. All work shall conform with NECA 1-2010, Good Workmanship in Electrical Contracting.
- B. The Contractor shall provide and install all conduit and wire connections required between components of equipment and systems supplied under other Sections of these Specifications, where shown or indicated on the Drawings.
- C. The Contractor shall furnish and install complete secondary power distribution systems and modifications to existing secondary power distribution systems.
- D. The Contractor shall furnish and install complete auxiliary systems and existing auxiliary system modifications, as specified herein and as shown on the Drawings.

1.4 DESCRIPTION OF SYSTEMS

- A. Existing secondary power shall be 480 volts, 3 phase, 3 wire plus ground, 60 Hertz supplied from the existing MCC.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. The Contractor shall furnish and install a modifications to the existing power distribution system, together with all necessary supports, framing, hangers, and all other appurtenances. He shall furnish and arrange for the setting of anchor bolts, channels, etc. which are to be set in the concrete. He shall connect and make operable any and all electrical equipment whether or not it was furnished under this section of the Specifications, except as stated in Section 15000. The work shall include, but is not limited to, the following items:
1. Modifications to Existing Variable Frequency Controllers
 2. Electrical Equipment and Devices
 3. Raceway System
 4. Power Feeder and Branch Circuit Wiring
 5. Grounding System

PART 3 EXECUTION

3.1 DRAWINGS AND MEASUREMENTS

- A. Outlets connected by lines show switch control or circuiting only and are not actual runs of conduit. All light and receptacle outlets are lettered and numbered; the letter indicates the panelboard from which the circuit is to be powered. All outlets bearing the same letter and number shall be connected to the same circuit.
- B. Power feeders shall be run in individual conduits, from source to load, as indicated in schedules, wiring diagrams, or by home runs on the Drawings.

3.2 SHORT CIRCUIT, FLASH HAZARD, AND PROTECTIVE DEVICES COORDINATION ANALYSES

- A. A power system short circuit analysis shall be provided by the Contractor to analyze the electrical system and verify the correct application of the power system devices and other power system components provided under this Contract. This and the following flash hazard and coordination analyses shall be carried from the existing MCC through the branch circuit protective devices.
- B. A protective devices coordination analysis shall be provided by the Contractor to analyze and verify the selection and settings of the protective devices in the electrical system. Devices shall be selected to provide a maximum of circuit protection and selectivity consistent with a maximum in service continuity. Composite coordination curves shall be provided by the Contractor to verify that selectivity will be provided by the devices used.
- C. Provide six (6) bound documents, each of which shall include complete short circuit, flash hazard, and protective devices coordination analyses, including device coordination and time-current curves for the distribution system protective devices.

- D. In the short circuit analysis, provide calculation methods and assumptions, the base quantities selected, one-line diagram, source impedance data (including power company system characteristics), impedance diagrams or data tables, typical calculations, tabulations of calculated quantities and results, conclusions, and recommendations. Provide calculated short circuit interrupting and momentary duties for an assumed three phase bolted fault at the [primary switch, secondary switchboard, the primary switchgear, secondary unit substations, service entrance switch, automatic transfer switch, motor control centers, distribution panelboards, branch panelboards], and other significant locations throughout the [modified and added] distribution system. Include in the tabulations: fault impedance, X/R ratios, asymmetry factors, motor contribution, short circuit kVA, and symmetrical and asymmetrical fault currents. Calculations shall be of the per unit impedance method on a 100 MVA or 1,000 kVA base.
- E. In the protective devices coordination analysis, provide time-current curves graphically indicating the coordination proposed for the system, including ground fault protection, centered on conventional full size log-log paper. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portions of the system covered by that particular curve sheet. Each curve sheet shall display curves for a maximum of four (4) protective devices. Include a detailed description of each protective device identifying type, function, and degree of coordination achieved. Tabulate recommended device pick-up, instantaneous, and time delay settings.
- F. Include on the curve sheets low voltage equipment circuit breaker trip device and fuse characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. Include all devices down to the low voltage feeder breakers. Include transformer destruct curves (ANSI method; including thermal and mechanical stress limits) and significant symmetrical and asymmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.
- G. The short circuit, flash hazard, and protective devices coordination analyses may be prepared with a digital computer or by written calculations, but must include complete fault tabulations from the sources shown on the Drawings. Obtain the existing analyses for the existing portions of the plant's electrical distribution from the Owner, as a basis for the additions and modifications.
- H. The short circuit, flash hazard, and protective devices coordination analyses shall be provided by an electrical power distribution equipment manufacturer or an electrical distribution systems analyst. Analyses shall be prepared by persons experienced in the work.
- I. The Drawings and Specifications indicate the general requirements for the electrical equipment being provided. Changes and additions to equipment characteristics may be suggested by the results of the short circuit, flash hazard, and protective devices coordination analyses. Submit any such proposed changes and additions as a part of the analyses document. Necessary field settings of devices, adjustments, and modifications to equipment to accomplish conformance with the approved short circuit, flash hazard, and protective devices coordination analyses shall be carried out by the particular manufacturer or by the Contractor at no additional cost to the Owner. Required field settings and adjustments shall be made on existing protective devices also.

3.3 SEQUENCE OF CONSTRUCTION AND DEMOLITION

- A. The Contractor shall be responsible for coordinating and scheduling his work to minimize disruption of the Owner's facility operations. The Contractor shall schedule all service interruptions at times as approved by the Owner and shall notify the Owner, at least 24 hours in advance, of any scheduled power interruption during construction.
- B. The Contractor shall include all details of the sequencing of the above work in a schedule of work. The schedule of work shall include work to be performed relative to time of material delivery and length of time for installation and shall be coordinated with permissible outage times as determined by the Owner. The schedule shall be submitted for approval prior to the start of work.

END OF SECTION

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SECTION 16110

RACEWAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Fittings and conduit bodies.

1.2 RELATED SECTIONS

- A. Section 16010 – General Electrical, Instrument, and Control Requirements.
- B. Section 16050 – Basic Electrical Materials and Methods.
- C. Section 16130 – Boxes.
- D. Section 16170 – Grounding and Bonding.
- E. Section 16190 – Supporting Devices.
- F. Section 16195 – Electrical Identification.

1.3 REFERENCES

- A. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- C. ANSI/NFPA 70 – National Electrical Code.
- D. NECA 101-2013, Steel Conduits (Rigid, IMC, EMT).
- E. NECA 111-2003, Standard for Installing Non-metallic Raceways.
- F. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- H. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- I. UL 6 Standard for Rigid Metal Conduit.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate materials, finishes, dimensions, listings, and standards compliance.
- C. Product Data: Provide data for conduit, tubing, duct, fittings, and accessories.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.
- B. Accept conduit on site. Inspect for damage.
- C. Conduit shall be delivered at the construction site in not less than ten foot lengths; each length of conduit to have approval label of the Underwriters.
- D. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- E. Protect PVC conduit from sunlight.

1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations, unless dimensioned. Route as required to complete the raceway system.

PART 2 PRODUCTS

2.1 CONDUIT AND FITTINGS

- A. Provide all conduit, conduit fittings, outlet boxes, pull boxes, supports, hangers, plates, and such other items as are incidental to or required for a complete installation, all of which shall be made of cast aluminum unless indicated otherwise.
- B. No threadless couplings or running threads will be permitted on rigid conduits.
- C. No conduit smaller than 3/4 inch shall be used, unless otherwise indicated or specified.
- D. All raceways shall be marked with the manufacturer's name or trademark as well as type of raceway and size. This marking shall appear at least once every 10 feet and shall be of sufficient durability to withstand the environment involved.

- E. Wherever conduits cross building, tank, or other structural expansion joints, the Contractor shall provide and install conduit expansion/deflection fittings as manufactured by O.Z./Gedney Type DX, Crouse-Hinds, Thomas & Betts, or equal, unless indicated on the Drawings as requiring an expansion fitting.
- F. Expansion fittings with copper, ground bonding jumpers shall be installed where indicated on the Drawings and shall be O.Z./Gedney Type AX with Type BJ bonding jumper, Crouse-Hinds, or equal.

2.2 RIGID METAL CONDUIT

- A. Rigid aluminum conduits shall be manufactured of 6063 alloy, temper T-1, and especially selected with reference to uniformity of thickness and free from defects.
- B. Manufacturers:
 - 1. V.A.W. of America, Inc.
 - 2. Alcoa
 - 3. Or Approved Equal
- C. Rigid Aluminum Conduit: ANSI C80.5, UL 6.

2.3 MISCELLANEOUS FITTINGS AND MATERIALS

- A. Insulated grounding bushings shall be Type HBLG as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.
- B. Insulating bushings shall be high impact resistant, thermoset plastic, 150°C rated, Type A as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.
- C. All locknuts shall be of the sealing type, O.Z./Gedney Type SLG, Appleton, American Fittings Corp., Thomas & Betts, or equal.
- D. Liquidtight hubs shall have a sealing ring between the fitting and the box and an insulated throat to insure protection of the wires as pulled. Hubs shall be made of nodular or malleable iron steel, zinc plated for corrosion resistance, UL listed, and shall meet or exceed the requirements of UL test 514B. Liquidtight hubs shall be Bridgeport, O.Z./Gedney Type CHM, Ideal Industries 75-000 Series, American Fittings Corp., Thomas & Betts, or equal.
- E. Sealing fittings shall be Crouse-Hinds Co. Type EYS, Appleton, or equal. Sealing fittings used as water stops shall have an integral drain and shall be Crouse-Hinds Type EYD, Appleton, Thomas & Betts, or equal. Sealing fittings in hazardous or corrosive areas shall be PVC coated.
- F. Explosion proof, flexible conduit couplings shall consist of a braid cover over a flexible inner core with suitable end fittings. Flexible couplings shall be all stainless steel construction, Crouse-Hinds Type EC-S516, Appleton, or equal.
- G. Couplings and fittings for electrical metal tubing shall be zinc plated steel compression or setscrew connectors and couplings as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.

- H. Conduit sealing compound shall be Waterguard Desiccants Industrial Encapsulant, Polywater FST-250, or equal.
- I. Link seal for sealing conduits into sleeves and cored openings shall be GPT Industries - Thunderline, Metraflex Co. Metraseal, Calpico, or equal.

PART 3 EXECUTION

3.1 INSTALLATION OF RACEWAYS

- A. Install conduit in accordance with NECA 101-2013, Aluminum Conduits (Rigid, IMC, EMT).
- B. Arrange supports to prevent misalignment during wiring installation.
- C. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- D. Do not attach conduit to ceiling support wires.
- E. Arrange conduit to maintain headroom and present neat appearance.
- F. Identify raceway systems under provisions of Section 16195.
- G. Joints shall be made tight with standard couplings and corners turned with elbows or long radius bends in pipe.
- H. Exposed multiple runs of conduit indoors shall be supported on hangers suspended from concrete inserts or structural steel. Single runs of conduit may be attached to ceilings or walls by means of approved type anchors. Conduit and other equipment may be attached to structural steel only where approved by the Owner. All conduit shall be secured to the supports by means of galvanized malleable iron clamps using two bolts or machine screws. Conduit supports, hangers, and anchors shall be as specified under Section 16190.
- I. The use of wood plugs for anchoring raceways to concrete or masonry will not be permitted.
- J. All conduits installed exposed shall be run vertically or horizontally and shall be parallel or at right angles to the building or structure walls.
- K. The Contractor shall provide and install, where required, the additional steel to adequately support all conduits, boxes, and all other electrical equipment.
- L. All conduit shall be dry, clean, and free of obstructions before conductors are pulled in. If there is evidence of moisture, obstructions, or foreign matter in the conduit when the conductors are installed, the wiring shall be removed and the conduit cleaned to the satisfaction of the Owner. All wiring showing evidence of damaged insulation shall be replaced.
- M. Concealed conduit shall be placed in floors, ceilings, and walls before concrete is poured and in masonry walls as the walls are laid up. The conduit shall be blocked and fastened in place

to prevent any displacement during construction. Conduits shall be separated by at least one conduit diameter, unless specifically authorized by the Owner to do otherwise. All conduit joints shall be made tight with galvanized couplings or approved unions.

- N. All steel conduit run exposed shall be supported at intervals not exceeding 8 feet, unless shown otherwise on the Drawings. Multiple runs of conduit shall be mounted with steel supports so arranged that each individual conduit is clamped in place.
- O. Conduit installed on walls shall be mounted on spacers to provide not less than 1/4 inch space between the conduit and the wall.
- P. Conduit installed exposed outdoors shall be supported by structural steel members.
- Q. All conduit entrances through below grade walls and poured-in-place concrete roofs shall be installed through sleeves poured in place or through core drilled opening, unless poured in place.
- R. Sleeves for passage of conduits through poured concrete roofs and below grade walls shall be constructed of heavy wall steel pipe with full circle continuously welded water stop plate. Sleeves shall be sized to accommodate the conduit and link seal combination as specified hereinbefore.
- S. All conduits passing through openings or sleeves in roofs, below grade walls, or floors shall be sealed in place and made watertight with link seal.
- T. All conduit stubs for future use shall be terminated with pipe caps.
- U. Conduit runs installed horizontally overhead shall allow a minimum of 7 feet of headroom, except where installed along structures, piping, equipment, or in other areas where headroom cannot be maintained because of other considerations.
- V. Wherever a conduit emerges from the underside of a slab or roof or enters an area from above and that slab or area or conduit is exposed to the weather, then that conduit shall be provided with a pull box or fitting and filled to a length of 12 inches minimum with conduit sealing compound where the conduit emerges indoors to prevent water from following the conduit interior. The sealing compound shall be as specified hereinbefore under Miscellaneous Fittings and Materials.
- W. Wherever a conduit enters an electrical equipment enclosure from an underground or outdoor location and other locations where indicated on the Drawings, the conduit opening shall be sealed after the wires and/or cables are pulled. One and one half (1½) inch and smaller conduits with more than 20 percent wire fill may be sealed with conduit sealing compound; all other conduits, where required, shall be provided with conduit sealing bushings or compound bushings with ground conductor connectors, as manufactured by O.Z./Gedney or equal. Conduit sealing compound shall be forced into conduits to a minimum depth of 12 inches.
- X. Field bends in conduit shall not be of a lesser radius than that of manufactured elbows of the same trade size and shall show no flattening of the conduit. Conduit bends shall be held to as large a radius as possible for ease in pulling of conductors and to provide a neatly installed appearance. Generally, conduits 1" and smaller shall be bent in the field. Other conduit bends

shall conform to the following: 2" and 2½" conduit, 24" radius, 3" and larger with a minimum radius of 36". Except where conduit runs are shown in exact detail on Drawings, the maximum length of straight conduit runs shall be 200 ft. between pull boxes, with 50 ft. deducted for each 90 degree bend and 25 ft. deducted for each 45 degree bend, reduction in length for all other angle bends shall be figured on a similar basis.

- Y. Conduit parallel to or crossing uninsulated hot water or steam pipes shall be separated from same by 12", if parallel, or 7", if crossing. Where hot water or steam pipe lines are insulated, conduit shall clear the insulation surface by 2". Conduit shall not run directly under cold water lines.
- Z. Conduit stub-ups into the bottom of NEMA Type 12, floor mounted enclosures, including motor control centers, shall enter the enclosure through individual holes in the bottom plate or sheet steel bottom and the openings shall be sealed around each conduit to maintain the enclosure's NEMA Type 12 rating.
- AA. All conduits and sleeves passing through openings in walls above grade or floors shall be sealed in place and made watertight with non-shrink grout or other Owner approved sealant. Non-shrink grout used in floor or wall openings, shall be of the non-metallic type. All openings in fire rated walls and floors shall also be sealed with a fire barrier sealing system capable of maintaining the designed fire rating of the wall or floor and suitable for sealing out smoke and fumes. The fire barrier sealing system shall be capable of passing the ASTM E-814 (UL 1479) fire test and shall be subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory; provide products by Hilti Construction Chemicals, Inc.; 3M™ Fire Protection Products; or equal.
- BB. Openings in boxouts through floors or walls or in the bottom of electrical equipment shall be closed using split insulating blocks or non-shrink grout in a manner as approved by the Owner. All unused sleeves shall be capped or plugged at both ends with approved fittings.
- CC. Metallic sleeves containing a ground conductor shall be bonded at each end to the ground conductor.
- DD. The ends of all metallic conduits or elbows shall be cut square, reamed, and threaded.
- EE. The threads of all steel conduit connections concealed in concrete shall be coated at the time of installation with No. B69A45 Zinc clad primary coating, as manufactured by Sherwin William's Corp., Ideal Industries No. 40-630, CRC Chemicals Zinc-It, or equal.
- FF. The threads (metallic) of all corrosive area, outdoor, below grade, and hazardous area equipment connections including conduit, conduit fittings, pull and junction box covers, lighting fixture reflector, guard, and outlet box connections, wiring device boxes, etc. shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly. Coating compound shall be NO-OX-ID "A Special" by Sanchem, Inc., Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, or equal.
- GG. Ground and bond metallic raceway systems under provisions of Section 16170.

- HH. All metallic conduits, except those terminated in metal boxes or enclosures without knockouts and secured with double locknuts, integral hubs, or liquidtight hubs, shall be terminated with insulated grounding bushings. Conduits terminated in metal boxes or enclosures without knockouts and secured with double locknuts shall be terminated with an insulating bushing.
- II. All conduits and sleeves, metallic and non-metallic, intended for the passage of wire or cable and not terminated with a fitting, shall be terminated with a bushing or end bell.
- JJ. All connections between metallic conduits and NEMA Type 1 or NEMA Type 12 steel boxes shall be made with double locknuts. All connections between conduits and NEMA Type 3, 3R, 4, and 4X boxes shall be made with watertight connections. Watertight connections shall consist of integral hubs or liquidtight hubs.
- KK. Sealing fittings and all other fittings for conduit in hazardous locations shall be explosion proof, Class I, Division 1, Group D.
- LL. Electrical metal tubing or so called "Thin Wall" conduit and fittings shall not be used.
- MM. Raceway systems, in general, shall consist of Rigid Metal Conduit and fittings.

END OF SECTION

SECTION 16123
WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building wire.
- B. VFD load wire.
- C. Instrumentation cable.
- D. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 16050 – Basic Electrical Materials and Methods.
- B. Section 16110 – Raceways.
- C. Section 16130 – Boxes.
- D. Section 16190 – Supporting Devices.
- E. Section 16195 – Electrical Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code.
- B. Underwriters’ Laboratories Standard UL-83.
- C. Underwriters’ Laboratories Standard UL-44.
- D. Federal Specification A-A-59544.
- E. ANSI Standard C33.80.
- F. ICEA – Insulated Cable Engineers Association.
- G. ASTM – American Society for Testing and Materials.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide for all wire and cable.

- C. Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

1.5 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Wire and cable routing shown on Drawings is approximate. Route wire and cable as required to meet Project Conditions.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.6 COORDINATION

- A. Coordinate Work under provisions of Section 01039.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 GENERAL

- A. All wires and cables shall be permanently identified, at intervals not exceeding 3 feet, indicating type, size, voltage rating, and manufacturer's name.
- B. All wires and cables shall be continuous and shall be delivered in reels or in coils. Reels and coils shall be plainly marked for complete identification, including the wire or cable size, the number of conductors, the type of wire or cable, length, weight, thickness and character of the insulation, and the name of the manufacturer.
- C. All coils and reels of wires or cables shall carry original date perforated inspection labels of the Underwriter's laboratories, Inc. showing the number of feet and type of wire contained.

2.2 MANUFACTURERS – BUILDING WIRE

- A. General Cable
- B. Southwire Corporation

2.3 BUILDING WIRE

- A. Description: Single conductor insulated wire.

- B. Conductor: Annealed, uncoated copper. All conductors shall be stranded. ASTM designation B-3.
- C. Conductor Temperature Rating: 90°C in wet locations; 90°C in dry locations.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation: ANSI/NFPA 70, Type THWN; high temperature polyvinyl chloride with nylon jacket or Type XHHW-2, high temperature cross-linked polyethylene.

2.4 MANUFACTURERS-VFD LOAD WIRE

- A. Southwire Corp.
- B. Belden
- C. General Cable
- D. Okonite Okoguard-Okolon
- E. Prysmian Cables & Systems

2.5 VFD LOAD WIRE

- A. Description: Single conductor, ANSI/NFPA 70 Type XHHW-2 or Type RHW-2.
- B. Conductor: Annealed copper. All conductors shall be stranded. ASTM designation B-8, B-33, B-172 or B-174.
- C. Conductor temperature rating: 90°C in wet or dry locations; 130°C emergency overload rating.
- D. Insulation voltage rating: 2000 volts minimum.
- E. Insulation: Type XHHW-2 or Type RHW-2, Cross-linked Polyethylene (XLPE).
- F. Shield: Overall copper tape shield with suitable overlap to prevent separation during installation.
- G. Jacket: Sunlight resistant, black overall PVC in accordance with S-95-658/NEMA WC70.
- H. Installation: If unshielded cable is provided, input line reactors must be provided and installed in VFD.

2.6 MANUFACTURERS – INSTRUMENTATION CABLE

- A. Single Pair Cable:
 - 1. Belden No. 8760
 - 2. Southwire Corporation
 - 3. General Cable/Carol Brand No. C2534.

- B. Multiple Pair Cable:
 - 1. Belden No. 9773 through No. 9777
 - 2. Southwire Corporation
 - 3. General Cable/Carol Brand No. C6047-C6051.

- C. Three Conductor Cable:
 - 1. Belden No. 8770.
 - 2. Southwire Corporation
 - 3. General Cable/Carol Brand No. C2535.

2.7 INSTRUMENTATION CABLE

- A. Description, general:
 - 1. Single pair cable shall be a single twisted pair, No. 18 gauge, stranded conductors with shield, drain wire, and overall jacket.
 - 2. Multiple pair cable shall be two or more individual twisted pair, No. 18 gauge, stranded conductors, each pair with shield and drain wire, and an overall jacket.
 - 3. Three conductor cable shall be three No. 18 gauge, stranded conductors with shield, drain wire, and overall jacket.

- B. Underground and General Use Cables:
 - 1. Conductors: Tinned copper.
 - 2. Insulation voltage rating: 300 volts.
 - 3. Insulation material:
 - a. Single pair cable – polyethylene.
 - b. Multiple pair cable – polyethylene or polypropylene.
 - c. Three conductor cable – polyethylene.
 - 4. Shield material: 100 percent aluminum polyester.
 - 5. Drain wire: Stranded, tinned copper.
 - 6. Jacket: Chrome vinyl (PVC).

- C. Riser and Plenum Use Cables:
 - 1. These cables shall be similar to the underground and general use cables specified above, except that the insulation and the overall jacket materials shall be either FEP or PVDF.

2.8 MANUFACTURERS – WIRING CONNECTORS AND ASSOCIATED MATERIALS

- A. Solderless Pressure Connectors:
 - 1. 3M™ Company Model Scotchlok
 - 2. Thomas & Betts Model Sta-Kon
 - 3. Burndy Model Insulug Type TN

- B. Spring Wire Connectors:
 - 1. 3M™ Company Model Scotchlok
 - 2. Ideal Model Wing-Nut

- C. Compression Connectors:
 - 1. 3M™ Company Model Scotchlok

2. Thomas & Betts Model Color-Keyed
 3. Burndy Model Hylug
- D. Tap Connectors:
1. Thomas & Betts Model Color-Keyed
 2. Burndy Model Crimpit
 3. Anderson Model Crimptaps
- E. Watertight, Twist-On Connectors:
1. 3M™ Company Direct Bury Splice Kits
 2. King Innovation “DryConn”
 3. Ideal Industries, Inc. Twister DB Plus
- F. Watertight, Insulated Connector Blocks:
1. Utilco Type USPA-SS, Type PSA-SS, or Type PED-SS
 2. IlSCO Type USPA-SS
- G. Electrical Insulating Tape:
1. 3M™ Company “Scotch” No. 33+
 2. Plymouth “Premium Black”
- H. High Temperature Tape:
1. 3M™ Company “Scotch” No. 70
 2. Plymouth “Plysil”
- I. Fireproofing Tape:
1. 3M™ Company “Scotch” No. 77
 2. Plymouth No. 50
- J. Woven Fiberglass Tape:
1. 3M™ Company “Scotch” No. 69
 2. Plymouth “Plyglas”
- K. Color Coding Tape:
1. 3M™ Company “Scotch” No. 35
 2. Plymouth “Slipknot” No. 45
- L. Insulating and Watertight Sealing Materials:
1. 3M™ Company “Scotchcast” kits
 2. Raychem WCS Series heat shrinkable sleeves
 3. 3M™ Company 8400 Series cold shrink materials
 4. 3M™ Company “Scotchkote” sealant
- M. Watertight Cord Grip Fittings:
1. Crouse-Hinds CGB-SG Series
 2. Appleton Electric Co.
 3. Thomas & Betts
- N. Cable or Cord Strain Relief:

1. Hubbell-Kellems
2. Daniel Woodhead Co.

- O. Cable Pulling Lubricant:
1. American Polywater “Dyna-Blue”
 2. Ideal “Aqua Gel”
 3. Minerallac “Golden Glide”
 4. 3M™ Company “GEL”

2.9 WIRING CONNECTORS AND ASSOCIATED MATERIALS

- A. All wiring connectors shall be 75°C rated and suitable for use on copper conductors.
- B. VFD Cable Fittings:
1. Fittings for terminating at VFDs shall conform to NEMA Standards.
 2. VFD fittings shall be designed to provide termination of armor and shield, if provided.
 3. When installed, VFD fittings shall include set-screws to limit vibrational loosening.
 4. All VFD fittings shall be suitable protected from corrosion and shall be UL listed for use in Type 3R enclosures.
 5. All fittings shall form a water-tight seal to the outer jacket of the cable.
- C. Cable or cord strain reliefs shall consist of stainless steel wire mesh with support bale. Strain reliefs shall be of the split rod type where required or indicated on the Drawings.
- D. Cable Pulling Lubricant:
1. Lubricant shall be UL listed and approved for use on the cable jacket or insulation.
 2. Lubricant shall be polymer based and shall dry completely when exposed to air.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. Interior Locations:
1. Wire for general power, light, and control shall be building wire, Type THWN or Type XHHW-2 insulation, in raceway or metal sheathed or metal clad cable, where indicated.
 2. Cables for instrumentation signals shall be single or multiple pair Instrumentation Cable.

3. All wire for connections between Variable Frequency Controllers and associated motors shall be shielded and shall be VFD Load Wire.

B. Use wiring methods indicated on Drawings.

C. Color Coding:

The color schedule for the conductor insulation of wire and cable shall conform to the following:

1. Three phase lighting and power, 208Y/120 VAC-Black, Red, Dark Blue, White or Gray, and Green ground.
2. Three phase lighting and power, 120/240 VAC-Black, Red, Orange (high leg to ground), White or Gray, and Green ground.
3. Single phase lighting and power, 120/240 VAC-Black, Red, White or Gray, and Green ground.
4. Three phase lighting and power, 480 VAC-Brown, Orange, Yellow, and Green ground.
5. Three phase lighting and power, 480Y/277 VAC-Brown, Orange, Yellow, Gray, and Green ground.
6. DC power – Red with White stripe (+) and Light Blue with White stripe (-).
7. Single conductor control, AC voltage – Red.
8. Multi-conductor control cables – ICEA Method 1.
9. Alarm, annunciator, instrumentation, graphic, and telemetering (if not shielded), AC voltage – Pink.
10. Alarm, annunciator, instrumentation, graphic, and telemetering (if not shielded), DC voltage – Light Blue.
11. Intrinsically safe circuits – Purple.
12. On wire sizes larger than Number 8 AWG and/or where authorized by the Owner, coding may be identified by taping with the appropriate colored self-adhesive vinyl color coding tape.
13. Grounding conductors shall be continuous green or bare for all systems.
14. Neutral conductors shall be continuous white or gray for all systems.

D. The installation of intrinsically safe circuits shall meet all requirements of the NEC.

E. Wiring Connections:

1. Dry location splices and tap connections shall consist of compression connectors or tap connectors, taped to 150 percent of insulation rating of the conductors.
2. Final connections to equipment wire leads for No. 8 AWG and smaller wire in dry locations only, except 480 volt motor leads, may be made with spring wire connectors.
3. Wet and damp location splices and tap connections shall consist of compression connectors or tap connectors with insulating and watertight sealing materials; water tight, twist-on connectors for wire sizes up to three No. 10 AWG; or watertight, insulated connector blocks; providing watertight connections suitable for direct burial.
4. All conductor terminations at screw terminals shall consist of solderless pressure connectors, except where conductor terminations are included with the equipment being connected.

5. Insulation of connections in lighting fixture and high temperature equipment shall consist of silicone rubber type high temperature tape with a woven fiberglass tape over-wrap.
6. Electrical insulating tape (plastic type) shall be used on all splice and tap connections, unless wire manufacturer's recommendations require otherwise.

3.4 INSTALLATION

- A. All wiring shall be run in rigid metal raceway systems, underground conduit systems, or non-metallic FRP conduit systems, unless noted otherwise.
- B. Install products in accordance with manufacturer's instructions.
- C. The minimum size of conductors shall be No. 12 AWG, unless specifically approved and/or shown otherwise on the Drawings.
- D. Use stranded conductors for control circuits, No. 14 AWG minimum, unless shown otherwise on the Drawings.
- E. Multi-conductor underground feeder, branch-circuit, and control cable shall meet the requirements of Article 340 of the National Electrical Code.
- F. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 60 feet.
- G. Use No. 8 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.
- H. Use No. 6 AWG conductors for 20 ampere, 120 volt branch circuits longer than 170 feet.
- I. Use No. 4 AWG conductors for 20 ampere, 120 volt branch circuits longer than 270 feet.
- J. Use No. 3 AWG conductors for 20 ampere, 120 volt branch circuits longer than 420 feet.
- K. Where conductors or cables are to be installed in non-metallic raceway systems, the Contractor shall allow 24 hours, minimum, for all solvents to evaporate after cementing the last joint before pulling wires or cables.
- L. Pull all conductors into raceway at same time. Cable pulling tensions shall not exceed manufacturer's recommended values.
- M. Use suitable wire pulling lubricant for wire, No. 4 AWG and larger, and for all cables. No soap flakes, vegetable oils, clays, or grease shall be permitted in raceways.
- N. Use suitable cable fittings and connectors.
- O. Neatly train and lace wiring inside boxes, equipment, and panelboards. Wires and cables shall be bundled and laced as specified in Section 16190.
- P. All wires and cables routed through manholes, handholes, cable vaults, large pull boxes, and terminal cabinets shall be looped to provide two to three feet (minimum) of slack within the enclosure, where practical.

- Q. Clean conductor surfaces before installing lugs and connectors.
- R. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- S. Wire and cable shall be supported in vertical runs by insulated clamps so that wire or cable weight will not be unduly supported from conductor terminations.
- T. Spade or fork tongue lugs shall not be used, except where approved by the Owner.
- U. Conductor terminations and tap splices within lighting fixture pole/transformer bases shall be suitable for wet or damp locations.
- V. Wires and cables shall, in general, be run continuously, without splicing, from origination to termination. No splices shall be permitted in any feeder circuit, except in outlet, junction, and/or pull boxes, or where specifically noted on the Drawings. Use sufficient length of wire for connecting to equipment without straining. All methods of splicing shall meet cable manufacturer's recommendations. All splices shall be carefully placed in outlet boxes, etc. without crowding. No splicing shall be permitted in signal cables.
- W. Splices and tap connections shall be made in junction boxes only; conduit type fittings shall not be used as junction boxes.
- X. Wires and cables shall be installed in raceways, as indicated on the Drawings or required, and shall provide a complete and operating system.
- Y. All wires and cables shall be tagged as specified in Section 16195.
- Z. Motor control center feeder circuits and distribution panelboard branch circuits shall each be run in individual raceways from source to motor or other load.
- AA. Vertical lengths of wire and cable shall be supported as required by Article 300.19 of the National Electrical Code. Cable weight shall not be unduly supported from conductor terminations.
- BB. Vertical lengths of exposed cable or cord runs over ten feet long shall be supported with a strain relief.
- CC. Where an exposed run of cable or cord enters a box or enclosure, provide a watertight cord grip fitting suitable for the cable or cord diameter.
- DD. All 120 VAC, single phase loads shall be connected to provide a balanced load on the lighting transformers. All 480 VAC, single phase loads shall be connected to provide a balanced load on the 480 VAC, three phase system.
- EE. Make conductor length for parallel feeders identical on each phase leg.
- FF. Feeders shall be connected for correct phase rotation. Where possible, busses shall be connected to result in the "A" or "X" phase being in the north, east, or top position with the other phases following in sequence. The terminals H1, H2, and H3 of transformers shall be

connected to A, B, and C; 1, 2, and 3; or X, Y, and Z conductors, respectively, of incoming feeders.

GG. Final connections to motors and other machinery, equipment and devices in hazardous areas which may be subject to movement or vibration may consist of a loop of mineral-insulated, metal-sheathed cable (Type MI) with UL listed fittings.

HH. All secondary wire and cables run exposed through manholes, handholes, and cable vaults shall be fireproofed, where exposed. Fireproofing of wire and cables shall be accomplished with half lapped taping using fireproofing tape made of heat resistant organic fabric coated on one side with a flame retardant elastomer. The fireproofing tape shall be held in place by spiral wrapping at recommended intervals using woven fiberglass tape.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 16195.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.6 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Sections 01400 and 16960.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.
- E. Verify continuity of each feeder conductor.
- F. All communication cables shall be tested and certified by a qualified third-party after installation in accordance with industry standards, and copies of the certified test results turned over to the Owner.

END OF SECTION

SECTION 16130

BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.
- C. Wireways.

1.2 RELATED SECTIONS

- A. Section 16010 - General Electrical, Instrument, and Control Requirements.
- B. Section 16050 - Basic Electrical Materials and Methods.
- C. Section 16110 - Raceways.
- D. Section 16140 - Wiring Devices.
- E. Section 16160 - Cabinets and Enclosures.
- F. Section 16190 - Supporting Devices.
- G. Section 16195 - Electrical Identification.

1.3 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA OS 2 - Non-metallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate materials, finishes, dimensions, listings, and standards compliance.

- C. Product Data: Provide data for boxes, wireways, and accessories.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Section 01700 - Contract Closeout: Submittals for Project closeout.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70, National Electrical Code.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to the authority having jurisdiction, as suitable for the purpose specified and indicated.
- C. All boxes shall be sized per Article 314 of the National Electrical Code as a minimum.

PART 2 PRODUCTS

2.1 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 16160.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Pull and junction boxes for hazardous areas shall be cast iron alloy, explosion proof, Class I, Division 1, Group D as manufactured by Curlee, Appleton, or equal, except boxes for intrinsically safe circuits may be NEMA Type 4 or non-metallic NEMA Type 4X rated.
- E. Single and two gang pull boxes and junction boxes shall be rust proof, cast metal, Type FD boxes with gasketed covers.
- F. Larger boxes and raceways shall be NEMA Type 4X with stainless steel hardware in all other locations or where indicated on the Drawings, built of Code gauge steel, with angle iron supports and braces. Cable support racks shall be provided where required. Access shall be by means of removable, gasketed screw covers fastened with machine screws.

- G. NEMA Type 4X boxes shall be of corrosion resistant, 304 stainless steel suitable for surface mounting. Barriers shall be provided where indicated on the Drawings or required.
- H. All pull boxes installed below grade within the structures shall be provided with a drain, Crouse-Hinds ECD Universal Series, Appleton, or equal mounted on a bolt-on, gasketed hub or Stahlin Drain Vent on NEMA Type 4X boxes.
- I. In-line pull boxes, where shown on the Drawings, shall be Appleton Type PTC with solid gasket or equal.
- J. Threaded conduit fittings with gasketed covers shall be used for all exposed conduit outlets and boxes.
- K. Conduit bodies and fittings shall be of cast iron, malleable iron, and/or galvanized steel.

2.2 WIREWAYS

- A. Wiring ducts shall be NEMA Type 4X in corrosive locations; or stainless steel, where indicated on the Drawings. Metallic wireways shall be 14 gauge steel raceways and all wireways shall be provided with removable covers held with captive screws. All fittings shall be designed to be used with the ducts to result in an unobstructed system. The ducts and fittings shall be sized as shown on the Drawings. All hardware on stainless steel and non-metallic wiring ducts shall be made of stainless steel.
- B. The wiring ducts shall be as manufactured by Keystone, Hoffman Engineering Co., B-Line, or equal.

2.3 MISCELLANEOUS COMPONENTS

- A. Anti-seize, lubricating, and protective compound shall be Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, Crouse-Hinds HTL, Sanchem, Inc. NO-OX-ID "A Special", or equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify locations of floor boxes and outlets in all work areas prior to rough-in.

3.2 INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install pull boxes and junction boxes in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

- C. Pull boxes and/or junction boxes shall be used in any conduit run where a splice is required. Pull boxes shall be provided every 200 feet of straight run, every 150 feet after 90 degrees of bends, every 100 feet after 180 degrees of bends, and every 50 feet after 270 degrees of bends. More than 270 degrees worth of bends shall not be installed between pulling points in any conduit run.
- D. Pull boxes, auxiliary pull fittings (slip joints), and cable raceways for the pulling, nesting, or concealment of wires or cables shall be provided where indicated on the Drawings and also where required, though not indicated, as specified above.
- E. Mark or label all boxes as specified in Section 16195.
- F. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- G. Enough room shall be supplied in boxes for insulating joints, wires, and bushings, and deep boxes shall be installed where required by the type of fixture or outlet called for on the Drawings.
- H. Wire and cable splices and tap connections shall be made in junction boxes only; conduit type fittings shall not be used as junction boxes.
- I. Electrical boxes are shown on Drawings in approximate locations, unless dimensioned. Adjust box location up to 8 feet, if required to accommodate intended purpose.
- J. Orient boxes to accommodate wiring devices oriented as specified in Section 16140.
- K. Maintain headroom and present neat mechanical appearance.
- L. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07270.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. At each concealed outlet in slabs or walls in dry locations only, a galvanized, pressed steel box of the knockout type, of not less than No. 12 B & S gauge, shall be placed and securely fastened. The conduits shall be fastened to these boxes with lock nuts, inside and outside, and bushings. All unused knockouts or holes must be left sealed.
- Q. Support boxes independently of conduit.
- R. Use gang box where more than one device is mounted together. Do not use sectional box.
- S. Use cast outlet box in exterior locations and wet locations.
- T. Set floor boxes level.

- U. Wall and ceiling mounted pull and junction boxes shall be spaced 1/2 inch minimum out from the wall or ceiling using corrosion resistant channel: Unistrut; Grinnell "Power-Strut", or other approved corrosion resistant spacers.
- V. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
- W. The threads of all corrosive area, hazardous area, outdoor, and below grade equipment connections including conduit, conduit fittings, pull and junction box covers, lighting fixture reflector, guard, and outlet box connections, wiring device boxes, etc. shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly.
- X. All metallic, except stainless steel, pull boxes, junction boxes, outlet boxes, and other exposed metal components installed in areas classified as hazardous and in corrosive areas shall be factory encased in polyvinyl chloride of minimum .040 inch (40 mil) thickness. Where factory PVC coating is not available or where PVC coating would void UL listing or labeling, factory or field coating with a corrosion resistant, epoxy paint shall be provided.

3.3 ADJUSTING

- A. Section 01700 - Contract Closeout: Adjusting installed work.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

3.4 CLEANING

- A. Section 01700 - Contract Closeout: Cleaning installed work.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16160
CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal boxes.
- D. Accessories.

1.2 RELATED SECTIONS

- A. Section 16010 - General Electrical, Instrument, and Control Requirements.
- B. Section 16050 - Basic Electrical Materials and Methods.
- C. Section 16110 - Raceways.
- D. Section 16130 - Boxes.
- E. Section 16190 - Supporting Devices.
- F. Section 16195 - Electrical Identification.

1.3 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- C. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

- D. Certified shop drawings and diagrams shall be furnished by the Contractor and delivered to the Owner for approval as follows:
 - 1. General dimensions and outline drawings showing the principal dimensions of the equipment and the location and size of electrical conduit connections.
 - 2. Detailed drawings, descriptive data, and other data sheets showing design information which verified that the equipment meets the technical requirements of the Specifications.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide three (3) of each cabinet key.

PART 2 PRODUCTS

2.1 CABINETS AND HINGED COVER ENCLOSURES

- A. Manufacturers: Manufacturers and model numbers of cabinets, enclosures, and associated components shall be as follows:
 - 1. Cabinets and Enclosures: Hoffman Engineering Co., Saginaw Controls, Stahlin, or Hammond.
 - 2. Anti-condensation Heaters: Saginaw Control & Engineering No. SCE-AHC50 or equal.
 - 3. Terminal Blocks: Allen-Bradley No. 1492-CA1, CA3, or -CD8.
 - 4. Substitutions: Items of equal function and performance are acceptable, if in conformance with all sections of this Specification.
- B. Cabinets and enclosures in dry locations shall be dust and oil tight, rated NEMA Type 12, and of 14 gauge (minimum) painted sheet steel construction or comparable non-metallic.
- C. Cabinets and enclosures in wet locations shall be watertight, rated NEMA Type 4, and of 14 gauge (minimum) painted sheet steel construction or comparable non-metallic.
- D. Cabinets and enclosures in corrosive areas shall be water, dust, and sleet tight, rated NEMA Type 4X, and of stainless steel construction or comparable non-metallic.
- E. Doors shall be equipped with a padlockable latch or padlock hasp and shall be provided with one (1) padlock with three keys.
- F. The top, sides, and doors of outdoor cabinets and enclosures shall be insulated with a 2-inch thick layer of extruded polystyrene material.

- G. The doors shall be gasketed.
- H. Provide an internal, mild steel sub-plate for mounting of internal components.
- I. Provide and install two (2) minimum, 120 volt, anti-condensation heaters within each outdoor cabinet or enclosures. The heaters shall be of the self-limiting type, 50 watts, 120 VAC.
- J. Cabinets and enclosures shall be provided with full-length door hinges. Hinges shall be stainless steel and the doors shall have a one point latch.
- K. All interior cabinet or enclosure surfaces, except fittings, shall be painted with two coats of primer and two coats of white, high gloss, baked epoxy enamel paint. The exterior shall be painted with one coat of primer, two coats of ANSI 61 gray paint, and a final coat of clear polyurethane.
- L. Terminal blocks shall be provided for all wiring entering cabinets and enclosures from external devices. Provide 10 percent spare terminals, in addition to those required.
- M. Terminal boxes shall be similar to cabinets and enclosures, except they shall have screw covers in lieu of hinged and latched doors.

2.2 TERMINAL BOXES

- A. Explosion proof terminal boxes for connection of the submersible dewatering and sample pump motor cable(s) shall be provided where shown on the Drawings. The terminal box shall be 12" high by 18" wide by 8" deep minimum with internal mounting plate for terminal blocks, cast iron or cast aluminum with external mounting ears for surface mounting, hinged cover with stainless steel bolts and NEMA Type 4 seal, explosion proof, Class I, Division 1, Group D with bossed, drilled, and tapped conduit entrances as required for conduit and fitting connections as indicated on the Drawings. Explosion proof terminal boxes shall be factory or field coated with a corrosion resistant, epoxy paint.
- B. Terminal blocks for power conductor connections shall be power distribution blocks for connection of copper wire with individual, set screw type connectors for each terminated conductor, Gould Shawmut 66000 Series, Marathon 143 Series, or equal. Terminal blocks for control conductor connections shall be of the screw terminal type, number of blocks as required, Allen-Bradley No. 1492-CA1 with associated mounting devices, Square D, or equal. Control terminal blocks and conductors shall be coated with a conformal coating compound after permanent terminations have been completed. Conformal coating compound shall be Chemtronics Konform, GC Electronics Conkoat, or equal. Provide an engraved, laminated plastic instruction plate, adjacent to the control terminal block, engraved: "RECOAT CONTROL TERMINATIONS WITH CONFORMAL COATING COMPOUND AFTER EACH RETERMINATION OF CONDUCTORS TO PREVENT NUISANCE MOTOR LEAK ALARMS".
- C. Provide an insulating barrier between the power and the control terminations.
- D. Explosion proof terminal boxes shall be Hope Electrical Products Co. H6000 Type, Crouse-Hinds Style C No. EJB181208-N4-MP-S598-S391, or equal.

2.3 ENCLOSURE ACCESSORIES

- A. All hardware on the exterior of NEMA Type 4 and NEMA Type 4X enclosures, including hinge pins, screws, bolts, nuts, washers, etc., shall be made of 300 series stainless steel.
- B. Combination drain and breather shall be Crouse-Hinds ECD Combination Series, Appleton, or equal. Combination drain and breather shall be Stahlin Drain Vent or equal on NEMA Type 4X enclosures.
- C. Anti-seize, lubricating, and protective compound shall be Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, Crouse-Hinds HTL, Sanchem, Inc. NO-OX-ID "A Special", or equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify installation conditions under provisions of Section 01039.
- B. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.
- D. All equipment installed in hazardous areas shall be provided in explosion proof enclosures, except equipment listed as intrinsically safe may be provided in NEMA Type 4 or non-metallic NEMA Type 4X enclosures. All explosion proof enclosures shall be factory or field coated with a corrosion resistant finish.
- E. NEMA Type 4 and Type 4X enclosures in other than corrosive areas shall be equipped with a combination drain and breather. The drain shall be mounted on a bolt-on, gasketed hub.
- F. All internal cabinet and enclosure components shall be mounted on the sub-plate positioned for easy access, convenient wiring, and for easy removal.
- G. Convenience receptacle mounted within cabinets and enclosures shall be mounted in a handy box with a cover plate.
- H. See Section 16110, Raceways for conduit entrance to cabinets and enclosures requirements.
- I. Mark or label all boxes, cabinets, and enclosures as specified in Section 16195.

- J. The threads of all corrosive area, hazardous area, outdoor, and below grade equipment connections including conduit, conduit fittings, pull and junction box covers, cable fittings, etc. shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly.
- K. Cabinets and enclosures shall be mounted to walls, columns, machine frames, etc., with 1/2" separation from same, and all necessary spacers, brackets, structural pieces, inserts, anchors, and bolts shall be provided.
- L. Termination of the submersible dewatering and sample pump motor cable(s) at the terminal box shall incorporate a cord connector, a sealing fitting, and an explosion proof union fitting for each cable. The end of the cable's overall jacket shall be potted within the seal-off fitting in accordance with Article 501.5(D) of the National Electrical Code. The cable's overall jacket shall be stripped back to provide sufficient lengths of individual conductors for proper termination within the terminal box.

END OF SECTION

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SECTION 16170
GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.2 RELATED SECTIONS

- A. Section 16010 - General Electrical, Instrument, and Control Requirements.
- B. Section 16050 - Basic Electrical Materials and Methods.
- C. Section 16960 – Electrical Testing and Equipment.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 GROUNDING ELECTRODE SYSTEM

- A. Metal underground utility piping.
- B. Metal frame of the building.
- C. Ground loops, risers, and conductors.
- D. Rod electrodes.
- E. Ground mat.

1.5 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.
- B. In the event that the ground resistance is not 5 ohms or less, additional rods or longer rods shall be installed or the soil treated to reduce its resistance by approved practices. All ground resistance measurements shall be made using the fall-of-potential method only and test reports shall be provided as specified under Section 16960, Electrical Testing and Equipment.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate facility's overall resistance to ground.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations of grounding electrodes.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MECHANICAL CONNECTORS

- A. All compression connectors, lugs, etc., used in grounding circuits in any location shall have bolts, nuts, etc., of silicon bronze alloy equal to "Everdur" metal. Grounding connections, clamps, etc., shall be as manufactured by Burndy Engineering Company, Thomas and Betts Company, Delta-Star Electric Company, Harger, or equal.
- B. Fittings for bonding a grounding conductor to metallic conduit shall be Thomas and Betts Series 3900BU or equal. Fittings for bonding a grounding conductor to its own conduit shall be Burndy Engineering Company GAR-BU Series, Thomas and Betts Series 3900, Harger, or equal.
- C. Where connections to ground rods or ground mats must be disconnected for testing, the fittings shall be Burndy Engineering Co. Type GD, GG, GAR; Thomas and Betts Co. Series 3902BU; Harger; or equal.

2.2 EXOTHERMIC CONNECTIONS

- A. Connections to steel, between conductors, and for water stops shall consist of exothermic welding similar and equal to Burndy Engineering Company's "Thermoweld", Erico Products, Inc. "Cadweld Kits", Thomas & Betts Corp. "Furseweld", or Harger.

2.3 CONDUCTORS

- A. Grounding conductors, loops, and risers shall be bare, stranded, soft-drawn copper and shall be of the sizes indicated on Drawings.
- B. All bonding jumpers shall be copper and of a cross-sectional area at least equal to their corresponding grounding conductors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Rod electrodes shall be driven into undisturbed earth or engineered backfill only.
- C. Provide bonding to meet Regulatory Requirements.
- D. The non-current carrying parts of all electrical equipment installed under this Contract, including but not limited to raceways, raceway supports, and equipment enclosures, shall be bonded by means of bare copper cable or copper strap to the grounding system as shown on the Drawings and specified hereinafter.
- E. All underground, metallic, service piping (water, gas, etc.) shall be solidly connected to the building grounding system with a No. 4/0 AWG grounding conductor (minimum) at the piping's entrance to the building.
- F. All exposed, including painted or coated, structural and architectural metal shall be bonded to the grounding system or rigidly secured to and in good electrical contact with grounded metal.
- G. All grounding cables, bus, etc., in locations where subject to mechanical damage, shall be protected by rigid metal conduit, steel guards, non-metallic conduit, or other suitable shield. In all cases, where conduit or other metallic encasement of grounding conductors is required, the conductor shall be permanently and effectively grounded to the enclosure at both ends of its length. This requirement applies to all such enclosures regardless of their length.
- H. Where grounding conductors pass through floor slabs, building walls, etc., and are not encased in the concrete pour, sleeves of rigid metal conduit or non-metallic conduit of the required size, shape, and length shall be provided with both ends of the sleeve sealed with duct seal after installation of the grounding conductor.

- I. Where grounding conductors pass through a concrete pour (encased), from underground to the interior of a structure, an exothermic water stop shall be provided on the grounding conductor within the pour.
- J. Where attached to equipment, conduits, cabinets, etc., suitable approved solderless lugs, compression connectors, or clamps shall be used. No soldered connections shall be used on grounding circuits at any point.
- K. Where a grounding cable is to be bonded to structural or architectural metal, the exact location of each bond shall be approved by the Owner. The location of such grounding connections shall be at points where they will not be subject to mechanical damage and, if possible, shall be accessible for inspection.
- L. Where welding to steel is prohibited, the grounding conductor shall be bolted directly to the steel as approved by the Owner. The contact surfaces of all bolted connections shall be thoroughly cleaned and coated with Alcoa No. 2 Electrical Joint Compound or equal.
- M. Taps and splices in grounding cables and connections to ground rods shall be made by an exothermic weld process.
- N. All metal ducts, conduits, starters, panels, switches, etc., which are not rigidly secured to and in good electrical contact with the grounded structural metal frame of the building or grounded conduit system, or which are subject to excessive vibration and loosened ground contacts, shall be securely bonded to grounded building steel or to the grounded conduit system by means of stranded copper jumpers. This jumper shall have a circular-mil cross section of not less than 50 percent of that of the largest conductor entering the enclosure being grounded, with a minimum size of No. 8 AWG stranded copper being used in any jumper.
- O. Conduits which run to boxes or cabinets having concentric or eccentric knockouts which partially perforate the metal around the conduit and impair the electrical connection to ground shall be provided with approved bonding jumpers. Jumpers shall consist of a stranded, braided copper wire at least No. 8 AWG with solderless indent type lugs. Jumper shall be connected from a grounding type locknut or bushing on the conduit inside the box to a stud or silicon bronze alloy bolt in the cabinet frame.
- P. All metal support racks for electrical equipment and enclosures shall be securely bonded to grounded building steel or the grounding system with a No. 2 AWG grounding conductor.
- Q. A copper ground conductor shall be carried for each power, lighting at 120 volts and higher, and receptacle circuit with the circuit conductors. The ground conductor shall have the same type insulation as the circuit conductors and shall be green in color through No. 10 AWG and bare copper wire for larger sizes.
- R. Switchgear, motor control center, distribution panelboard, and automatic transfer switch grounding shall consist of ground connections to feeder conduits, ground busses, etc. as required or as indicated on the Drawings.
- S. Splices in wire or cable ground leads shall not be permitted.

3.3 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

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SECTION 16190
SUPPORTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Conduit and equipment supports and hangers shall be made of galvanized structural steel, with welded or bolted joints. Conduit and equipment supports and hangers shall be fabricated from "Unistrut" Series P1000 galvanized channels and fittings, as manufactured by the Unistrut Products Company, Superstrut A-1200 Series, Grinnell "Power-Strut" PS-200, or equal.

- D. All conduit and equipment supports, hangers, beam clamps (no "C" clamps shall be allowed), and other similar devices made of steel shall be hot dipped galvanized or sherardized after fabrication. All hanger rods, U-bolts, bolts, nuts, and other threaded support components shall be electro-galvanized (per ASTM-B633 Type III SC1) or sherardized. Field cuts and all welds shall be coated with an approved cold or hot galvanizing compound: Z.R.C., CRC Chemicals Zinc-It, or equal. All hanger rods shall be 3/8 inch diameter minimum. All such hardware shall be factory encased with polyvinyl chloride (PVC) of minimum .040 inch (40 mil) thickness where indicated on the Drawings and where indicated elsewhere in Division 16. All touch-up required in the field shall be in strict accordance with the manufacturer's printed instructions.
- E. Concrete inserts shall be of the continuous channel or spot type. The channel type shall be No. 12 gauge steel with integral anchors, Super Strut No. C-302, Kindorf No. D-990, or equal. Spot inserts shall be Super Strut No. 452, Kindorf No. D-255, or equal.
- F. Threaded anchors for use in concrete shall be self-drilling type expansion anchors made of case hardened and drawn carburized steel. The anchors and expander plugs shall be furnished with a rustproof finish. The expansion anchors shall be concrete fasteners as manufactured by the ITW "Red Head", Ideal Industries Co., or equal.
- G. Threaded anchors for heavy loads (i.e.: panels, transformers, disconnect switches) supported from masonry or precast concrete panels shall be epoxy based adhesive anchors with threaded rod and screen tube. Adhesives shall match the application, as recommended by the anchor manufacturer. Threaded rods, nuts, and washers shall be furnished with a rustproof finish. Adhesive anchors shall be Hilti Type HIT or equal.
- H. Anchors for light loads (i.e.: conduit clamps, outlet boxes, small pull and junction boxes) supported from masonry or precast concrete panels shall be lead type or plastic expansion anchors with corrosion resistant screws.
- I. Threaded rods, nuts, washers, screws, and bolts for anchors used in areas classified as hazardous and in corrosive areas shall be made of 316 stainless steel. Also expansion anchors for light loads used in masonry or precast concrete panels in these areas shall be plastic only.
- J. Anti-seize, lubricating, and protective compound shall be Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, Crouse-Hinds HTL, Sanchem, Inc. NO-OX-ID "A Special", or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions. Tighten all bolted connections to manufacturer's recommended torque values with compensation for lubricated threads (anti-seize, lubricating and protective compound applied) to avoid over-torqueing.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

- C. Do not anchor supports from pipes, ducts, mechanical equipment, or conduit.
- D. Do not use spring steel clips and clamps.
- E. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- F. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.
- J. All electrical enclosures, including raceways, boxes, panelboards, motor control equipment, etc., shall be securely attached to the building or structure walls by means of concrete inserts or expansion anchors, unless indicated as rack mounted on the Drawings or of free standing design. Unless otherwise indicated, all electrical enclosures, except conduit and outlet boxes, shall be spaced at least 1/2 inch from the wall or ceiling with Unistrut, Grinnell "Power-Strut", or equal.
- K. The use of wood plugs for anchoring raceways, cabinets, enclosures, or equipment to concrete or masonry will not be permitted.
- L. The Contractor shall provide and install, where required, the additional steel to adequately support all conduits, boxes, and all other electrical equipment.
- M. All wires and cables shall be laced when entering or leaving pull or junction boxes and at each termination. Wires and cables shall be laced so that the wires of the individual circuits are laced together by circuit. All wiring entering and exiting electrical enclosures shall be bundled into groups. Power, lighting, control, alarm, annunciator, and instrumentation wiring shall be bundled and laced as specified herein.
- N. The threads of all corrosive area, hazardous area, outdoor, and below grade support connections shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.2 RELATED SECTIONS

- A. Section 09900 - Painting.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide catalog data for nameplates, labels, signs, diagrams, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. The nameplates shall be 1 1/4" high by 3 1/2" wide (minimum), except pushbutton and selector switch stations and other enclosures where space is limited may have smaller plates of suitable size, and shall be attached to the equipment by means of corrosion resistant screws. Nameplates may be attached to equipment located in dry, interior areas by means of pressure sensitive, firm acrylic adhesive tape, 3M "Scotch" No. 468 or equal. The plates shall be white laminated plastic with engraved black letters approximately 3/32" thick with beveled edges. Engraved letters shall be 1/8" high (minimum), block type.

- B. Circuit number markers shall consist of self adhesive vinyl cloth or polyvinyl fluoride film markers with 1/8" high (minimum), black lettering on a yellow background, W. H. Brady Co. 3410 Series, Ideal Industries 44-500 Series and 44-600 Series, or equal. Circuit number markers may also consist of computer or typewriter generated, vinyl cloth, permanent, non-smearing, self-adhesive markers such as Brady Datab, BradyMarker XC Plus, 3M Scotchcode SCS or STS, or equal. Circuit number markers for panelboard circuit breakers may be the manufacturer's standard.

2.2 WIRE MARKERS

- A. Wire and cable tags for use in large pull boxes, large junction boxes shall be made of minimum 1/8" thick white laminated plastic, 1-1/4" by 3-1/2", with black engraved identification in letters 3/64" deep by 3/16" high minimum. Tags shall be drilled at each end and secured twice to each cable by 3/32" minimum diameter polyethylene cord. Tags shall be engraved with the circuit number, equipment served, and associated nominal voltage level.
- B. Wire and cable number tags for use in pull or junction boxes and at termination points shall be computer or typewriter generated, vinyl cloth, permanent, non-smearing, self-adhesive markers such as Brady Datab, Brady Marker XC Plus, or 3M Scotchcode. Pre-printed, vinyl cloth, plastic coated, self-adhesive, tape markers as manufactured by W. H. Brady Co. or 3M Company shall also be acceptable.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive nameplates and labels.

3.2 INSTALLATION

- A. Nameplates shall be installed on the doors or covers of all panels, panelboards, starters, contactors, transfer switches, relays, control devices, signaling devices, and all other electrical equipment furnished under this Contract, except remote mounted pushbutton and selector switch stations, mounted adjacent to identified and associated disconnect switches or other control devices, need not be identified as described herein.
- B. Nameplate engraving for equipment and devices associated with motor control center, motor starters, panelboard, or control panel circuits shall match the engraving indicated in schedules on the Drawings, except nameplates for spare units and devices shall be furnished blank. All other nameplates shall be engraved as follows and shall be included on nameplate schedules submitted to the Owner for approval:
 1. First Line - Process description, equipment served, or area served (if applicable).
 2. Second Line - Equipment or device description.
 3. Third Line - Equipment or device designation number and power source circuit number.
 4. Abbreviations shall be used only where full wording will not fit. See the Drawings for nameplate details.

- C. All devices and equipment powered from lighting panelboards shall be marked with the appropriate circuit number(s). Lighting circuits shall be identified on switch cover plates, receptacles on cover plates, and other devices on enclosure door or on associated disconnect switch door or cover.
- D. The entire raceway system for intrinsically safe circuits shall be labeled "Intrinsic Safety Wiring" per National Electrical Code Article 504.80(B).
- E. All pull boxes shall be marked with the type of system within them, i.e.: 480V power, alarm, 120V control, etc.
- F. All wires and cables within control panels, motor starters, motor control centers, terminal boxes, etc. shall be tagged at each termination.
- G. The wires and cables of each circuit in pull boxes and junction boxes larger than 12" by 12" by 8" shall be bundled together, neatly arranged, and clearly identified with a tag secured with polyethylene cabling twine indicating circuit number, equipment served, and nominal voltage level.
- H. A system shall be developed and submitted to prevent duplication of wire numbers for all wiring external to equipment. Equipment numbers or designations may be used as prefixes. Interconnecting diagrams shall clearly show wire numbers, originating terminal numbers, and destination terminal numbers.
- I. All enclosures, panels, boxes, and devices containing electrical components and circuits with exposed, energized parts when the door is open, shall have an arc flash and shock hazard warning label affixed to the door. All label blank fields shall be filled in with permanent markers according to the results of the Short Circuit, Flash Hazard, and Protective Devices Coordination Analyses, in Section 16050.
- J. Label or otherwise clearly identify all panelboard branch circuit breakers feeding emergency lighting and exit fixtures as required by National Electrical Code Article 700.12(E).

END OF SECTION

SECTION 16477

FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fuses.

1.2 RELATED SECTIONS

- A. Section 16010 - General Electrical, Instrument, and Control Requirements.
- B. Section 16050 - Basic Electrical Materials and Methods.

1.3 REFERENCES

- A. NFPA 70 - National Electric Code.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data sheets showing electrical characteristics including time-current curves and fuse let-through values for fault current available.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Submit series ratings for fuse and circuit breaker combinations, where applicable.
- C. Provide type II documents for motor starters.
- D. Record actual fuse sizes.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

1.7 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Section 01700.

- B. Provide two fuse pullers.

1.8 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide ten (10) spare fuses of each size and type, rated 600 VAC and lower, installed.
- C. Provide three (3) spare fuses of each size and type, rated higher than 600 VAC, installed.
- D. For additional spare parts requirements, see Section 16010.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Bussmann
- B. Mersen
- C. Edison
- D. Littelfuse

2.2 FUSE REQUIREMENTS

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Fuses shall be dual element or current limiting type, Class R, or as otherwise required for installation in the equipment furnished, and as shown on the Drawings. Fuses shall provide type II protection for motor circuits.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install fuse with label oriented such that manufacturer, type, and size are easily read.
- C. All fuse holders shall be provided with fuses.
- D. The Contractor shall replace all blown fuses and the quantities specified above shall be turned over to the Owner at the time of completion.
- E. Spare fuses shall, be packed and boxed for storing with each box labeled with fuse rating, class, etc.

END OF SECTION

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SECTION 16960

ELECTRICAL TESTING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Division 16 testing requirements.
- B. Test equipment requirements.
- C. Sample forms.

1.2 RELATED SECTIONS

- A. Section 01400 - Quality Control: Manufacturer's Field Reports.
- B. Section 16010 - General Electrical, Instrument, and Control Requirements.
- C. Section 16050 - Basic Electrical Materials and Methods.
- D. Section 16970 – Calibration and Start-up of Systems.

1.3 REFERENCES

- A. All testing methods shall be in conformance with the following documents:
 - 1. National Electrical Code, latest approved edition.
 - 2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
 - 3. NETA Acceptance and Maintenance Specifications and Safety Guidelines.
- B. All equipment shall be tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL, and OSHA, except as modified herein.

1.4 SUBMITTALS

- A. Submit on Products under provisions of Section 01300.
- B. Product Data: Indicate electrical characteristics and specifications; including layout of switches, buttons, displays, dimensions, weights, and external power requirements; and, list cables, connections and all available accessories.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit test results under provisions of Section 01700.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.

- B. Operation Data: Include bound copies of operating and programming instructions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and use of product(s).

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.
- B. Cable testing shall be performed by technicians certified in accordance with ANSI/NETA ETT-2000 Standards for the Certification of Electrical Testing Technicians. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make an informed judgment on the continued serviceability or nonserviceability of the specific equipment. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.

1.8 REGULATORY REQUIREMENTS

- A. Furnish Products listed and classified by Underwriters Laboratories, Inc. (UL), Factory Mutual (FM), and/or Canadian Standards Association (CSA), as specifically indicated, and as acceptable to authority having jurisdiction, as suitable for purpose specified and indicated.
- B. All test instruments and devices shall be in conformance with all applicable standards and requirements of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories. NIST – traceable certificates of calibration shall be provided with each instrument/device.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Accept products on site in factory containers. Inspect for damage. Turn over to Owner immediately.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. The work shall include, but is not limited to, the following major items:
 - 1. Programming.
 - 2. Testing, Start-up, Demonstration, and Training for all electrical, instrumentation and controls equipment and/or systems furnished and installed as a part of Division 16.

PART 3 EXECUTION

3.1 TESTING

- A. The Contractor shall perform all testing necessary to ensure that the work performed under the Contract is satisfactory and in conformity with the requirements of the Contract Documents.
- B. All testing shall be performed prior to start-up of equipment or systems as specified under Section 16970.
- C. All tests shall be witnessed by the Owner's Representative and four (4) copies of all field tests, as specified herein and in other Sections, shall be submitted to the Owner. Twenty-four (24) hours (minimum) written notice shall be given the Owner prior to performing the tests. Such tests shall be scheduled at a time agreed upon by the Owner and the Contractor.
- D. Testing shall include, but shall not be limited to, the following tests:
 - 1. Insulation resistance to ground of all conductors and equipment.
 - 2. Continuity, connections, and integrity of the facility's entire grounding system.
 - 3. Continuity, polarity, phase sequence, and connection of all current carrying conductors and equipment.
 - 4. Ground fault detection systems shall be tested in accordance with the NEC, UL, and manufacturer's recommendations.
 - 5. Power Cable Tests shall be performed by a NETA full member testing company, supervised by a certified NETA testing leader, and made as follows:
 - a. All new 480 volt feeder and branch circuit wires and cables between transformers and all motor control center and distribution panelboard conductors shall be given a dielectric absorption test. The dielectric absorption tests shall be made in accordance with NETA Acceptance and Maintenance Specifications and NETA Safety Guidelines.
 - b. Wire insulation tests shall be made with a 1000 volt megger on 480 volt power distribution cables and/or wires. Each test shall be continued for a time sufficient to charge the cable or wire.
 - 6. The following information shall be included in a test report on each cable:
 - a. Complete identification of cable, including approximate length.
 - b. Approximate average cable temperature.
 - c. Megger readings versus time data, including converted values (480 volt cables only).
 - 7. In order to be acceptable, the cable must withstand the specified high voltage without breakdown or have satisfactory megger readings.
- E. All improper connections, or materials, and equipment not adapted to the purpose for which it is intended, or material, or equipment found to be faulty while performing the tests, shall be corrected; and any changes or repairs necessary to put the work in satisfactory condition and operation shall be done by the Contractor and re-tested at no additional cost to the Owner.

3.2 CONTRACTOR'S ASSISTANCE

- A. Testing of Package equipment, as described in Section 16010, shall be as required in other Sections of this Specification.

- B. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturer's service representatives on any and all field test and adjustments as may be made or required by equipment manufacturers or the Contractor as the equipment is put into service. The Contractor shall make equipment manufacturers' service representatives available as required to assist in testing or putting equipment into operation.

3.3 DEMONSTRATION

- A. After acceptance of the test equipment, the Owner's operators shall be provided with one day (in two ½ day sessions) of on site training in the use and maintenance of each piece of the equipment. The training shall cover the operation of the test equipment, preventative maintenance of all equipment, and trouble-shooting and repair/replacement procedures.

END OF SECTION

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CABLE TEST CERTIFICATE

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____
 Address: _____ Phone No.: _____

2.0 CABLE IDENTIFICATION

Cable Designation or Circuit No.: _____
 Cable Source _____ Air Temperature _____
 Termination Point _____ Humidity _____
 Connected Equipment _____ Equipment Temperature _____
 Test Voltage _____ No. of Conductors _____ Age _____
 Length _____ Size _____ Operating Voltage _____
 Cable Type _____ Rated Voltage _____ Ground Type _____
 Manufacturer _____ Insulation Type _____
 Insulation Thickness _____ Installed In _____
 Conductor Material _____

Phase Color Identification

Phase A: _____ Phase B: _____ Phase C: _____

3.0 TEST INSTRUMENT

Manufacturer _____ Model No. _____

4.0 POWER CABLE TEST – MEGGER TEST

Time Minutes	Phase A Megohms		Phase B Megohms		Phase C Megohms	
	Before	After	Before	After	Before	After
.25						
.50						
.75						
1.00						
1.25						
1.50						
1.75						
2.00						
2.25						
2.50						
2.75						
3.0						
4.0						
5.0						

5.0 CERTIFICATION

I certify that the above information is correct and that the cable installation and condition conforms to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature: _____ Date: _____

6.0 ENGINEER REVIEW

Test Witnessed: Yes No Reviewer Signature: _____ Date: _____

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SECTION 16970

CALIBRATION AND START-UP OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for Setup and Calibration of devices and instruments.
- B. Requirements for Start-up of Systems furnished/installed under this Contract.
- C. Calibration equipment requirements.
- D. Sample Forms.

1.2 RELATED SECTIONS

- A. Section 01400 - Quality Control: Manufacturer's Field Reports.
- B. Section 16010 - General Electrical, Instrument, and Control Requirements.
- C. Section 16050 - Basic Electrical Materials and Methods.
- D. Section 16960 - Electrical Testing and Equipment.

1.3 REFERENCES

- A. All setup, calibration, and workmanship shall be in conformance with the following documents:
 - 1. National Electrical Code, latest approved edition.
 - 2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
- B. All equipment shall be designed, constructed, installed, tested and calibrated in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL, and OSHA.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Indicate electrical characteristics and specifications; including layout of switches, buttons, displays, dimensions, weights, and external power requirements; and, list cables, connections and all available accessories.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit calibration, setup and programming documentation under provisions of Section 01700.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Operation Data: Include bound copies of operating and programming instructions. Include component parts replacement, adjustments, and preventative maintenance procedures and materials.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and use of product(s).

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Furnish Products listed and classified by Underwriters Laboratories, Inc. (UL), Factory Mutual (FM), and/or Canadian Standards Association (CSA), as specifically indicated, and as acceptable to authority having jurisdiction, as suitable for purpose specified and indicated.
- B. All instruments and devices shall be in conformance with all applicable standards and requirements of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Accept products on site in factory containers. Inspect for damage.
- C. Turn products over to Owner immediately.

PART 2 PRODUCTS

None.

PART 3 EXECUTION

3.1 START-UP REQUIREMENTS

- A. Setup, calibration and start-up of equipment and/or systems shall be performed as described below, and per the requirements of the Section under which the equipment/system was furnished.
- B. The Contractor shall also verify operation of the facility's main control and monitoring systems, and coordination with all other equipment and sub-systems.

- C. Prior to scheduling Start-up of any equipment and/or system, the Contractor shall have complied with the requirements of Section 16960, Electrical Testing and Equipment, and shall have submitted reports indicating successful completion of testing for the equipment/system being started.
- D. Prior to energizing and operating any equipment or system, the Contractor shall arrange for the manufacturer's representative to inspect the installation for compliance to the manufacturer's recommendations. As a part of this inspection, the Contractor and/or the manufacturer's service personnel shall set all protective devices as required by the Short Circuit, Flash Hazard, and Protective Devices Coordination Analyses specified under Section 16050.
- E. The Contractor shall energize the equipment/system and perform all setting of equipment limit and safety switches. The calibration of all sensing relays, and all timer/sequencer, etc. settings, along with any programming required for proper operation shall be made at this time. The Contractor shall then start-up the equipment/system and verify the proper operation of all features and functions as required by the Specifications and Drawings.
- F. After completing the above items, the Contractor shall schedule a "Witnessed" Start-up. Twenty-four (24) hours (minimum) written notice shall be given the Owner's Representative prior to performing any Start-up. Start-up shall be scheduled at a time agreed upon by the Owner and the Contractor.
- G. Start-up and operation of the equipment and/or system shall be performed using the manufacturer's Operation and Maintenance Manual. Any deficiencies in the O & M Manual noted during Start-up shall be corrected prior to scheduling the Owner's Demonstration as specified under Section 16980. Start-up will be witnessed by the Owner's Representative.
- H. Verification of the start-up performance of the equipment and/or system shall be provided in the form of a start-up report, indicating that the Owner's Representative witnessed all functions and operations required of the equipment and/or system. Four (4) copies of all Start-up reports, as specified herein and in other Sections, shall be submitted to the Owner.
- I. All improperly functioning equipment not adapted to the purpose for which it is intended, or material, or equipment found to be faulty while performing the tests, shall be corrected; and any changes or repairs necessary to put the work in satisfactory condition and operation shall be done by the Contractor at no additional cost to the Owner. Start-up of the repaired equipment/system shall be witnessed by the Owner's Representative.
- J. Successful and approved completion of the Start-up requirements is a prerequisite to determining whether the Work or a portion of the Work is Substantially Complete as specified under Section 16010.

3.2 CONTRACTOR'S ASSISTANCE

- A. Setup, calibration, and Start-up of Package Equipment as described in Section 16010 shall be as required in other Sections of this Specification.
- B. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturer's service representatives on any and all field tests and adjustments as

may be made or required by equipment manufacturers or the Contractor as the equipment is started up. The Contractor shall make equipment manufacturers' service representatives available as required to assist in putting equipment into operation.

3.3 DEMONSTRATION

- A. After acceptance of the calibration equipment, the Owner's operators shall be provided with one day (in ½-day sessions) of on site training in the use and maintenance of each piece of the equipment. The training shall cover the operation of the calibration equipment, preventative maintenance of all equipment, and trouble-shooting and repair/replacement procedures.

END OF SECTION

\\hrc-engr\general\projdocs\201510\20151005\04_design\project_docs\east ps install

DEVICE SETTINGS CERTIFICATE
FOR VARIABLE FREQUENCY CONTROLLER

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____
Address: _____ Phone No.: _____

2.0 EQUIPMENT IDENTIFICATION

VFD Designations: _____

3.0 DEVICE SETTINGS

Attach manufacturer's form(s), with settings filled in, whenever available.

SETTINGS						
Device ID:	VFD #					
Manufacturer						
Model No.						
Accel Time (seconds)						
Decel Time (seconds)						
Minimum Speed (Hz)						
Maximum Speed (Hz)						
Current Limit (%)						
Manual Torque Boost (%)						
V/Hz Base Speed (Hz)						
RPM at Base Speed						
Output Relay Configured to						
Carrier Frequency (kHz)						
Remote Reference Gain (%)						
Remote Reference Offset (%)						
Electronic Thermal Overload (%)						
Electronic Thermal Overload Trip (on/off)						
Coast Stop Feature (on/off)						
Reverse (on/off)						
RPM Setpoint Feature (on/off)						
Power-Up Start Feature (on/off)						
Password Lockout Feature (on/off)						
Avoidance Frequency (Hz)						
Avoidance Bandwidth (Hz)						
Multi-Speed Preset 1 (Hz)						
Multi-Speed Preset 2 (Hz)						
Multi-Speed Preset 3 (Hz)						
Auto-Restart Number of Attempts						
Auto-Restart Retry Wait Time (seconds)						
Analog Output Configured to						

4.0 CERTIFICATION

I certify that the above information is correct and that the device installation and settings conform to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature _____ Date: _____

5.0 ENGINEER REVIEW

Setting Witnessed: Yes No Reviewer Signature _____ Date: _____

SECTION 16980

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for Demonstration of equipment and/or systems for the Owner's personnel.
- B. Requirements for Training of Owner's personnel in the operation and maintenance of the equipment/system.

1.2 RELATED SECTIONS

- A. Section 01400 - Quality Control: Manufacturer's Field Reports.
- B. Section 01700 - Contract Closeout.
- C. Section 01800 - Training.
- D. Section 16010 - General Electrical, Instrument, and Control Requirements.
- E. Section 16050 - Basic Electrical Materials and Methods.
- F. Section 16960 - Electrical Testing and Equipment.
- G. Section 16970 – Calibration and Start-up of Systems.

1.3 REFERENCES

- A. All equipment and workmanship shall be in conformance with the following documents:
 - 1. National Electrical Code (NEC), latest approved edition.
 - 2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
- B. All equipment shall be designed, constructed, installed, and tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL and OSHA, except as modified herein.

PART 2 PRODUCTS

None.

PART 3 EXECUTION

3.1 DEMONSTRATION OF EQUIPMENT

- A. Demonstration of equipment and systems, and training of the Owner's personnel in the proper operation and maintenance of the equipment and systems, shall be performed as required under Section 01800, as described below, and per the requirements of the Section under which the equipment/system was furnished.
- B. The following shall occur prior to scheduling demonstration and training of any equipment and/or system:
 - 1. The Contractor shall have fully complied with the requirements of Section 16970, Calibration and Start-up of Systems, and shall have submitted reports indicating successful completion of start-up for the equipment/system being started.
 - 2. Any deficiencies in the manufacturer's Operation and Maintenance (O&M) Manuals and/or "As-Built" drawings, noted during Start-up shall be corrected prior to scheduling the Owner's Demonstration and Training, as required per Section 16970.
 - 3. The Contractor shall submit for approval a proposed agenda for said demonstration/training, and shall adhere to the approved agenda for the demonstration and training session(s).
 - 4. Any and all test equipment, maintenance equipment, tools, or devices, and/or spare parts required to be furnished under Division 16 shall be turned over, and stored as required under Sections 01700 and 16010.
- C. After completing the above items, the Contractor shall schedule the Owner's Demonstration and Training. Seventy-two (72) hours (minimum) written notice shall be given the Owner's Representative prior to performing any Demonstration and/or Training. Such sessions shall be scheduled at a time agreed upon by the Owner and the Contractor. Multiple sessions shall be scheduled to allow attendance by all Owner's Personnel.
- D. The Demonstration shall instruct the Owner's personnel in all facets, features, and functions of the operation of the equipment and/or system. Training shall be performed using the manufacturer's Operation and Maintenance Manual and "As-Built" drawings, and shall familiarize the Owner's personnel in identifying improper operation, troubleshooting for the cause(s), and performing repair, replacement, and recalibration/setup necessary to correct the mis-operation. Use of any test equipment necessary, and a review of any recommended and/or provided spare parts shall be included in the Training.
- E. Verification of the Demonstration and Training for the equipment and/or system shall be provided in the form of a report, indicating that the Owner's personnel attended and witnessed all functions and operations required of the equipment and/or system, and received the required instruction. Demonstration and Training will be witnessed by the Owner's Representative and four (4) copies of all demonstration and training reports, as specified above and in other Sections, shall be submitted to the Owner.
- F. Successful and approved completion of the Demonstration and Training requirements is a prerequisite to determining whether the Work or a portion of the Work is Substantially Complete as specified under Section 16010.

3.2 CONTRACTOR'S ASSISTANCE

- A. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturers' service representatives on any and all field set-ups and adjustments as may be required to demonstrate operation of the equipment or system. The Contractor shall make equipment manufacturers' service representatives available as required to assist in demonstrating equipment operation.

3.3 CLEANUP

- A. Cleanup shall occur as required under Section 01700, and as specified under Section 16010.

3.4 ACCEPTANCE

- A. Acceptance shall occur after all the above requirements have been satisfied, and as per Section 01700.
- B. Acceptance of equipment and/or systems shall be signified by execution of Guarantees as described below.

3.5 GUARANTEES

- A. The equipment and installation furnished under Division 16 shall be guaranteed for a period of one (1) year as specified under Section 01700, Contract Closeout.
- B. The Contractor's Guarantee shall be furnished as follows:
 - 1. Provide multiple copies.
 - 2. Execute for Owner's signature a certificate of Contractor's guarantee, listing date of acceptance as start of warranty period (except where indicated otherwise under the detailed equipment specifications), for all work and materials provided and installed under this Division.*
 - 3. Execute and assemble any and all transferable warranty and/or license documents from Subcontractors, suppliers, and manufacturers.
 - 4. Provide Table of Contents and assemble in three D, side ring binder with durable plastic cover.
- * For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of Owner's acceptance as start of warranty period.
- C. The Owner's dated signature on these documents shall constitute acceptance for warranty purposes.

END OF SECTION

SECTION IV/06

INSPECTION REPORT: Building No. 02-06

Appendix I - Homogeneous Area

Appendix II - Laboratory Analysis

Appendix III - Hazard Assessment

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
Water Pollution Control Facilities
Mr. Mark A. Fulks
27 September 1989

T.E.C. Report Number: 18509-1

BUILDING DESCRIPTION

NAME: East Pumping Station including East/West Stairwells
and Support Buildings

ADDRESS: G-4652 Beecher Road
Flint, Michigan 48504

PHONE NUMBER: (313) 766-7149

YEAR CONSTRUCTED: 1982

SQUARE FOOTAGE: 23,197

NUMBER OF FLOORS: 1/with 5 story basement

CONSTRUCTION TYPE: Masonry

COMMENTS:

This building contains:

X - Non-Friable ACBM

X - Assumed ACBM

_ - Friable ACBM

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
Water Pollution Control Facilities
Mr. Mark A. Fulks
27 September 1989

T.E.C. Report Number: 18509-1

APPENDIX I

HOMOGENEOUS AREAS

The following table lists the homogeneous areas utilized for sampling purposes at the East Pumping Station, Flint, Michigan.

IDENTIFICATION OF CODES:

- SM = Surfacing Materials
- TSI = Thermal System Insulation
- MM = Miscellaneous Material
- ACBM = Asbestos-Containing Building Material
- F = Friable
- N = Non-Friable

<u>HOMOGENEOUS AREA</u>	<u>DESCRIPTION</u>	<u>FRIABILITY (F/N)</u>	<u>ACBM (Y/N)</u>	<u>APPROXIMATE QUANTITY</u>
SM - 1	Condensate Tar Insulation on Metal Pipe	N	Y	745 Square Feet
MM - 2	Gray/Brown Wallboard	N	N	52 Square Feet
MM - 3	Fire Doors	N	N	3 Fire Doors
<u>Assumed ACBM</u>				
MM - 4	Flange Joint Gaskets	N	Y	135 Flanges

Note: All accessible straight pipe and pipe joint insulation was foam rubber.

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
 Water Pollution Control Facilities
 Mr. Mark A. Fulks
 27 September 1989

T.E.C. Report Number: 18509-1

APPENDIX II

LABORATORY ANALYSIS

The results of the bulk sample analysis for the East Pumping Station, Flint, Michigan are presented in the following table.

SAMPLE COMPONENTS

NFP = Non-Fibrous Particles
 Chrysotile = Asbestos
 Amosite = Asbestos
 Crocidolite = Asbestos
 Actinolite/Tremolite = Asbestos
 Fiberglass/Mineral Wool = Glass

DATE ANALYZED LAB #/ SAMPLE #	HOMOGENEOUS AREA	LOCATION/ FUNCTIONAL SPACE	SAMPLE LOCATION	SAMPLE TYPE	APPROXIMATE PERCENT COMPOSITION
11-15-89 T27922 02-06-001	SM - 1	First Floor F-3	26'-0" West, 3'-0" South of Fire Extinguisher #17, Elevation 705'-6"	Condensate Tar Insulation	Black, Compact, Resinous (100%): 20% Chrysotile 80% NFP
11-15-89 T27923 02-06-002	SM - 1	Second Floor F-4	10'-2" West, 3'-0" North of Fire Extinguisher #19, Elevation 694'-6"	Condensate Tar Insulation	Black, Compact, Resinous (100%): 10% Chrysotile 90% NFP
11-15-89 T27924 02-06-003	SM - 1	Fifth Floor (Pump Floor) F-7	Off Pump #2, 10'-6" West, 3'-6" North of Fire Extinguisher #22, Elevation 658'-0"	Condensate Tar Insulation	Black, Compact, Resinous (95%): 10% Chrysotile 90% NFP ----- White, Compact, Fibrous (5%) 2% Chrysotile 86% Cellulose 10% NFP 2% Polymer Fibers

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
 Water Pollution Control Facilities
 Mr. Mark A. Fulks
 27 September 1989

T.E.C. Report Number: 18509-1

<u>DATE ANALYZED</u> LAB #/ SAMPLE #	<u>HOMOGENEOUS AREA</u>	<u>LOCATION/ FUNCTIONAL SPACE</u>	<u>SAMPLE LOCATION</u>	<u>SAMPLE TYPE</u>	<u>APPROXIMATE PERCENT COMPOSITION</u>
11-15-89 T27925 02-06-004	MM - 2	Ground Floor F-2	1'-9" South of Fire Extinguisher #11, Elevation 715'-4"	Wall-board	Brown, Hard, Compact, Fibrous, Painted Blue (100%): 90% Cellulose 10% NFP
11-15-89 T27926 02-06-005	MM - 2	Ground Floor F-2	5'-9" South of Fire Extinguisher #11, Elevation 719'-10"	Wall-board	Brown, Hard, Compact, Fibrous, Painted Gray (100%): 95% Cellulose 5% NFP
11-15-89 T27927 02-06-006	MM - 2	Tunnel Area of East Building F-9	4'-0" East From Unit Heater #12, Elevation 704'-0"	Wall-board	Brown, Hard, Compact, Fibrous (100%): 90% Cellulose 10% NFP

* * * * *

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
 Water Pollution Control Facilities
 Mr. Mark A. Fulks
 27 September 1989

T.E.C. Report Number: 18509-1

APPENDIX III

HAZARD ASSESSMENT

The following table summarizes the material condition assessment for each Asbestos-Containing Building Material (ACBM) present in each Functional Space at the East Pumping Station, Flint, Michigan.

ACBM Category

1. Damaged or significantly damaged thermal system insulation ACBM
 2. Damaged friable surfacing ACBM
 3. Significantly damaged friable surfacing ACBM
 4. Damaged or significantly damaged friable miscellaneous ACBM
 5. ACBM with potential for damage
 6. ACBM with potential for significant damage
 7. Any remaining friable ACBM or suspect friable ACBM
- (-) Indicates materials not ACBM

<u>Functional Space/ Room</u>	<u>Homog. Area No.</u>	<u>ACBM Category</u>	<u>Mat'l Cond.</u>	<u>Pot. for Contact</u>	<u>Influ. Of Vibr.</u>	<u>Pot. For Air Eros.</u>	<u>Pot. Dist.</u>
F-1 Raking Room							
No Suspect ACBM Present.							
F-2 Motor Room Floor	MM-2 MM-3	- -	---- ----	----- -----	----- -----	--- ---	----- -----
F-3 First Floor	SM-1 MM-4	5 5	Good Good	Moderate Low	Low Low	Low Low	Moderate Low
F-4 Second Floor	SM-1 MM-4	5 5	Good Good	Moderate Low	Low Low	Low Low	Moderate Low
F-5 Third Floor	SM-1 MM-4	5 5	Good Good	Moderate Low	Low Low	Low Low	Moderate Low

TESTING ENGINEERS & CONSULTANTS, INC.

City of Flint
 Water Pollution Control Facilities
 Mr. Mark A. Fulks
 27 September 1989

T.E.C. Report Number: 18509-1

APPENDIX III (cont'd)

<u>Functional Space/Room</u>	<u>Homog. Area No.</u>	<u>ACBM Category</u>	<u>Mat'l Cond.</u>	<u>Pot. for Contact</u>	<u>Influ. Of Vibr.</u>	<u>Pot. For Air Eros.</u>	<u>Pot. Dist.</u>
F-6 Fourth Floor	SM-1 MM-4	5 5	Good Good	Moderate Low	Low Low	Low Low	Moderate Low
F-7 Fifth Floor	SM-1 MM-4	5 5	Good Good	Moderate Low	Low Low	Low Low	Moderate Low
F-8 Electrical Room			No Suspect ACBM Present.				
F-9 East Stairwell and Tunnels	MM-2 MM-4	- 5	----- Good	----- Low	----- Low	----- Low	----- Low
F-10 Bathroom			No Suspect ACBM Present.				
F-11 East Stairwell Building	MM-3 MM-4	- 5	----- Good	----- Low	----- Low	----- Low	----- Low

* * * * *



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SUBMITTAL FOR REVIEW/APPROVAL

CITY OF FLINT
EAST PUMP STATION
QTY (4) FLYGT DRY PIT PUMPS

ENGINEER: HUBBELL, ROTH & CLARK

CUSTOMER: CITY OF FLINT

Reviewed without comment	
Reviewed exceptions noted	X
Comments attached	X
Reviewed for design concept only	
Rejected	
Reviewed in accordance with specification section 01300 Hubbell, Roth & Clark, Inc. Date <u>01/25/2019</u> By <u>dhansen</u>	
RESUBMITTAL REQUIRED <input checked="" type="checkbox"/> YES <input type="checkbox"/> No	

JANUARY 23, 2019

JOB #96891



KENNEDY
INDUSTRIES

INNOVATE
SOLVE
MONITOR
REPAIR

KENNEDY INDUSTRIES PERSONNEL HAVE DONE ITS DUE DILIGENCE TO ENSURE THAT ALL PROJECT REQUIREMENTS ARE MET BY OUR SUPPLY. THE FOLLOWING DRAWINGS, SPECIFICATIONS & CUT SHEETS ARE THE OFFERINGS THAT WE SUBMIT FOR APPROVAL TO SUPPLY. KENNEDY INDUSTRIES IS A SUPPLIER AND STRIVES TO PROVIDE OUR CUSTOMERS WITH THE HIGHEST QUALITY PRODUCTS AND LEVEL OF SERVICE. IF A CHANGE OR DEVIATION FROM THE FOLLOWING IS DESIRED PLEASE ADVISE US AND WE WILL CHANGE OUR SCOPE OF SUPPLY AS REQUIRED. IF MATERIALS OF CONSTRUCTION OR SCOPE OF SUPPLY CHANGES, IT MAY IMPACT THE CONTRACT PRICE.

PROJECT:	EAST PUMP STATION	JOB #:	96891
KI CONTACT:	NICK HEINTZ / CINDY WOODARD	CUSTOMER:	CITY OF FLINT
OWNER:	CITY OF FLINT	ENGINEER:	HUBBELL, ROTH & CLARK
DATE:	1/23/19	SECTION:	N/A
PUMP TYPE:	VERTICAL DRY-PIT	CONDITION:	9,300 GPM @ 80' TDH
PH/VOLT:	3 PH / 480 V	PIPE DIA:	16"
WW DIA:	N/A	WW DEPTH:	N/A

**PUMP POWER AND
SENSOR CABLE
SHALL BE 100 FEET
FOR EACH PUMP**

NOTES:

QTY.	DESCRIPTION	COMMENTS
4	FLYGT CT3356.766, 490 MM IMP, 250 HP, 3/480V, 16"X14"	TOTAL WT = 4190 LBS
4	FLS	DETECTS MECHANICAL SEAL LEAKS
8	POWER AND SENSOR CABLE (2) CABLES PER PUMP	941997 - 1.54" O.D., EACH 50' LENGTH, (385 LBS)
4	T STAND	
1	MAS-801 CENTRAL UNIT	8230700
4	MAS-801 BASE UNIT	8230600
4	MAS-801 PEM PUMP ELECTRIC MODULE	8230500
4	MAS-801 POWER ANALYZER PAN312	40-501526
1	MAS-801 7" GRAPHICAL PANEL SCREEN	8224800
12	FLYGT CT	14-404115, 600:1



PERFORMANCE CURVE

DATE 2018-09-10	PROJECT: East Flint, MI		ISSUE 47	PROD C 3356/766
NO. OF BLADES..... IMPELLER THROUGHLET... 3 102*102 Circular	TOT.MOM.OF INERTIA..... RATED SPEED..... 5.25 KGM² 1185 RPM	POLES 6 FREQ. 60 HZ VOLTAGE..... MOTOR SHAFT POWER..... STARTING TORQUE..... MAX TORQUE..... RATED CURRENT..... STARTING CURRENT..... 480 V 250hp / 186 kW 2075 NM 4568 NM 282 A 1880 A	CURVE NO 63- 620 IMPELLER DIAMETER 490 mm MOTOR TYPE 43-56-6ID /01 (12) GEAR TYPE RATIO	
MOTOR COS PHI	1/1-LOAD 0.83	3/4-LOAD 0.78	1/2-LOAD 0.66	
MOTOR EFFICIENCY	96.3%	96.7%	96.8%	
GEAR EFFICIENCY				

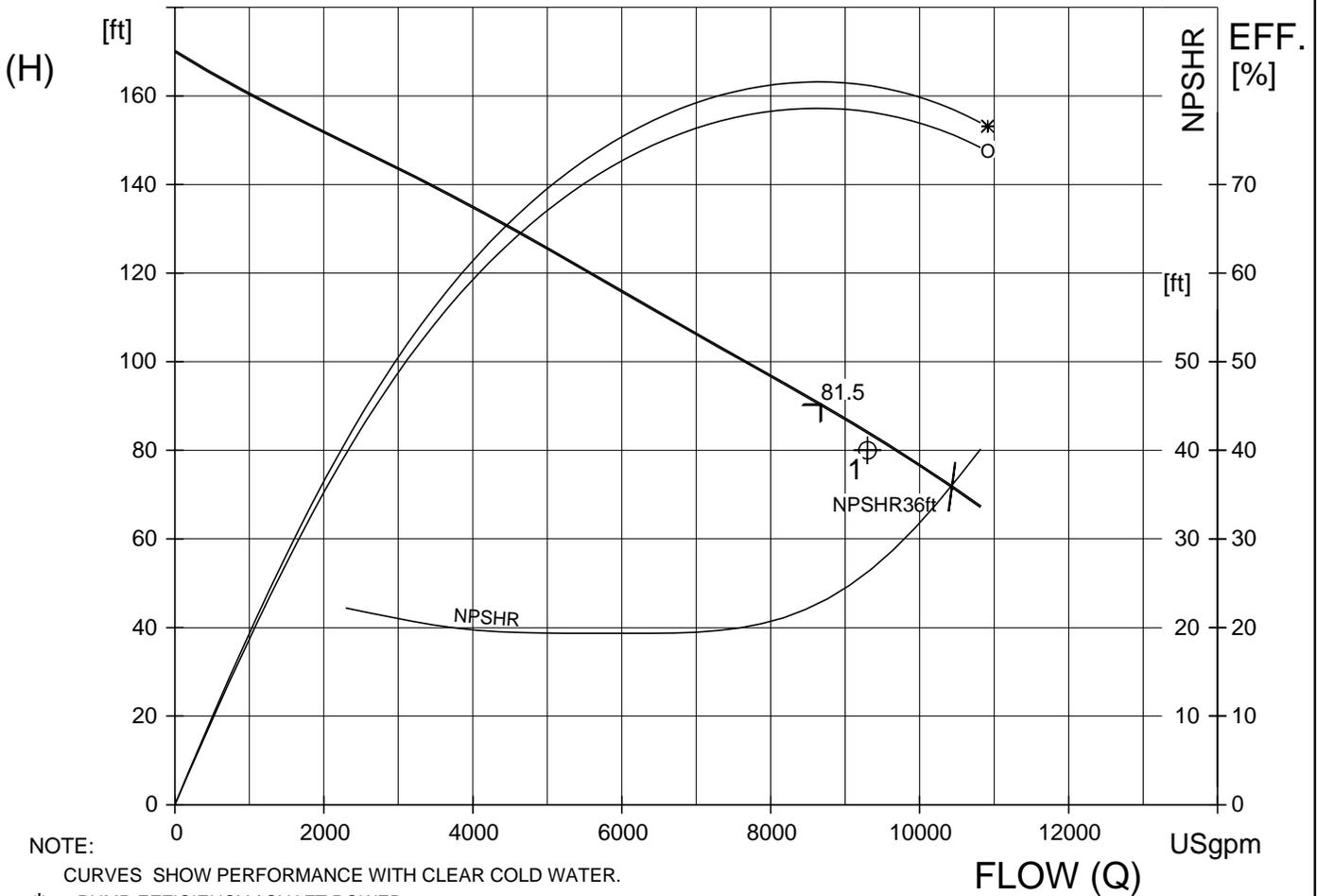
POWER



DUTY POINTs: FLOW[USgpm] HEAD[ft] POWER [hp] EFF. [%] NPSHR[ft] GUARANTEE) * -> No guarantee

HEAD

9300 80.0 (< 258) (<249) * 76.3 (79.5) * 28.4 HI grade 1U eff. (ANSI/HI 11.6:2012)



NOTE:

CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER.

* : PUMP EFFICIENCY / SHAFT POWER

O : OVERALL EFFICIENCY / INPUT POWER

NPSHR = NPSH3 + min. operational margin

UNIX AUTHOR: fus109 PECU rev:21.10 /CJPC

USA



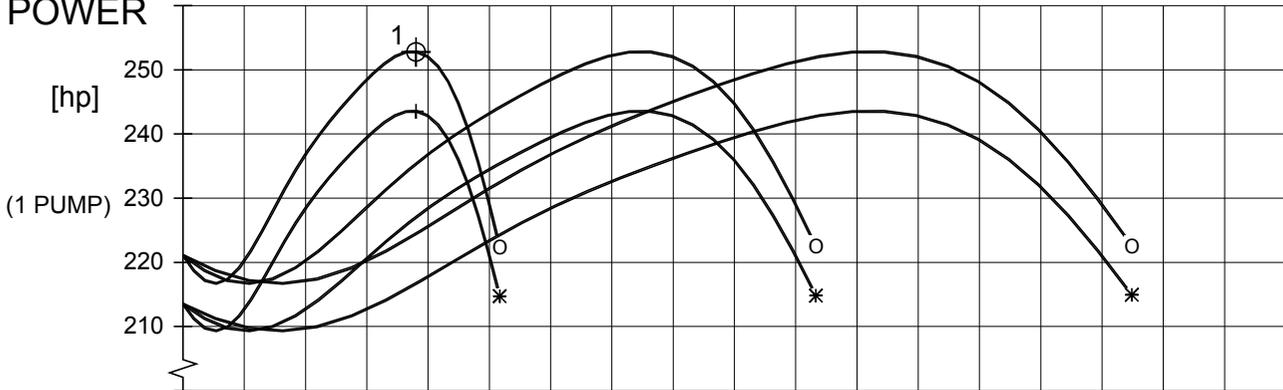
PERFORMANCE CURVE



PERFORMANCE CURVE

DATE 2018-08-01	PROJECT: East Flint, MI		ISSUE 47	PROD C 3356/766	
NO. OF BLADES..... IMPELLER THROUGHLET... 3 102*102 Circular	TOT.MOM.OF INERTIA..... RATED SPEED..... 5.25 KGM² 1185 RPM	POLES 6	FREQ. 60 HZ	CURVE NO 63- 620	
MOTOR COS PHI	1/1-LOAD	3/4-LOAD	1/2-LOAD	IMPELLER DIAMETER 490 mm	
MOTOR EFFICIENCY	0.83	0.78	0.66	MOTOR TYPE 43-56-6ID /01 (12)	
GEAR EFFICIENCY	96.3%	96.7%	96.8%	GEAR TYPE	RATIO
				VOLTAGE..... MOTOR SHAFT POWER..... STARTING TORQUE..... MAX TORQUE..... RATED CURRENT..... STARTING CURRENT.....	480 V 210hp / 186 kW 2075 NM 4568 NM 282 A 1880 A

POWER

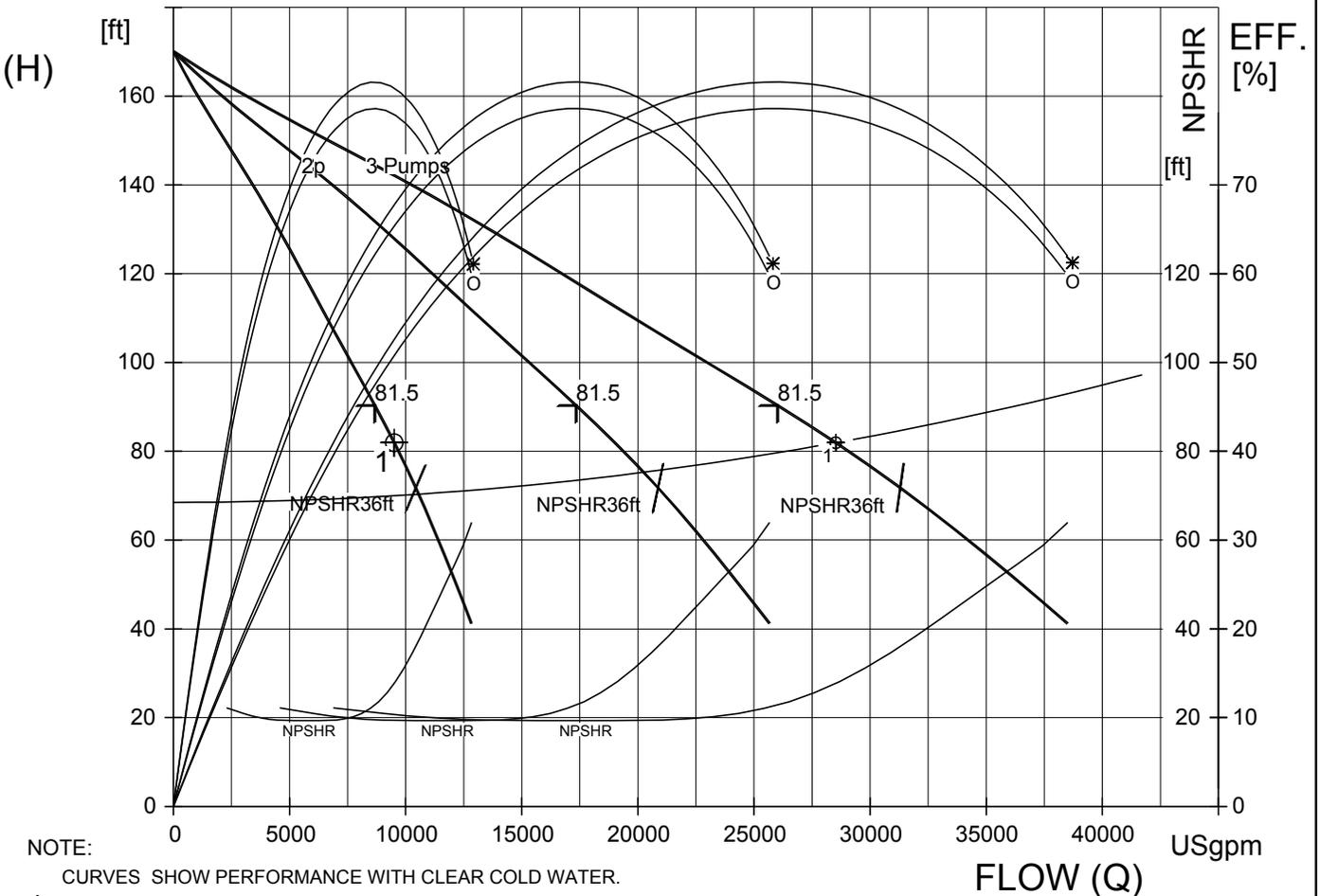


DUTY POINTS:

FLOW[USgpm]	HEAD[ft]	POWER [kW]	EFF. [%]	NPSHR[ft]
9507	81.9	189 (182)*	77.9 (80.9)*	27.7

3P : 28520 3P: 545 On Curve

HEAD



NOTE:

CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER.

* : PUMP EFFICIENCY / SHAFT POWER

O : OVERALL EFFICIENCY / INPUT POWER

NPSHR = NPSH3 + min. operational margin

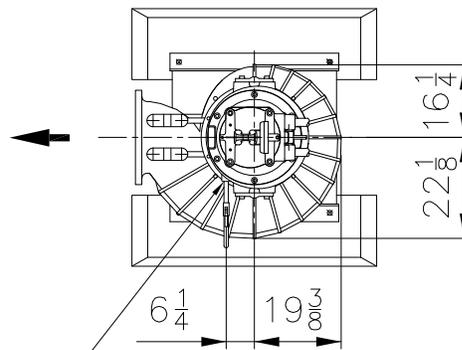
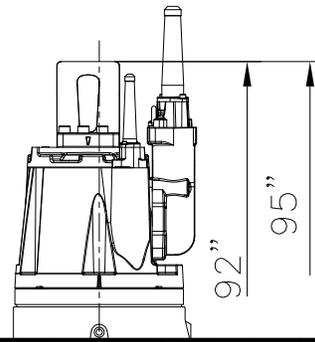
UNIX AUTHOR: fus109 PECU rev:21.10 /CJPC

USA

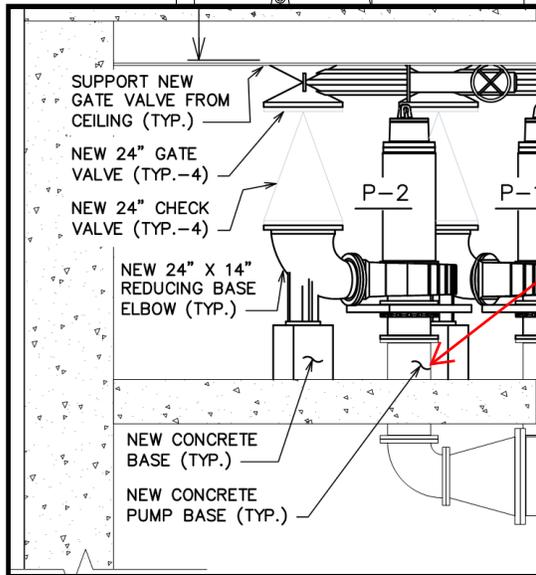


PERFORMANCE CURVE

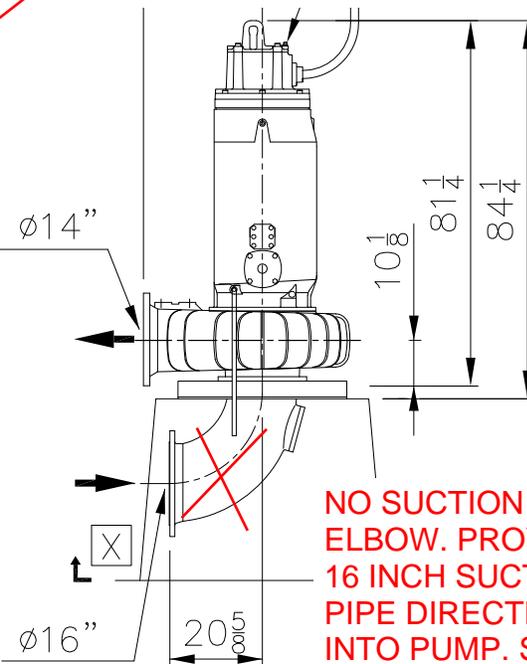
MAX. 2 CABLES
95-120mm²
ADDITIONAL 335lbs



FOR COOLING JACKET DRAIN
ISO G3/4



26 3/8
2"
CABLES UP TO 70mm²
16 INCH SUCTION



NO SUCTION ELBOW. PROVIDE 16 INCH SUCTION PIPE DIRECTLY INTO PUMP. SEE DRAWINGS.

PINS TO ANCHOR PEDESTALS

NOTE:

PUMP CAN BE ROTATED ABOUT ITS CENTERLINE TO 16 POSITIONS RELATIVE TO THE INLET ELBOW. INCREMENTS ARE 22.5°.

SUCTION/OUTLET FLANGE DRILLED ACCORDING TO CUSTOMER SPECIFICATION

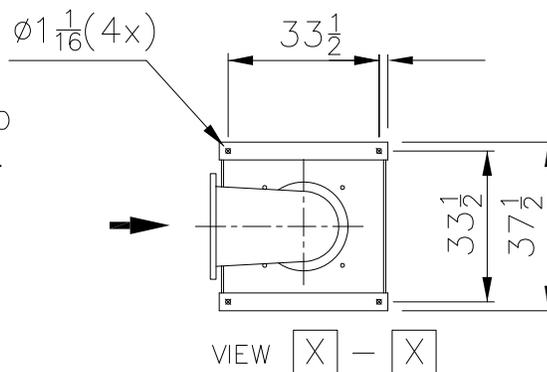
* DIMENSION TO INLET ELBOW FLANGE

ccw 27 deg

cw 27 deg



Rotate 2 pumps 27 deg ccw and 2 pumps 27 deg cw. Rotate pumps 22.5 deg if 27 deg is not available.



VIEW X - X

Weight (lbs)		
Pump	Stand	Inlet Elbow
4190	225	445
Drawn by DS	Checked by	Date 120104
Scale		Reg no 5399
6443600		5



Denomination
Dimensional drwg
CT,NT 3356 765/775
ø16"/ø14"

C 3356 SPECIFICATION

REQUIREMENTS

Furnish (4) submersible non-clog wastewater pump. Each pump shall be equipped with a close coupled 250 HP, submersible electric motor connected for operation on 480 volts, 3 phase, 60 hertz, with ~~(2) 50 foot~~ lengths of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards. **(2) 100 FOOT LENGTHS OF SUBCAB**

PUMP DESIGN CONFIGURATION

Pump shall be capable of operating in a continuous non submerged condition in a vertical (CT) position in a dry pit installation and permanently connected to inlet and outlet pipes. Pump shall be of submersible construction and will continue to operate satisfactorily should the dry pit be subjected to flooding.

The pump shall be capable of delivering 9,300 GPM at 80 FT. TDH.

PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other casting irregularities. All exposed nuts or bolts shall be AISI type 316 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or optional Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM - (Closed Loop System)

Each pump/motor unit shall be equipped with an integral, closed-loop motor cooling system. The motor cooling jacket shall encircle the stator housing and shall be of Type 304 stainless steel. The closed-loop motor cooling system shall provide heat dissipation for the motor regardless of whether the motor unit is submerged in the pumped media or surrounded by air in dry-pit installation mode. A high efficiency impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the system. The cooling liquid shall pass about the stator housing in the closed loop system between the motor housing and close-fitting guide sleeve in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C) in accordance with NEMA standards. Operational restrictions that limit the ambient or pumped liquid temperatures at levels less than 40°C are not acceptable.

CABLE ENTRY SEAL

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant

Class H insulation rated for 180°C (356°F). The stator shall be insulated by the current-UV-dip impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum.

Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. One PT-100 type temperature sensor shall be installed in the stator winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. A mechanical float switch (FLS) shall be mounted in the junction chamber to signal if there is water intrusion. A pump memory module shall be provided and mounted in the junction chamber to record pump run time, number of starts as well as contain the motor unit performance and manufacturing data and service history. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS

The pump shaft shall rotate on at least three grease-lubricated bearings. The lower bearings shall consist of at least one roller bearing for radial forces and one or two angular contact ball bearings for axial thrust.

The minimum L₁₀ bearing life shall be 100,000 hours at any point along the usable portion of the pump curve at maximum product speed.

The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down.

INSULATED BEARINGS (7xx, 8xx, and 9xx Motors)

The upper support bearing, provided for radial forces, shall be a single roller bearing and shall have an insulated outer ring to provide protection against potential bearing damage from electrically induced currents that can be created especially when the motor is used with a VFD. The outer ring shall have a plasma-spray technique or oxide-ceramic coating that provides an insulating barrier between the bearing face and the bearing housing of the pump.

MECHANICAL SEAL

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The lower seal shall be independent of the impeller hub. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one

stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. The Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. For special applications, other seal face materials shall be available.

Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come into contact with the lower bearings.

The following seal types shall not be considered acceptable or equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication.

The motor shall be able to operate continuously while non-submerged without damage while pumping under load.

Seal lubricant shall be non-hazardous.

PUMP SHAFT

Pump and motor shaft shall be a solid continuous shaft. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be of AISI 431 stainless steel.

IMPELLER - Grey Cast Iron

The impeller shall be of grey cast iron, Class 35B, dynamically balanced, multiple-vane, double shrouded non-clogging design having long throughlets without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Impeller shall be keyed to the shaft, retained with an expansion ring. The impeller shall be coated with an acrylic dispersion zinc phosphate primer.

WEAR RINGS

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the rotating impeller. Each pump shall be equipped with a replaceable stationary bronze ring that is drive fitted to the volute suction inlet.

This pump shall also have a stainless steel impeller rotating wear ring, heat-shrink fitted onto the suction inlet of the impeller.

VOLUTE

Pump volute shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

PROTECTION

The stator shall incorporate three thermal switches, connected in series, to provide over temperature protection of the motor winding. Should high temperature occur, the thermal switches shall open, stop the motor and activate an alarm. The stator shall also include one PT-100 type temperature probe to provide

for monitoring of the stator temperature

A lower bearing temperature sensor shall be provided. The sensor shall directly contact the outer race of the thrust bearing providing for accurate temperature monitoring.

The solid-state pump memory unit, three thermal switches, two FLS switches, PT-100 stator temperature monitor and the lower bearing PT-100 temperature monitor shall all be connected to a MAS (Monitoring and Status) monitoring unit. The MAS shall be designed to be mounted in the control panel and shall come with an Operator Panel that is dead-front panel mounted. The Operator Panel shall have soft-touch operator keys and provide local indication of the status of the alarms within the connected pump unit by means of an LCD screen read-out. Local MAS system change shall be made by use of the soft-touch keypad or local connection by means of a laptop computer. Remote indication of pump unit status shall be possible with connection to customer PLC or via LAN.

3356 Standard Pump Cable

Pump Model	HP	Volts	Ø	Cable Size/ Nominal O.D.	Part Number	No. of Cables	Max. Cable Length (Ft)	
→ 3356	215 Δ	230	3	3x120+2G70/2+S(2x0.5) 2.17"-(55.0 mm) *S3x120+3x70/3+2S(2x0.5) 2.00"-(51.0 mm)	94 19 88 94 19 99	2	270	
	Δ	460	3	3x50+2G35/2+S(2x0.5) 1.42"-(36.0mm)	94 19 85	2	395	
	Δ	575	3	*S3x50+3x25/3+S(4x0.5) 1.54"-(39.0mm)	94 19 96	2	620	
	Pilot Cable				S12 x 1.5 1.18"-(30.0 mm)	94 08 94	1	--
→ 250	Δ	460	3	3x70+2G35/2+S(2x0.5) 1.56"-(39.5 mm) *S3x70+3x35/3+2S(2x0.5) 1.54"-(39.0mm)	94 19 86 94 19 97	2	420	
	Δ	575	3	3x50+2G35/2+S(2x0.5) 1.42"-(36.0mm) *S3x50+3x25/3+S(4x0.5) 1.54"-(39.0mm)	94 19 85 94 19 96	2	500	
	Pilot Cable				S12 x 1.5 1.18"-(30.0 mm)	94 08 94	1	--



MAS 801 Pump Monitoring System

SMART DATA MANAGEMENT TO PROTECT YOUR INVESTMENT

The smart way to monitor performance

The MAS 801 pump monitoring system is a smart new approach that gives you total control and peace of mind. Its powerful data management capabilities ensure you are constantly updated on each pump's condition and operational status.

We've also removed the traditional sensor cable, which means simplified handling, improved measurement quality and fewer callouts. Digital communication now takes place in the power cable, made possible by the new Flygt SUBCAB range with integrated signal leads.

Key benefits

Large set of monitoring channels for superior protection

- Touch panel and PC interaction
- Easy to install and use
- Efficient, learning system
- Sensor cable eliminated
- Reliable operation and less downtime
- Fast and powerful troubleshooting
- Separate modules for each pump, with data in two locations for redundancy

INTELLIGENT PUMPS. DEPENDABLE SOLUTION.

MAS 801 is a comprehensive solution that builds on unique features embedded into your Flygt pump. The Pump Electronic Module (PEM) features an integrated 3-axis vibration sensor and pump current measurement. Pump sensor readings are logged and also sent to the central unit for fast access and presentation.

The PEM memory holds factory configuration data, speeding up installation. Serial number and name plate data is key to the Flygt Service Guide and for spare parts ordering. During maintenance, service records, operational data and black boxes help determine the pump's status, which is used in reporting and customer support.

SUPERIOR INTERFACE

Redesigned user interfaces

- Seven-inch graphical display, new design of embedded web pages
- Intuitive, informative and easy to navigate

Access anywhere

- Monitor your pump station from any mobile device or PC with a web browser
- Simple and convenient!

Powerful overview, fault tracing and reporting

- Extensive monitoring and logging capability
- Total control through accurate and efficient analysis

Ultimate reliability - minimum downtime

- A pump status overview shows deviations from normal
- Early warnings are highly visible, enabling timely preventive measures
- Reminders alert when service is due, helping to ensure optimal pumps performance
- Alarm messages notify about possible causes and remedial actions
- Data is linked to alarms for quick analysis and remedy (black boxes)

MAS 801 PUMP RANGE AVAILABILITY



LARGE - "G&G" | **STANDARD**
3001 and 7000



MIDRANGE | **OPTIONAL**
3153-3315 | MiniCAS II is std



SLIMLINE | **OPTIONAL**
7020, 7030, 7035 | MiniCAS II is std
7040 | MiniCAS II is std

SCADA and Cloud

Connectivity using standard protocols.



Operator panel

Seven-inch color touchscreen
One panel for all pumps.



Remote access

Use a PC, tablet or smartphone for full access of embedded web functionality (configuration and analysis tool).



Pump controller

Communication with Flygt pump controller or PLC using a standard protocol



Central unit (CU)

One measurement database for all pumps. One point of access to embedded web pages for all pumps.



PAN312 optional power analyzer

To keep track of pump performance and electrical supply by measuring voltage, current, power, energy and imbalances.

One base unit for each pump

Pump Electronic Module and Base unit can monitor and stop the pump independently of each other.
Max 10 BUs and PEMs per CU.



Two-wire communication in SUBCAB power cable eliminates separate signal cable

Screened and twisted pair of leads for digital signal transmission. Special protocol to cope with interference from variable speed drives.

Pump Electronic Module (PEM)

Interfaces with all pump sensors, two-wire communication. Three-axis vibration sensor on board and pump current measurement built in. 64 MB memory: factory (asset) info, trend database, alarms list, black box, service records.



Flygt MAS 801

Monitoring system for Large, Midrange and Slimline ranges of Flygt pumps



Features

- Best possible protection of a large Flygt pump.
- Pumps can be “connected” for total control and peace of mind.
- Built-in web pages for easy interaction using a graphical panel, PC or tablet.
- Overview, alarm handling and service messages.
- Fault tracing tools, including “black box” incident analysis.
- Open protocols to fit into most SCADA and cloud systems.

Why more than 96% of large pump customers use the MAS monitoring system

MAS 801 is simply made for optimal protection of a large Flygt pump. Customers have learnt to trust and appreciate Flygt monitoring systems since the 80ies, when electronic monitoring was first introduced.

It begins already in the factory, where information about the pump such as the data plate and alarm settings are stored in a pump electronic module (PEM). Flygt knowledge is entered into the pump, which caters for safe operation and easy installation. Electronic asset info in the pump contributes to efficient service and maintenance.

The new generation of monitoring is partially integrated into the pump through mechatronic design. This ensures that the most important quantities such as vibration, current and temperature are measured and monitored from the outset.

It has never been so easy, learning and efficient to use a monitoring system. Information is provided using the latest interaction technologies. Responsive web pages are displayed on a graphical screen, be it on the local pump station panel, a PC or smartphone. Experienced or beginner, the built-in configuration and analysis tool provides references and text tips helping operators to understand and make the right decisions.

The sensor cable is no longer needed

A special feature of MAS 801 pumps is that the conventional multi-wire sensor cable is no longer needed. Instead all information is communicated using two leads in the power cable. Pump sensors are connected to the pump electronic module converting all measurements to bits and bytes and the data is safely transmitted using a proprietary protocol. So there is no more hassle connecting all the 12 or 24 leads of the sensor cable!

A legacy of functionality

The new MAS 801 is based on many years of experience from previous monitoring equipment such as MAS 711. Features have been refined and new ones have been added. Performance, memory capacity and usability are strengthened to make the new system an optimal work tool.

Flygt MAS 801 Monitoring system

Part number	System detail
823 07 00	MAS 801 Central unit (CU)
823 06 00	MAS 811 Base unit (BU)
823 05 00	MAS 811 Pump Electronic Module (PEM)
822 48 00	FOP 402 - 7 inch graphical touch panel (with integrated web browser)

Relevant Flygt pump models	3153 – 3315, 3231 – 3800, 7020 – 7900, 5100, 5150, 5570
Approvals (all units)	CE, CSA, US

Technical data

Environment	CU and BU: – 20°C to +60°C (-4°F to +140°F) PEM: - 20°C to +115°C (-4°F to +140°F) Maximum 85% relative humidity
Supply voltage and required power	CU: 24 V DC / 10 W BU: 24 V DC/ 10 W PEM is supplied by the BU
Dimensions (W x H x D)	CU and BU: (44 x 122 x 113) mm / (1.73 x 4.80 x 4.45) inch PEM: (150 x 18 x 85) mm / (5.91 x 0.71 x 3.35) inch
Ingress protection	BU/CU/PEM: IP20
CU I/Os and protocols	RS485, Modbus slave for external communication RJ45 socket for embedded web page access or Modbus TCP RJ45 to HMI for responsive web page access DeviceNet for communication with BUs USB socket for download or upload (operational data / configuration / software upgrade)
BU inputs and outputs	GO-relay (250 V AC/8(3) A, A-Alarm relay 250V AC/4 A Digital input for volt free contact (reset, alarm, alarm, or thermal contact) Modbus master (PAN 312 or SmartRun) DeviceNet (to CU) PEM communication (two-wire proprietary protocol)
PEM Inputs and sensors	BU communication (two-wire proprietary protocol) Thermal contact / thermistor 5 x Analogue temperature (Pt100) 3 x Leakage detector Current transformer (pump current) On board three axis vibration MEMS sensor
7 inch graphical panel	Capacitive touch panel RJ45 socket for connection to CU and access of responsive web pages



System Installation and Operation Manual

887731_1.0



MAS 801

Pump monitoring

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1 About this manual

This manual describes how to make the electrical installation and setup of the MAS 801 system. It also describes how to operate the system from the computer and the HMI.

Other manuals

The product information is structured in the following order:

1. Technical Specification: For information about the technical details of the products.
2. Installation, Operation, and Maintenance manual: For information about the safe and preferred way of installing, operating, and maintaining the products.
3. MAS801 System Installation and Operation Manual: This manual. For information about the electrical installation, setup, and operation of a complete system.
4. For more information on how to operate and run the HMI, see the manual of the manufacturer.

2 Introduction and Safety

2.1 Introduction

Purpose of the manual

The purpose of this manual is to provide necessary information for installation, operation, and maintenance of the unit.

Read and keep the manual

Save this manual for future reference, and keep it readily available at the location of the unit.



CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

The equipment, and its functioning, may be impaired if used in a manner not specified by the manufacturer.

Intended use



WARNING:

Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment and the surroundings. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.

2.2 Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
 Electrical Hazard:	 CAUTION:

2.3 User safety

Introduction

All government regulations, local health and safety directives must be observed.

Prevent danger due to electricity

All danger due to electricity must be avoided. Electrical connections must always be carried out in compliance with the following:

- The standard connections shown in the product documentation that is delivered together with the product
- All international, national, state, and local regulations. (For details, consult the regulations of your local electricity supplier.)

For more information about requirements, see sections dealing specifically with electrical connections.

Power lock-out



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



Qualification of personnel



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

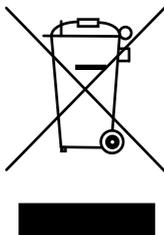
All work on the product must be carried out by certified electricians or Xylem authorized mechanics.

Xylem disclaims all responsibility for work done by untrained, unauthorized personnel.

2.4 End of life product disposal

Handle and dispose of all waste in compliance with local laws and regulations.

EU only: Correct disposal of this product – WEEE Directive on waste electrical and electronic equipment



WS009973A

This marking on the product, accessories or literature indicates that the product should not be disposed of with other waste at the end of its working life.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Waste from electrical and electronic equipment can be returned to the producer or distributor.

2.5 Spare parts



CAUTION:

Only use the manufacturer's original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage, and injuries as well as void the warranty.

2.6 Warranty

For information about warranty, see the sales contract.

2.7 Support

Xylem only supports products that have been tested and approved. Xylem does not support unapproved equipment.

3 System Description

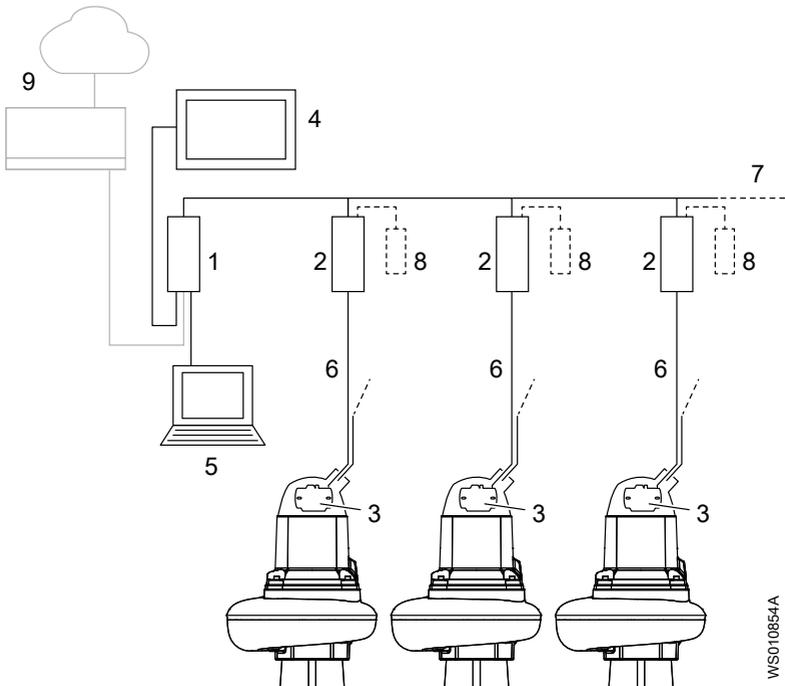
3.1 System overview

MAS 801

The MAS 801 is a monitoring system that is designed to protect the pump, that is based on measurements. The measurements are acquired from pump sensors and measurement modules. The system offers considerable functionality for the benefit of different user categories:

- A graphical user interface, the configuration and analysis tool, for computer and HMI.
- Local and remote presentation of pump status, key data, and alarms.
- Analysis and troubleshooting that are based on graphs, alarms, and black boxes.
- Service reminders and reporting.
- Configuration of the system and monitoring channels.
- Protocols for communication with external automation electronics, SCADA, and cloud applications

The system consists of a central unit, base units, pump electronic modules, and an HMI.



WS010854A

Table 1: Parts

Number	Part	Product name	Description
1	Central unit (CU)	MAS CU 801	The central unit communicates with all base units in the system. The central unit includes the configuration and analysis tool, embedded webpages, that are used to interact with the system. The central unit is installed in an electrical cabinet.
2	Base unit (BU)	MAS BU 811	The base unit communicates data between the pump electronic module and the central unit. If needed, for pump protection, the base unit stops the pump. The base unit is installed in an electrical cabinet.
3	Pump electronic module (PEM)	MAS PEM 811	The pump electronic module communicates with the base unit and contains factory settings, specific to the pump. It is connected to the pump sensors and stores measured data. The pump electronic module is mounted in the pump junction box.
4	Human-machine interface	FOP 402	The HMI is connected to the central unit and displays the configuration and analysis tool, for user interaction. The HMI is front-mounted in an electrical cabinet door.
5	Computer	-	The computer is an alternative to the HMI. It is connected to the central unit and displays the configuration and analysis tool, for user interaction.
6	Two-wire communication	-	Noise tolerant bus communication between the pump electronic module and the base unit in a SUBCAB® cable.
7	DeviceNet	-	Communication bus connecting the central unit with base units.
8	Power analyzer, optional	PAN 312	Measures power, power factor, current in three phases, voltage in three phases, voltage imbalance, energy
9	Extra components	-	Controller SCADA system

Communication

Measurements and pump information are transmitted over the two wires from each pump electronic module. Data runs through the base unit and further on to the central unit over the DeviceNet bus. This way two equal databases of pump information are continually updated securing redundancy and providing different access possibilities.

Monitoring alternatives

Pump sensors:

- Thermal contacts or thermistors for stator winding temperature monitoring
- Leakage sensor in the stator housing
- Leakage sensor in the junction box
- Leakage sensor in the oil inspection chamber
- One or three Pt100 sensors for stator winding temperature measurement

- Pt100 sensor for main bearing temperature measurement
- Pt100 sensor for support bearing temperature measurement
- Current transformer for pump current and speed measurement
- Vibration sensor for 3-axis vibration measurement

Optional monitoring channels by using PAN 312

- Three-phase power
- Power factor
- System voltage
- Voltage imbalance
- Pump current
- Current imbalance

4 Installation

Precautions

Before starting work, make sure that the safety instructions in the chapter [Introduction and Safety](#) on page 4 have been read and understood.



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



DANGER: Electrical Hazard

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.



WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.



CAUTION: Electrical Hazard

Prevent cables from becoming sharply bent or damaged.

Requirements

These requirements apply for the electrical installation:

- The mains voltage and frequency must agree with the specifications for the product.
- Circuit breakers must be installed between the main voltage line and this unit.
- All fuses and circuit breakers must have the proper rating, and comply with local regulations.
- The cables must be in accordance with the local rules and regulations.
- If the power cable is jerked loose, then the ground (earth) conductor must be the last conductor to come loose from its terminal. Make sure that the ground (earth) conductor is longer than the phase conductors at both ends of the cable.

Measurement category III

This installation is expected to have a minimum of two levels of overcurrent protective devices, fuses, between the main power and the base unit or the central unit.

Cables

These requirements apply for cable installation:

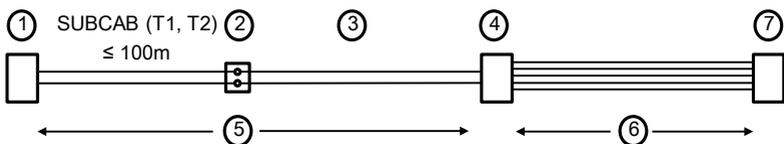
- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The minimum bending radius must not be below the accepted value.
- Use cables with appropriate temperature rating.

Maximum cable length

The maximum length of the SUBCAB® cable is 100 m (328 ft).

The communication distance between the pump electronic module and the base unit can be extended to maximum 300 m (984 ft). Use a connection box to split the SUBCAB® cable and use separate cables for communication and power. Use a screened and twisted cable and separate the communication cable from power cable with >30 cm (0.984 ft).

The maximum length of DeviceNet cable is 500 m (1640 ft).



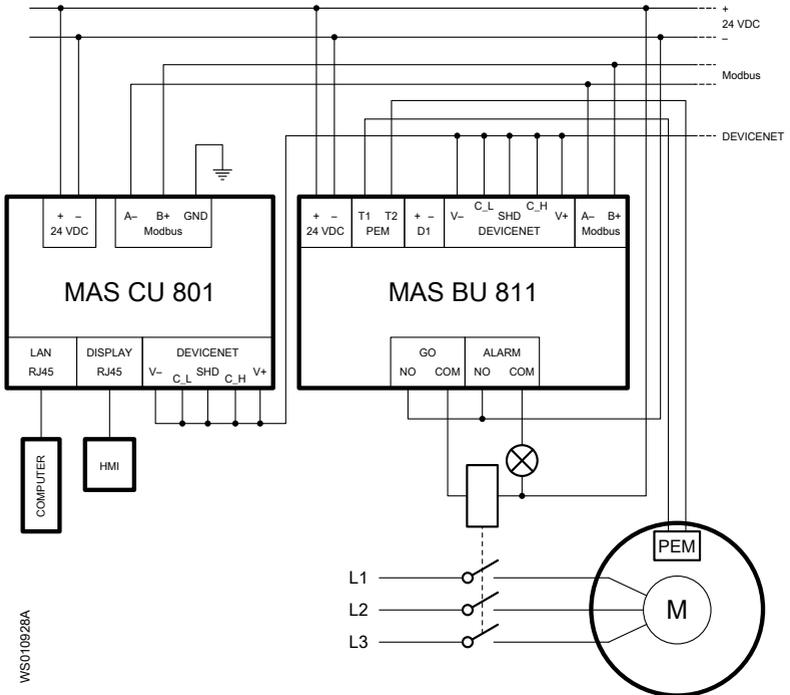
1. Pump electronic module
2. Connection box

WS009153

3. Signal cable, twisted and shielded
4. Base unit
5. Two-wire communication
6. DeviceNet
7. Central unit

4.1 Connect the MAS 801 system

This figure shows an overview of the MAS 801 system.



4.2 Connect the central unit to the HMI or the computer

Connect the central unit with a RJ45 cable to the HMI or the computer.

Part	Terminal	Central unit terminal
HMI	ETH	DISPLAY
Computer	LAN	LAN

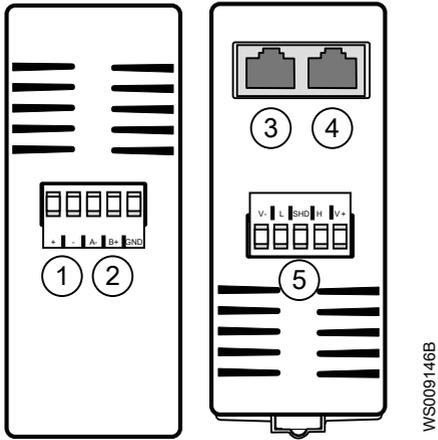
4.3 Connect the Modbus cable to the central unit and or the base unit

The MAS 801 system supports Modbus RTU and Modbus TCP.

Connect the Modbus cable.

Modbus	Terminal
RTU	RS-485
TCP	Ethernet

4.4 Connect the central unit to the base unit

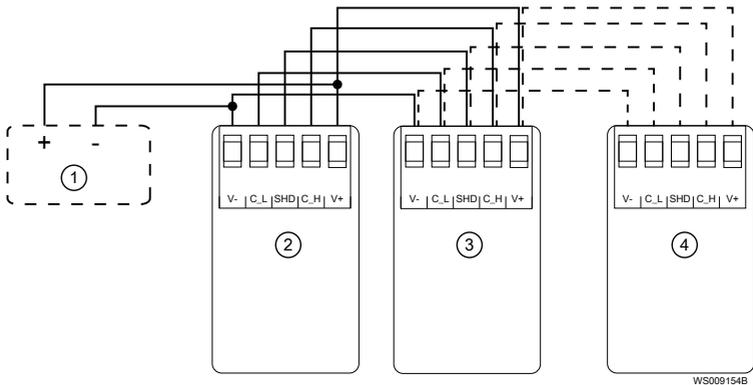


- 1. 24 VDC
- 2. Modbus
- 3. Display
- 4. LAN
- 5. DeviceNet

Figure 1: Central unit terminals top and bottom view

1. Connect the DeviceNet cable between the central unit and the base unit.
 - a) Connect the communication leads.
 - b) Connect the power leads.

The DeviceNet communication requires a 24 VDC power supply.



1. 24 VDC power supply
 2. Central unit
 3. Base unit 1
 4. Base unit 2
2. Connect the 24 VDC power supply.
- To avoid a restart at power outages an uninterrupted power supply can be used.

4.5 Connect the base unit

1. If used, connect the DI 1.

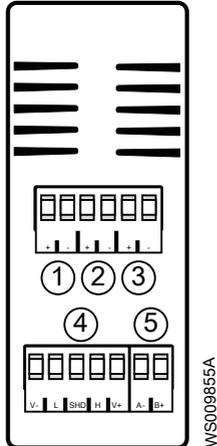
For standard pumps the digital input, can be configured for an alarm reset or external alarm input. For Ex pumps the digital input is mandatory to use for correct handling of the thermal contacts status.
2. Connect the Go-contact.

The relay is opened when an A-alarm is detected and the pump is stopped.
3. If used, connect the alarm terminals.

The relay is closed when an A-alarm is detected.
4. Connect the 24 VDC power supply.

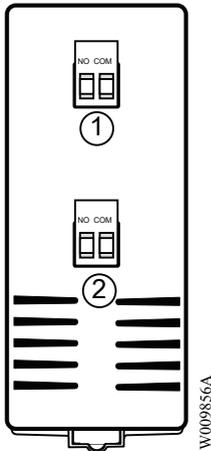
To avoid a restart at power outages, an uninterrupted power supply can be used.

4.6 Connect the base unit to the pump electronic module



1. 24 VDC
2. PEM
3. DI 1
4. DeviceNet
5. Modbus

Figure 2: Terminal top



1. Go-contact 250 VAC/8(3) A
2. A-alarm 250 VAC/4A

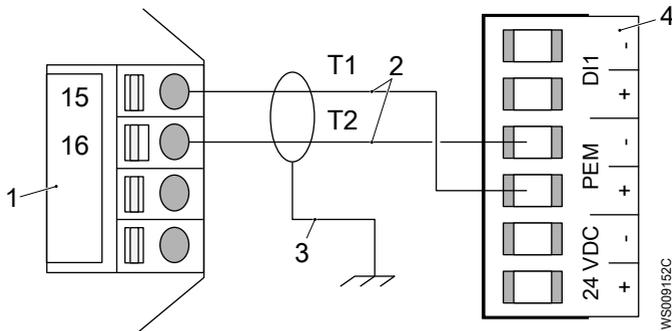
Figure 3: Terminal bottom



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

1. Connect the two signal leads that are integrated in the SUBCAB[®], T1 and T2, from the pump electronic module terminal to the base unit terminal.



Number	Description
1	Pump electronic module terminal.
2	T1 and T2: Two-wire communication and power supply to the pump electronic module.
3	Functional ground on the pump electronic module.
4	Base unit terminal.

If interference from, for example, a variable frequency drive disrupts the communication, there is an option to use an EMC certified connector. See the appendix how to assemble the connector.

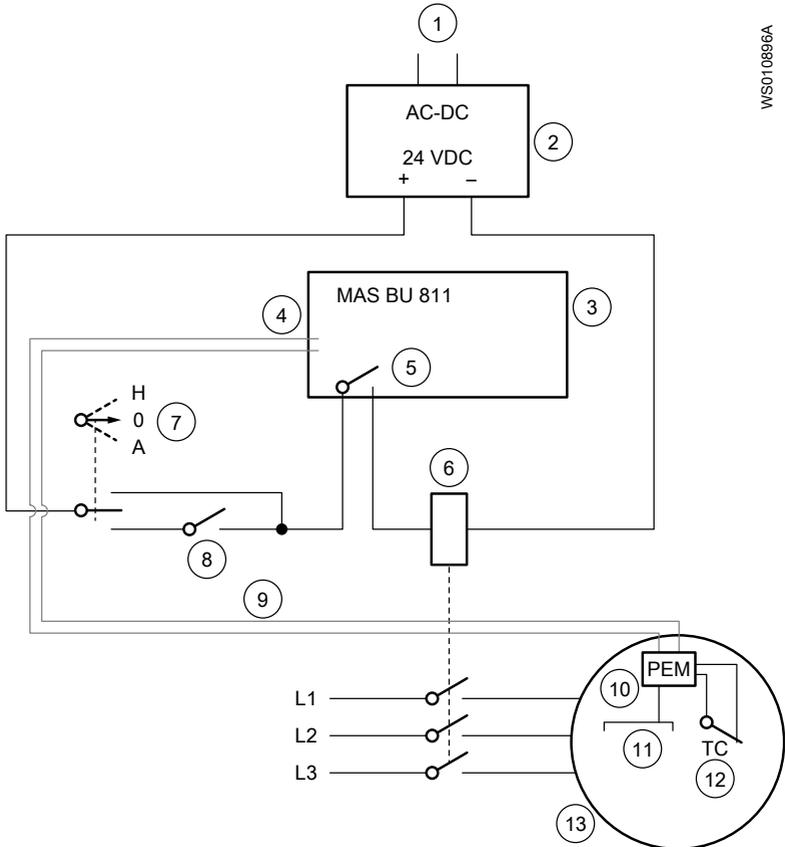
Prepare the SUBCAB on page 43

- a) Connect the T1 and T2 leads from the SUBCAB[®] cable to the connector.
 - b) Connect the T1 and T2 leads from the connector to the base unit terminal.
 - c) Connect the functional ground.
 - d) Connect the connector.
2. Connect the functional ground on the pump electronic module.
 3. Connect the 24 VDC power supply.

To avoid a restart at power outages an uninterrupted power supply can be used.

4.7 Wiring for standard application

In the standard application, thermal contacts are wired to the pump electronic module. All sensor signals are digitally transmitted via T1 and T2 in the power cable.

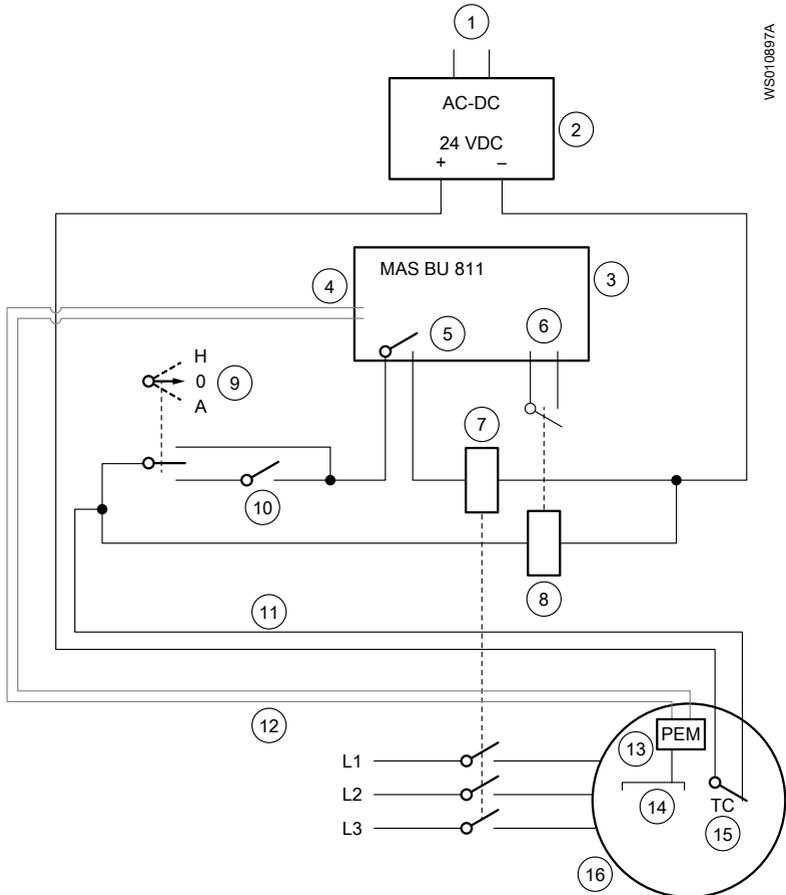


2. AC DC converter	9. T1 and T2 signal leads in SUBCAB® power cable
3. Base unit	10. Pump electronic module
4. Pump electronic module communication	11. Pump sensors
5. Go – contact	12. Thermal contact
6. Contactor	13. Pump
7. Controller <ul style="list-style-type: none">• H – Hands• O – Off• A – Automatic	

Figure 4: Thermal contacts are wired to the PEM

4.8 Wiring for Ex application

In Ex applications thermal contacts must be wired separately to break contactor circuit directly. MAS 811 BU receives a signal about the thermal contact status via the auxiliary relay R1. The Go-contact will inhibit restart until reset is done via the MAS 801 system.



1. Power outlet, 100-240 VAC	9. Controller <ul style="list-style-type: none"> • H - Hands • O - Off • A - Automatic
2. AC DC converter	10. Pump control on/off
3. Base unit	11. T3 and T4 signal leads in SUBCAB® power cable
4. Pump electronic module communication	12. T1 and T2 signal leads in SUBCAB® power cable
5. Go - contact	13. Pump electronic module
6. Digital input	14. Pump sensors
7. Contactor	15. Thermal contact
8. R1 Auxiliary relay	16. Pump

Figure 5: Thermal contacts are wired separately to break contactor directly

5 System Setup

5.1 Commissioning

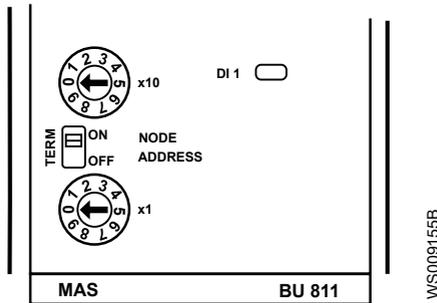
All mechanical and electrical installations must be correctly made before this task. This includes installation of the pump with the sensors, the central unit, the base units, the HMI, and also any external connections.

1. Set the **TERM**, termination resistor, DIP switch to **ON** on last base unit in the connection chain.

All other base units in the connection chain must have the DIP switch set to **OFF**.

2. Set the applicable **NODE ADDRESS** on the two rotary switches.

The central unit has the fixed address 0.



Pump position	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Rotational switch x1	1	2	3	4	5	6	7	8	9	0
Rotational switch x10	0	0	0	0	0	0	0	0	0	1

3. The system is ready to be energized.

5.1.1 Connect to the configuration and analysis tool through the HMI

Steps to be done the first time connecting to the tool through the HMI.

1. Connect an Ethernet cable between the HMI and the central unit.
2. Press and swipe the touchscreen from top to bottom.
3. Select Startup > Startmode.
4. Select **Web** by using the arrows.
5. Go to > **Network** in the menu.
Uncheck DHCP and uncheck active DNS.
Set IP address to 10.10.10.5 for the HMI.
Set **Subnet mask** to 255.255.255.0.
6. Go to > **Web** in the menu.
7. Set the server IP address to 10.10.10.10 for the configuration and analysis tool.

8. Go to > **Save&Exit** in the menu.
9. Press Save changes&exit.

The configuration and analysis tool starts in operator mode and automatically logs in.

The start page appears. For login to the tool see, [Log in to the application via HMI](#)

5.1.2 Connect to the configuration and analysis tool through the computer

These steps have to be done the first time connecting to the tool through the computer. This instruction requires operating system Windows 7.

1. Connect an Ethernet cable between the computer and the central unit.
2. Click the **Start** icon on the computer.
3. Select **Control panel**.
4. Select **Network and Sharing center**.
5. Select **Local Area Connection**.
6. Click **properties**.
7. Select **Internet Protocol Version 4 (TCP/IPv4)** in the list and click **Properties**.
8. Select **Use the following IP address** and enter an address in the **IP address field**.

The first three groups of the IP address must be the same for the central unit and the computer, to make them part of the same subnet. The number in the last group must be different to make them unique in the network.

Use, for example, computer IP address 10.0.48.4, if the default central unit address, 10.0.48.94, is used.

9. Set **Subnet mask** to 255.255.255.0.
10. Click **OK** and close the dialog boxes.
11. Start a web browser.
12. Enter the central unit IP address in the web browser address box.
Default is 10.0.48.94.

The start page appears. For login to the tool see, [Log in to the configuration and analysis tool through the HMI or the computer](#) on page 21

5.1.3 Log in to the configuration and analysis tool through the HMI or the computer

Make sure that the steps in [Commissioning](#) on page 20 are completed.

1. Start a web browser with a computer or start the HMI.
The start page appears.
2. Select language in the **language** list.
3. Select the type of user, administrator, or operator.

- **Admin - Full rights (view data, change settings and acknowledge alarms)** for full rights.
 - **Operator - Limited rights (view data and settings and acknowledge alarms)** for limited rights
4. Enter 1234 in the **password** box.
 5. Click the **Login** button.

5.2 Run the Setup Wizard for the pumping station and the MAS 801 system

The Setup Wizard starts the first time that the user logs into the configuration and analysis tool. The wizard includes all the steps that are required to set up the pumping station and the MAS 801 system. After a restore of the factory settings for the central unit, the wizard will automatically be launched at next system startup.

1. Click **Next**
2. Set the **Station name and address**
3. Set the **Number of pumps in the station**
4. Select the **Set clock** check box to get the default settings.
5. Select the **Temperature unit** and the **Length unit**.
6. Click **Next**
7. Click **Next** to keep the default settings.
8. Click **Next** possible to change the password for the user.
9. Click **Next**. The basics for the pumping station and the MAS 801 system are now configured.
10. Click **Finish**. The system restarts.
All pumps, pump electronic modules, needs to be installed and configured.
11. Go to [Install a pump](#) on page 22

5.3 Install a pump

For each pump:

1. Go to **REMINDERS**
Await the install pump button to appear.
2. Click **Install pump**
3. Select **Install pump**
4. Click **Next**
Select data to copy from PEM to CU. Configuration and logged data are selected as default.
5. Click **OK**
Data is copied from the pump electronic module to the central unit.
6. Click **Complete**
7. Click **Finish**
The pump is now installed.

5.4 Common procedures

5.4.1 Change password

1. Login
2. Go to **SETTINGS > System settings**
3. Scroll down and select **User settings**
4. Click the icon to the right of either operator or admin
5. In the popup window **Edit user** type in the new password and confirm.
6. Click **Save**

5.4.2 Change Display Language

At the start page, select preferred language in the drop down menu **Language**

5.4.3 View installed pump

1. Go to **PUMP STATION > Status** to get an overview of each installed pump.
2. Click **Detailed view** to see details of the pump and its **Channels**. In the HMI click directly on the pump icon to get the detailed view.

5.4.4 Change the number of pumps

1. Go to **SETTINGS > System settings**
2. Type **Station name** and **Address**
3. Select the number of pumps in the drop-down menu **Number of pumps in the station**
4. Click **Save**

5.4.5 Configure an Ex pump

Important that Screened SUBCAB® cable is used.

1. Go to **SETTINGS > Channel settings**
2. Click **Temperature**
3. Click **Stator phases 1-3**
4. Select **None** as an input source.
5. Click **Save**

5.4.6 Create a backup of the central unit

Create a backup of the central unit to keep the settings and events.

1. Go to **SETTINGS > System modification**.
2. Click **Create backup** for the **Central Unit - CU**.
3. Select **Save file to PC** or **Save file to USB**.

As default the configuration settings and the event log data will be copied.

5.4.7 Upload software package

To prepare the system for software upgrade, upload an installation file to the central unit.

1. Go to **HELP > Upgrade software**.
2. Click **Upload software package**.
3. Select **Copy file from PC** or **Copy file from USB**.
4. Click **OK**.

The software package is uploaded to the **Central Unit - CU**.

5. Click **Complete**.

When finished the **Software version** is uploaded and available for upgrade.

5.4.8 Upgrade software package

The software package is available and can be upgraded in the central unit, the base unit and in the pump electronic module for each pump. When there is a new software version that is uploaded in the central unit, a reminder informs to upgrade the complete system.

1. Go to **HELP > Upgrade software**.
2. Click **Upgrade software** for the selected pumps.
3. Click **OK** to confirm the upgrade.
4. Click **Complete** when the upgrade process is finished.
5. Click **Upgrade software** for the central unit.
6. Click **OK** to confirm the upgrade.
7. Click **Complete** when the upgrade process is finished.

5.4.9 Acknowledge alarms

To acknowledge active alarms for the pumps or the system.

1. Go to **PUMP STATION > Active alarms**.
2. Acknowledge all.

Condition	Action
Acknowledge all active alarms for a pump.	Click Acknowledge all in the pump section.
Acknowledge all active alarms for the system.	Click Acknowledge all in the system section.

3. Type initials in the text box **Enter initials (max 3)**.
4. Click **Acknowledge all**, a status check starts.
5. Click **Close** when the check is done. The alarms are now confirmed.

5.4.10 Select an alarm in the Alarm and event log

To see the raised and acknowledged A or B-alarms for a particular pump.

1. Go to **PUMP STATION > Alarms & events**.
2. Select the pump.
3. Select A or B-alarm.
4. Click **Update**.

5.4.11 Channel settings

An example on how to set alarm parameters for the temperature sensor at channel **Stator phase 1**.

1. Go to **SETTINGS > Channel settings**.
2. Click **Temperature**.
3. Select **Stator phase 1**.
4. Select **Input source**.
5. Alarm settings

Condition	Action
Apply default settings.	Click OK, at Apply default .
Set the alarm parameters.	Set and select the alarm parameters Limit, Priority, Reset option and Delay .

6. Graph

Condition	Action
To apply default settings.	Click OK, at Apply default
Axis	Set Y-axis min and Y-axis max

7. Click **Save**.

5.4.12 Connect and configure for SCADA

Enable and configure the system for Modbus.

Condition	Action
Modbus RTU	<ol style="list-style-type: none"> 1. Connect the MAS 801 system to the SCADA system through RS-485 connection. 2. Enable Modbus: Go to SETTINGS > System settings > Modbus RTU > Enable 3. Configure Modbus to match the SCADA system and Save settings.
Modbus TCP	<ol style="list-style-type: none"> 1. Connect the MAS 801 system to the SCADA system through an RJ45 connection. 2. Enable Modbus: Go to SETTINGS > System settings > Modbus TCP > Enable 3. Configure Modbus to match the SCADA system and Save settings.

5.4.13 Enable a power analyzer

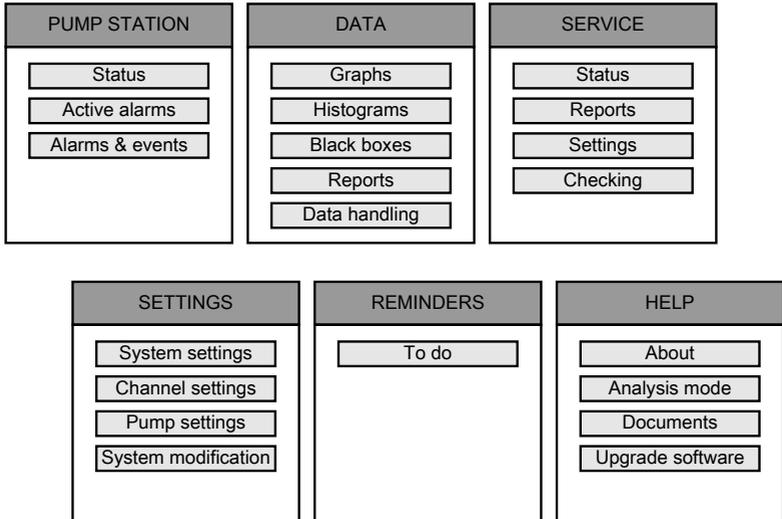
Use of an external power meter connected to the base unit.

1. Go to **SETTINGS > Pump settings**.
2. Click **Meters**.
3. Click **Edit meter**.
4. Select **Enable**.
5. Click **Save**.

The meter is now available for selection in channel settings. PAN 312 is selected automatically for those channels that can use PAN 312 measurement.

6 User Interface

6.1 The menu tree structure



WS010883C

6.2 Configuration and analysis tool overview

6.2.1 Symbols in the tool

Useful symbols in the tool.

Symbol	Description
	The information symbol to get additional information about a parameter or the possible cause and action for an alarm.
	The black box symbol, to get graphs and data for a specific pump.
	The editor symbol, to change parameters and data.
	The A-alarm indicator shows red when there is an A-alarm. An A-alarm stops the pump. The B-alarm indicator shows yellow when there is a B-alarm.

6.2.2 PUMP STATION

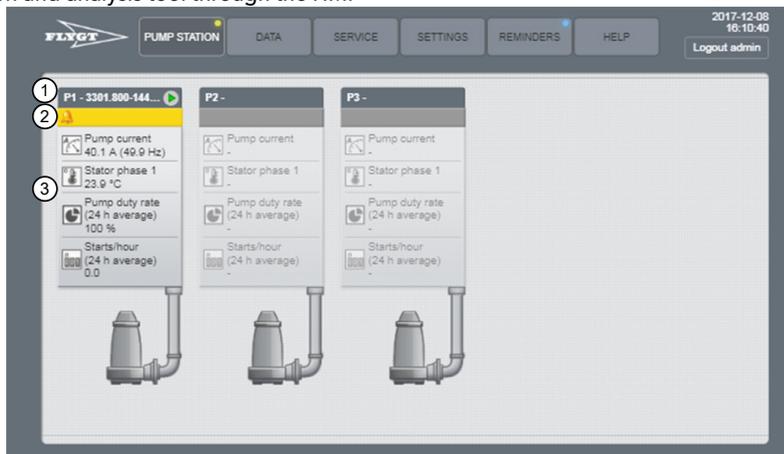
The **PUMP STATION** tab in the menu bar includes the **Status** the **Active alarms** and the **Alarms & events** menus that give the actual status of the system. The

PUMP STATION tab in the menu bar also indicates, with a led, any active alarms or reminders.

Feature	Function
Status	The window shows information about the status for the pumps in the system. This window is the start window when the PUMP STATION tab is selected.
Active alarms	The window shows a list of all active and non-active alarms.
Alarms & events	The window shows information about the alarm and event log for the pumps or the system.

6.2.2.1 Status

Configuration and analysis tool through the HMI



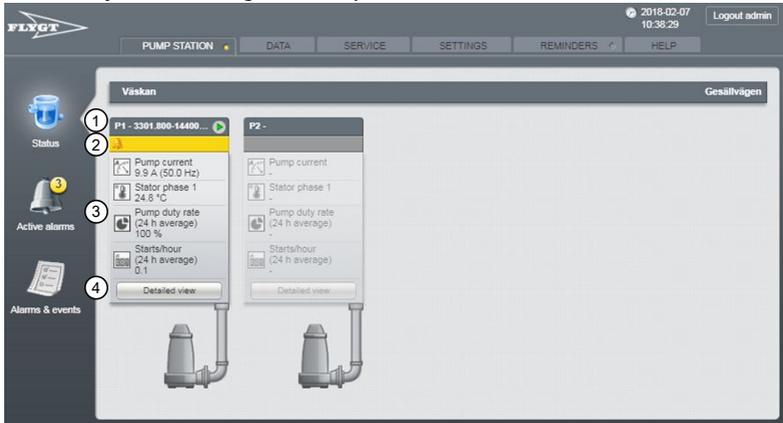
WSO10885A

1. Pump ID
 2. Status row
 3. Key data. Press the Key data image to get the detailed view.
- Submenus are found under each tab in the HMI.



WSO10886B

Configuration and analysis tool through the computer



W5010884B

1. Pump ID
2. Status row
3. Key data
4. Detailed view

Pump ID

This part shows the pump identification.

Status row

This part shows if there is an active alarm present or a reminder. The color of the alarm row is the same as the highest rated active alarm present in the system.

Red	A-alarm
Yellow	B-alarm
Blue	Reminder

Key data

This part shows selected key data parameters:

- Run time the last 24 hours in percentage.
- The number of starts in the last 24 hours.
- Pump current (A).
- Stator temperature for phase 1 (°C).

Detailed view

Part	Description
Pump ID	The pump identification.
Data plate	The pump data.
Start and stop	The log for starts, stops, and run time.
Channels	The channels that are monitored for the pump. Each channel window has icons for trends or histogram, or both.
Run time & starts	The starts, stops, and run time as a rate in percentage for the pump.
Leakage	The possible occurrence of leakage in the stator housing, inspection/oil chamber, and the junction box.

Part	Description
Temperature	The temperature is monitored in the pump. Location: <ul style="list-style-type: none"> • Stator phases 1-3 • Main bearing • Support bearing • Pump electronic module
Vibration	The vibration in X, Y, and Z axis, and the total vibration.
Electrical	The frequency, voltage, and the pump current. The alarm levels for low and high settings.
Miscellaneous	Digital and analog input.

6.2.2.2 Active alarms

Pump ID

Part	Description
Time	The time that the alarm is generated.
Name	The alarm name, typically the alarm sensor location.
Unit	The component in system that generates the alarm.
Reset option	The option for the alarm reset: Automatic or Manual .
Status	Alarm indication level:
Priority	The alarm priority, A, or B.

System

Part	Description
Time	The time that the alarm is generated.
Name	The alarm name, typically the alarm sensor location.
Unit	The component in system that generates the alarm.
Reset option	The option for the alarm reset: Automatic or Manual .
Status	Alarm indication level:
Priority	The alarm priority, A, or B.

Acknowledge all

The button that resets all the alarms for the specific pump or system.

Alarm level

The A and B indicators that shows when the active alarms are A or B-alarms. Indicator flashes when that the alarm is not acknowledged. See [Symbols in the tool](#) on page 26

Active alarms

The icon that shows the number of alarms that are active and the type of alarm. The icon is red when there is one or more A-alarms and yellow when there are only B-alarms.

6.2.2.3 Alarms & events

Alarms & events

Part	Description
Time	The time that the alarm is generated.
Source	The pump in the system that generates the alarm.
Name	The alarm name, typically the alarm sensor location.
Unit	The component in the system that generates the alarm.
Type	Reminder or Alarm
Status	The alarm level, A or B.

6.2.3 DATA

The **Data** tab in the menu bar contains settings for presentation of the pump data.

Tool bar icon	Purpose
Graphs	The window shows graphs for collected monitored pump data for one or more selected channels.
Histogram	The window shows histograms for collected monitored pump data for one or more selected channels.
Black boxes	The window shows the alarm history for a selected pump and channel.
Reports	The window shows reports for a selected pump and source.
Data handling	The window shows gives an overview of all installed and previously installed pumps in the system. All monitored and stored data for a selected pump can be downloaded here.

6.2.3.1 Graphs

Graph view

Part	Description
Graph label	The name, and the time period. Displayed for saved views.
Pump label	The pump, the channel, and the unit of measurement.

Graph details

Part	Description
Start period	The date and time for measurements to start
End period	The date and time for measurements to stop
Resolution	The resolution of trend data, in time
Axis options	Multiple axes or Common axis . Minimum and maximum settings in percent for the axis.

Pump and channel selection

The settings include pump, channel, and period.

Reload graph and Reset view

Part	Description
Reload graph	The button that loads the selected channels
Reset view	The button that clears the screen

Save view and Saved views

Part	Description
Name	The name of the saved view.
Description	The description of the saved view.
Cancel	The button that cancels the view.
Save	The button that saves the view.
The histogram icon	The icon for the upload of the saved view.
The delete icon	The icon for deletion of the saved view.

6.2.3.2 Histograms

Histogram view

Part	Description
Histogram label	The name, and the time period. Displayed for saved views.
Pump label	The pump, the channel, and the unit of measurement.
Mean value	The mean value of the measurements.
Amount of data	The amount of data, in hours, of the histogram.
Block width	The block width of the histogram.
Histogram start	The histogram start time.

Axis options

Minimum and maximum settings in percent of y-axis.

Pump and channel selection

The settings include pump, channel, and period.

Update

The button that updates the current histogram.

Reset histogram

The button that removes the current histogram.

Save view and Saved views

Part	Description
Name	The name of the saved view.
Description	The description of the saved view.
Cancel	The button that cancels the view.
Save	The button that saves the view.
The histogram icon	The icon for the upload of the saved view.
The delete icon	The icon for a deletion of the saved view.

6.2.3.3 Black boxes

Part	Description
Start period and End period	The start and the end period respectively for the alarm history in the black box.
Resolution	The time units for the alarm history
Axis options	The axis options, multiple or aligned
Select channel and Add channel	The options for pump and channel selection.
Update , Reset , and Save view	The options to update or reset a view. The settings for saved views.

6.2.3.4 Reports

Part	Description
Name and Description	The name and the description of the report.
Source	The pump ID for the pump.
Data	The type of data that is exported to the report.
Clear report and Save template	The buttons to clear the filled in form and save the report.
Generate report	The button to create a report that contains the selected data for a selected time period.

6.2.3.5 Data handling

Connected pumps, Disconnected pumps

The table describes the data for the connected and disconnected pumps.

Part	Description
Pump	The pump ID number in the system.
Serial number	The serial number for the monitored pump.
Latest data	The information on when data latest was collected.

Part	Description
Copy PEM data to file	The option to copy backup data for the selected pump. The default choice is all data but any type of data can be selected.
Copy data on file to PEM	The option to copy backup data from the file to the selected pump to restore data to the pump.
Copy PEM data to CU	The option to copy data from the pump electronic module to the central unit.
Delete	The option to remove data from the pump electronic module and the central unit for a selected pump.
Disconnected pumps	A list of disconnected pumps. The data stays stored for disconnected pumps, until deleted.

6.2.4 SERVICE

The **SERVICE** tab in the menu bar is used to get an overview of the services performed on the pumps and when to schedule the service.

Part	Description
Status	The window show service times intervals and counters to determine next service for all connected pumps.
Reports	The window is used for performing and reporting service.
Settings	The window gives access to all service interval settings for all the connected pumps.
Checking	The window is used for checking that the pump sensors are functional.

6.2.4.1 Status

Part	Description
Service counter overview	An overview of the service counters for each pump and the next predicted service date.
Pump	The pump ID.
Latest service	The latest service date for the actual pump.
Predicted service date	The predicted next service date for the actual pump.
Counter	The name of the service counter.
Latest service	The latest service date for the actual pump.
Counter (h)	The run time in hours since the last service.
Service reminder after (h)	The run time in hours for service reminder.
Predicted service date	The predicted date for the service reminder.

6.2.4.2 Reports

Part	Description
Submitted reports	A list of submitted reports.
Date	The date and time the report was created.
Service	Type of service.
Run time (total)	Total running time for the pump.
Performed by	The person that created the report.
Workshop	Service site.
New report	To create a new service report type.

6.2.4.3 Settings

Part	Description
On/Off	The check box to set the service counter to on or off.
Counter	The items that use the service counter-function.
Service interval	The time between service intervals.
Activate reminder	The check box to create a service reminder in the To do list. For more information, see REMINDERS on page 36.

6.2.4.4 Checking

Part	Description
Checkpoint	Checked pump channels.
Status	Status on the channel.
Actual	Actual channel value.

6.2.5 SETTINGS

The **SETTINGS** tab in the menu bar is used to make all necessary settings for the system and its parts.

Tool bar icon	Purpose
System settings	The window for all system settings.
Channel settings	The window for the setup of the channels to be monitored.
Pump settings	The window that shows status and characteristics for a selected pump.
System modification	The window that gives an overview of the pump system configuration. It is used to restore the CU data bases, restart the CU or apply factory settings to the pumps.

6.2.5.1 System settings

Part	Description
System settings	This part shows settings for: <ul style="list-style-type: none"> • Station name • Address • Number of pumps in the station
Date and time	This part shows settings for: <ul style="list-style-type: none"> • Date • Time • Time zone
Units	This part shows settings for: <ul style="list-style-type: none"> • Temperature unit • Length unit
Network	This part shows settings for the network.
Modbus RTU	This part shows the settings for the Modbus remote terminal unit protocol.
Modbus TCP	This part shows setup menus for the Modbus transmission control protocol.
Modbus id mapping	Shows the Modbus id for the pumps, 1-10, and the system.
User settings	This part shows User settings to register. <ul style="list-style-type: none"> • Name • Limit

6.2.5.2 Channel settings

Part	Description
Pump ID	The unique pump
Run time & starts	The settings for the alarm levels for duty rate, pump run and starts per 24 h or per week for the monitored pump. The monitor histogram can be enabled/disabled and edited.
Leakage	The settings for the alarm levels for possible leakages in the stator housing or in the junction box.
Temperature	The settings for the alarm levels for the monitored temperature in the bearings, the electronic module and in the stator.
Vibration	The settings for the alarm levels for monitored vibrations in the pump. This channel is an option.
Electrical	The settings for the alarm levels for current, power, voltage and frequency for the monitored pump.
Miscellaneous	The settings for custom channels.

6.2.5.3 Pump settings

Part	Description
Pump ID	The pump identification.
Status	The status of the pumps in the system.
Data plate	A list of the pump data.
Meters	A list of all connected measuring devices.

6.2.5.4 System modification

Central unit

Part	Description
Create backup	The button to create a backup of the central unit settings and event log.
Restore backup	The button to restore an earlier saved backup of the central unit settings.
Restart	The button to restart the central unit.
System log	The button to show the system event log.
Restore factory settings	The button to restore the Xylem factory settings.

Pump

Part	Description
Restart	The button to restart the pump.
Restore factory settings	The button to restore the Xylem factory settings.

6.2.6 REMINDERS

The **REMINDERS** tab in the menu bar gives access to the **To do**-list.

A reminder is created by the system to remind the operator about an action that is required.

6.2.7 HELP

The **HELP** tab in the menu bar gives access to information, analysis tools, and software.

Tool bar icon	Description
About	General information.
Analysis mode	The window for analysis of the system.
Documents	The window for additional information about the pumps.
Upgrade software	The window for a software upgrade of the system parts.

6.2.7.1 About

General information.

6.2.7.2 Analysis mode

Analysis mode

The start button gives access to the analysis mode dialog box.

6.2.7.3 Documents

A list of pdf documents available for each pump.

6.2.7.4 Upgrade software

The **Software version** part of the window shows what software packages are available for upgrade. The site location part of the window shows what software version all connected units run.

7 Troubleshooting

7.1 System alarms and reminders

System alarms	Unit	Type	Cause	Remedy
System: Watchdog restart	Central unit	Alarm (B)	CU has restarted due to software or hardware locking.	Contact local sales office or service center. Report error and status code.
System: Program error	Central unit	Alarm (B)	CU has restarted due to internal fault in the module.	Contact local sales office or service center. Report error and status code.
System: Clock error	Central unit	Alarm (B)	Clock failure in CU: 1. The time has been adjusted more than 30 seconds. 2. Incorrect time at setting. 3. The clock has been lost, CU has been without supply for more than 7 days. 4. The software clock can not be set. 5. The hardware clock can not be set. 6. The software clock time zone can not be set. 7. The hardware clock time zone can not be set.	Error Status 3: The clock has been lost and must be reset. Error Status 4-7: Contact local sales office or service center. Report error and status code.
System: RAM error	Central unit	Alarm (B)	CU RAM memory error.	Contact local sales office or service center. Report error and status code.
System: FLASH parameter error	Central unit	Alarm (B)	CU flash memory error when parameter setting is saved.	Contact local sales office or service center. Report error and status code.
System: FLASH parameter flag error	Base unit	Alarm (B)	CU Flash memory error when transferring settings from CU to BU/PEM.	Contact local sales office or service center. Report error and status code.

System alarms	Unit	Type	Cause	Remedy
System: New pump detected but no free position in CU	Base unit	Reminder	System: New pump detected but no free position in CU	New pump found but no free position in CU. Delete a disconnected pump that will no longer be used in the station. Menu: SETTINGS Pump settings Remove.
System: New software for CU detected	Base unit	Reminder	System: New software for CU detected	New software for CU available for update. Update the software. Menu: HELP Upgrade software.
CU-BU communication error	Central unit	Alarm (B)	CU-BU communication lost.	Check DeviceNet connection CU-BU.
Pump disconnected	Central unit	Alarm (B)	Pump disconnected.	Check the 2-wire connection for BU-PEM communication
Watchdog restart	Base unit	Alarm (B)	BU has restarted due to software or hardware locking.	Contact local sales office or service center. Report error and status code.
Program error	Base unit	Alarm (B)	BU has restarted due to internal fault in the module.	Contact local sales office or service center. Report error and status code.
Clock error	Base unit	Alarm (B)	BU RTC clock error. 1. The time has been adjusted more than 30 seconds. 2. Incorrect time at setting. 3. The clock has been lost, BU has been without supply for more than 7 days. 4. The clock can not be set.	Error Status 3: The clock has been lost and must be reset. Error status 4: Contact local sales office or service center. Report error and status code.
RAM memory error	Base unit	Alarm (B)	BU RAM memory error.	Contact local sales office or service center. Report error and status code.

FLASH parameter error	Base unit	Alarm (B)	Settings in BU lost or corrupt.	Contact local sales office or service center. Report error and status code.
FLASH file error	Base unit	Alarm (B)	BU Flash memory error.	Contact local sales office or service center. Report error and status code.
FLASH database event CU error	Base unit	Alarm (B)	BU Flash memory error.	Contact local sales office or service center. Report error and status code.
FLASH database event BU error	Base unit	Alarm (B)	BU Flash memory error.	Contact local sales office or service center. Report error and status code.
FLASH database event PEM error	Base unit	Alarm (B)	BU Flash memory error.	Contact local sales office or service center. Report error and status code.
BU-PEM communication error	Base unit	Alarm (B)	Interrupted BU-PEM communication	Fix BU-PEM communication interference problem. Adjust pump cabling. Contact local sales office or service center.

Emergency signalling (heartbeat)/BU-PEM communication error	Base unit	Alarm (A)	Pump connected with normal current consumption, but neither communication nor emergency signalling (heartbeat) works.	<p>Check BU LEDs for PEM, TD and RD:</p> <ul style="list-style-type: none"> • TD and RD off: No communication, no PEM connected. • TD green and RD off: PEM powered but not responding. • TD green and RD yellow: PEM emergency signalling (heartbeat). • TD green and RD green: Communication OK. <ol style="list-style-type: none"> 1. Try restart of BU 2. Replace BU. 3. Replace PEM in pump.
Unspecified pump alarm	Base unit	Alarm (A)	Pump indicates A alarm via emergency signalling (heartbeat).	Fix alarms in the pump and make sure to solve communication problems. Note! To acknowledge alarm, BU-PEM communication must work.
Alarm BU output power PEM	Base unit	Alarm (A)	Pump off or power consumption to PEM incorrect: 12V: Current consumption <15 mA or >200 mA. 24V: Current consumption <30 mA or >400 mA	Connected pump with low or high current consumption may be due to errors in BU or PEM. 1. Try restart of BU. 2. Replace BU. 3. Replace PEM in pump

<p>PAN 312 communication error</p>	<p>Base unit</p>	<p>Alarm (B)</p>	<p>The communication between BU and connected power module PAN 312 has been lost.</p>	<p>Check that the PAN 312 is powered and correctly connected to the RS485 input of BU. Check BU communication LEDs: for Modbus, TD (transmission) and RD (reception). If reception is missing check that the PAN 312 module is powered and functioning. If the problem persists check that ID is 255 in PAN 312.</p>
<p>SRC 311 communication error</p>	<p>Base unit</p>	<p>Alarm (B)</p>	<p>The communication between BU and connected frequency converter SRC 311 (SmartRun) has been lost.</p>	<p>Check that the SRC 311 is powered and correctly connected to the RS485 input of BU. Check BU communication LEDs: for Modbus TD (transmission) and RD (reception). If reception is missing check that the SRC 311 module is powered and functioning. If the problem persists, check that the ID number for the module is correct.</p>

8 Appendix

8.1 Prepare the SUBCAB®

Round or square connectors are used. This instruction describes both options.

Necessary tools:

- Wrench 24 mm (0.9448 in), square connector
- Screwdriver, square connector

For description, see [Table 2: Description of illustrations](#) on page 44.

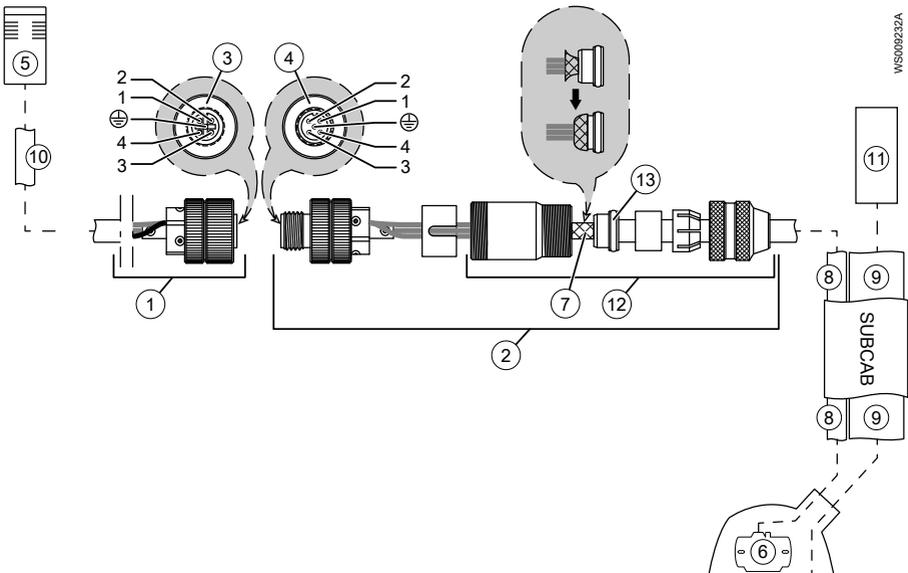


Figure 6: Round connector

For description, see [Table 2: Description of illustrations](#) on page 44.

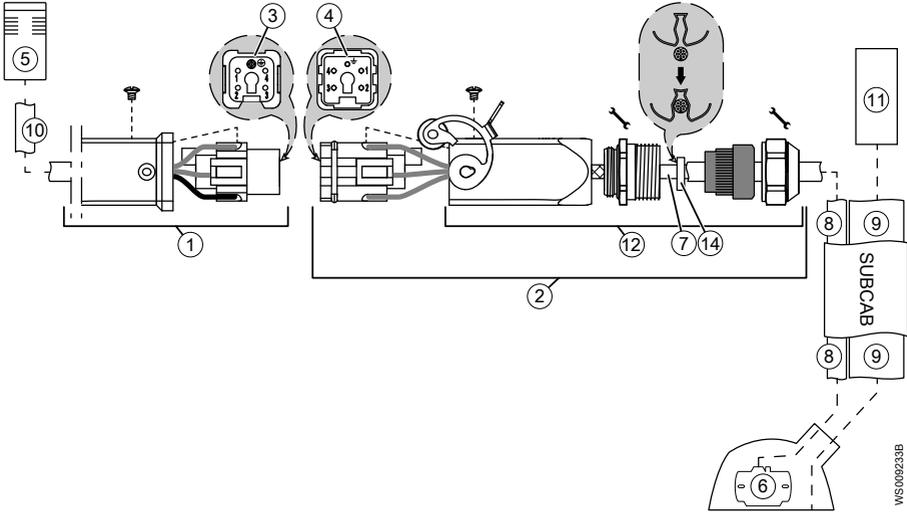


Figure 7: Square connector

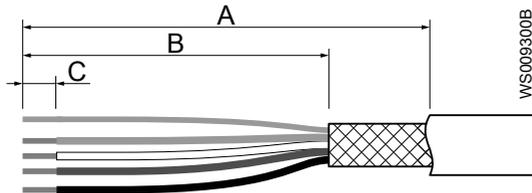
Table 2: Description of illustrations

Item	Denomination	Comments
1	Female connector, exploded view.	Parts that are not visible are identical on male and female side.
2	Male connector, exploded view.	
3	Female connector, end view	See Table 3: Connections on page 45.
4	Male connector, end view	
5	Base unit	
6	Pump electronic module	
7	Screen	Al tape
8	Signal leads	T1, T2. For Ex application T3 and T4.
9	Phase leads	
10	Base unit cable	941742 AWM Style 20233 80°C (176°F) 300 V, blue.
11	Variable Frequency Drive (VFD)	
12	Housing assembly	
13	Insert	For round connectors.
14	Contact spring	For square connectors.

Table 3: Connections

Terminals	Base unit cable	SUBCAB® for standard pumps	Screened SUBCAB® for Ex pumps.
1	RD	T1	T1
2	BK	T2	T2
3	WH	-	T3
4	GR	-	T4
Signal ground (earth)	Drain wire	Drain wire	Drain wire

1. Peel the outer sheath of the SUBCAB® cable.
2. Prepare the signal leads and the base unit cable:



- a) Peel the sheath (A).

Round connector	Square connector
40 mm (1.6 in)	60 mm (2.4 in)

- b) Peel the screen (B). For the base unit cable, peel off the metal foil the same length.

Round connector	Square connector
30 mm (1.2 in)	50 mm (2.0 in)

- c) For square connectors, adapt the aluminum tape over the remaining screen.

The tape is included in the delivery.

- d) Peel the cores (C).

Peel length: 5 mm (0.2 in)

3. Put the cable ends through the connectors as illustrated.
4. Use the screw terminals on the connectors to connect the cores. See [Table 3: Connections](#) on page 45.
5. Connect the screen.

See the correct illustration:

 - a) For round connectors, fold the screen back over the insert.
 - b) For square connectors, put the contact spring over the screen.
6. Assemble the parts of the housing assembly.

Tighten the rubber bushings. Use tools where applicable.
7. Assemble the remaining parts of the connectors.

Use tools where applicable.

8. Test the screen: measure the resistance between the signal ground (earth) terminal and the connector housing assembly. Expected value < 5 m ohm.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services, and agricultural settings. With its October 2016 acquisition of Sensus, Xylem added smart metering, network technologies and advanced data analytics for water, gas and electric utilities to its portfolio of solutions. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com



Xylem Water Solutions Global
Services AB
361 80 Emmaboda
Sweden
Tel: +46-471-24 70 00
Fax: +46-471-24 74 01
<http://tpi.xyleminc.com>

Visit our Web site for the latest version of this document and more information

The original instruction is in English. All non-English instructions are translations of the original instruction.

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CURRENT TRANSFORMERS

Model 5 Ratio to 1 (Window Size: 1.56" Diameters)

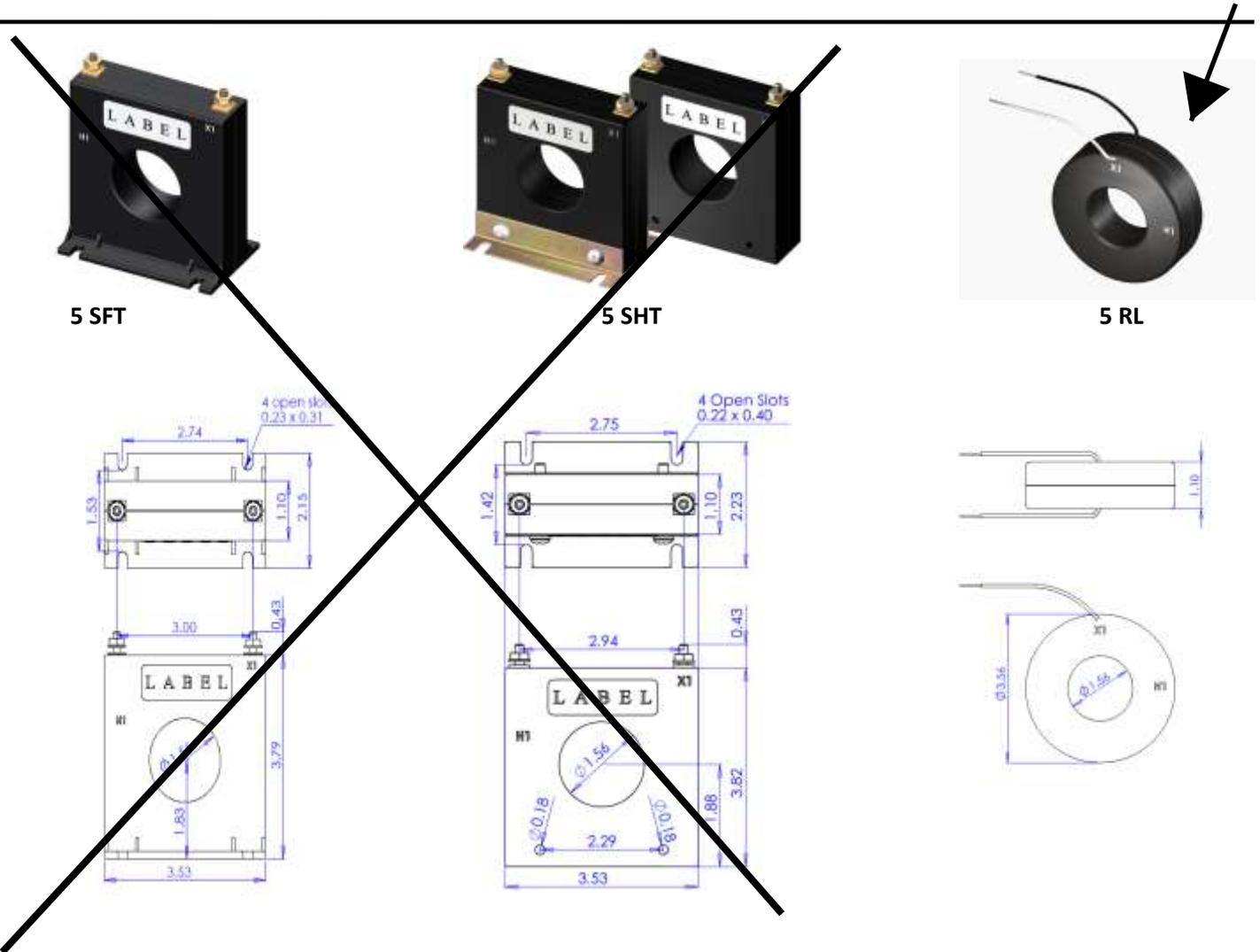
Application: Used with ammeters, watt meters and cross current compensation.

Frequency: 50-400 Hz

Insulation Level: 600 Volts, 10Kv BIL Full Wave

Standards: CSA 66.1-06, CSA 66.2-06, IEEE C 57.13, and UL 506

- Flexible leads available for all case configurations. Flexible leads are UL 1015 105°C, C.S.A approved #16 AWG, 24" long standard length. Non-standard lengths are available upon request.
- Terminals are brass. Stud and Female options w/ hardware available. See Page 2 (Note: Terminals are only available on the square case configuration.)
- Mounting bracket kits for the Model 5SHT or 5SHL are available.
- Approximate weight: 0.5 lbs.



*Note - Mounting bracket kits for the Model 5SHT or 5SHL are available. (Sold separately Part Number 1121A00020-1)



Electromagnetic Industries LLP

www.electromagnetic.biz

CURRENT TRANSFORMERS

Model 5 Ratio to 1 (Window Size: 1.56" Diameters)

Catalog Number	Current Ratio	MODEL 5SFT, 5SHT, 5RL, 5SFY, 5SHY ANSI METERING CLASS AT 60 HZ				
		B0.1	B0.2	B0.5	B0.9	B1.8
5 **--101-1	100:1	1.2	-	-	-	-
5 **--121-1	120:1	1.2	-	-	-	-
5 **--151-1	150:1	1.2	1.2	-	-	-
5 **--201-1	200:1	0.6	0.6	2.4	-	-
5 **--251-1	250:1	0.3	0.3	1.2	2.4	-
5 **--301-1	300:1	0.3	0.3	1.2	2.4	-
5 **--401-1	400:1	0.3	0.3	0.6	1.2	2.4
5 **--501-1	500:1	0.3	0.3	0.3	0.6	2.4
5 **--601-1	600:1	0.3	0.3	0.3	0.6	2.4
5 **--751-1	750:1	0.3	0.3	0.3	0.6	2.4
5 **--801-1	800:1	0.15	0.3	0.3	0.6	1.2
5 **--102-1	1000:1	0.15	0.15	0.15	0.3	0.6
5 **--122-1	1200:1	0.15	0.15	0.15	0.3	0.6

**Note: When ordering, use prefix below to indicate unit designation/configuration. (i.e. 5SFT-101-1)

RL = Thin Round Case with Standard 24" leads (Non-standard lengths are available upon request)

SHX* = Square Case with mounting holes

SFX* = Square Case w/molded feet and terminals

T = Male (Brass studs No. 8-32 UNC with one flat washer, one lock washer and one nut each)

Y = Female (Brass with one Cup washer, one lock washer and one No. 8-32 UNC binding head screw each)



L = 16awg Lead Wire Y = Female Terminals T = Male Terminals

*X is to be replaced with "L", "Y" or "T" for terminal or lead designation.

*Note - Mounting bracket kits for the Model 5SHT or 5SHL are available. (Sold separately Part Number 1121A00020-1)



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Phone: 586.978.7200 • Fax: 586.978.2200
www.hesco-mi.com

March 7, 2019

Mr. John Florshinger
City of Flint
PO Box 246
Flint, MI 48501

**Subject: Flint East Pump Station Pump Replacement
Record Submittal Package: Spec Section 15100 Valves and Actuators**

Dear John,

We have received the review comments for the Replacement Knife Gate Valve and Swing Check Valve equipment for the Flint East Pump Station Pump Replacement Project. Below are our responses to the engineer's review comments dated February 7, 2019:

1. 24" Knife Gate Valve shall have 316 stainless steel wetted parts including seat, gate and hardware.
Response: Confirmed. 316 stainless steel will be supplied for wetted parts including seat, gate and hardware.
2. 30" Knife Gate Valve handwheel shall be rotated 90 degrees so that the plane of the handwheel face is parallel with the valve face plane. Valve shall have 316 stainless steel wetted parts including seat, gate and hardware.
Response: Confirmed. The handwheel provided will be rotated 90 degrees so that the plane of the handwheel face is parallel with the valve face plane and 316 stainless steel will be supplied for wetted parts including seat, gate and hardware.

This equipment has been released noting the engineer's comments. Please don't hesitate to give me a call if you have any questions or need anything further.

Best regards,

HESCO

Diana Segovia

Diana Segovia
Encl.



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PROJECT

**City of Flint WPCF
East Pump Station Pump Replacement**

ENGINEER

Hubbel, Roth & Clark, Inc.
555 Hulet Dr.
Bloomfield Hills, MI 48302
Phone 248-454-6300

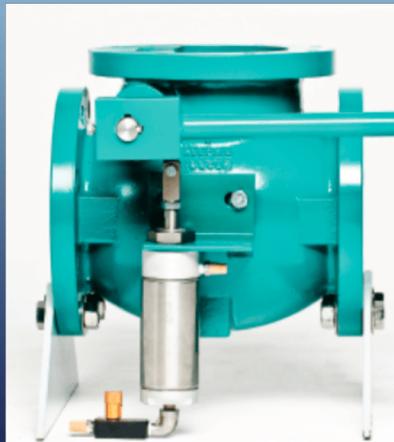
LOCAL REPRESENTATIVE

HESCO
28838 Van Dyke Ave.
Warren, MI 48093
Phone 586-978-7200

MANUFACTURERS

ITT Engineered Valves
33 Centerville Road
Lancaster, PA 17603
Phone: 717-509-2200

Crispin Valve
PO Box 427
600 Fowler Ave
Berwick, PA 18603
Phone 800-247-8258





**City of Flint WPCF
East Pump Station Pump Replacement
Spec Section 15100: Valves and Actuators**

**2.1 Fabricated Knife Gate Valves
2.2 Check Valves**

Submittal Package

TABLE OF CONTENTS

Item	Description
1	<u>2.1 Fabricated Knife Gate Valves</u> (4) 24" ITT Fabri-Valve C67R Knife Gate Valve <ul style="list-style-type: none">• Valve Data Sheet• Valve Drawing (4) 30" ITT Fabri-Valve C67R Knife Gate Valve <ul style="list-style-type: none">• Valve Data Sheet• Valve Drawing <ul style="list-style-type: none">• ITT Series C67 Knife Gate Valve Brochure• ITT Warranty
2	<u>2.2 Check Valves</u> (4) 24" Crispin Outside Lever & Spring Swing Check Valve <ul style="list-style-type: none">• Valve Data Sheet• Valve Drawing• Tnemec Paint Data Sheet• Crispin SWL Swing Check Valve Brochure• Crispin Warranty

2.1 Fabricated Knife Gate Valves



ITT Engineered Valves. LLC
1110 Bankhead Ave
Amory, MS, 38821 USA
Phone: +1 662-256-7285

CERTIFIED DATA SHEET

Created By: Christopher Logan

Date Issued: February 22, 2019

Customer:	HESCO	Order Number:	190017398
Customer P.O.:	50698	Order Line No:	100
Item Number:	FV-C6720195800	Item Description:	24-C67-R-316-EBU-BG4-BL-ANSI-G2- ACRSC-PSB1-PG4-YM1-ST1-FT2-CW1- CW2/8.0
Drawing Number:	D19-0007	Drawing Rev. No:	0

SIZE: 24"
FIGURE NO.: C67
SERIES: R - ALLOY STEEL WETTED PARTS, CARBON STEEL EXTERIOR
BODY: CAST 316 SS
SEAL MATERIAL: EPDM
SPECIAL SEAL ATTRIBUTES: SEAL COLOR - BLACK
RATED COLD WORKING PRESSURE (CWP): 150 PSI
FLANGE DRILLING: ANSI 125/150
GATE MATERIAL: 316 SS
PACKING: ACRYLIC / SILICONE
PACKING SUPPORT: CARBON-FILLED TFE
PACKING GLAND MATERIAL: DUCTILE IRON
YOKE MATERIAL: CARBON STEEL
STEM MATERIAL: 304 SS
FASTENERS: 316 SS
MANUAL OPERATOR: 4:1 BG4 BEVEL GEAR
WITH CHAINWHEEL
LENGTH OF CHAIN: 8 FT
CHAIN: INCLUDED

Tagging and Additional Information



ITT Engineered Valves. LLC
1110 Bankhead Ave
Amory, MS, 38821 USA
Phone: +1 662-256-7285

CERTIFIED DATA SHEET

Created By: Christopher Logan

Date Issued: February 26, 2019

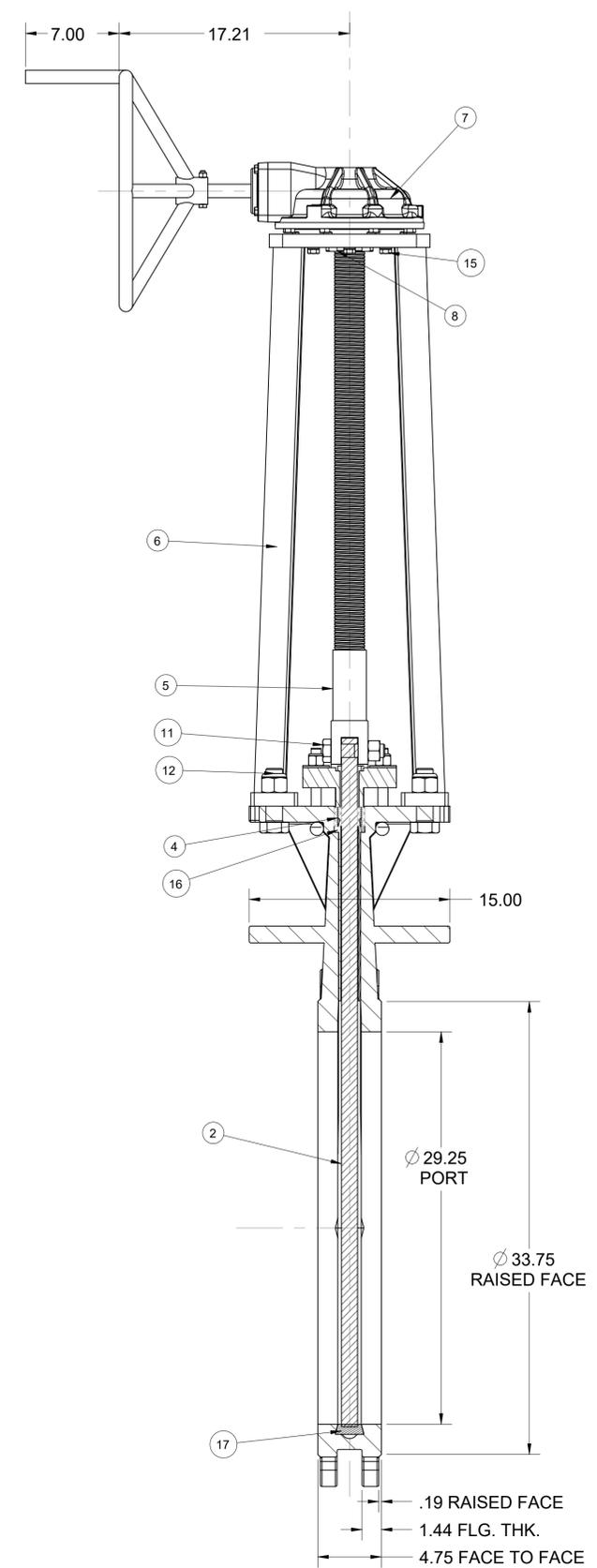
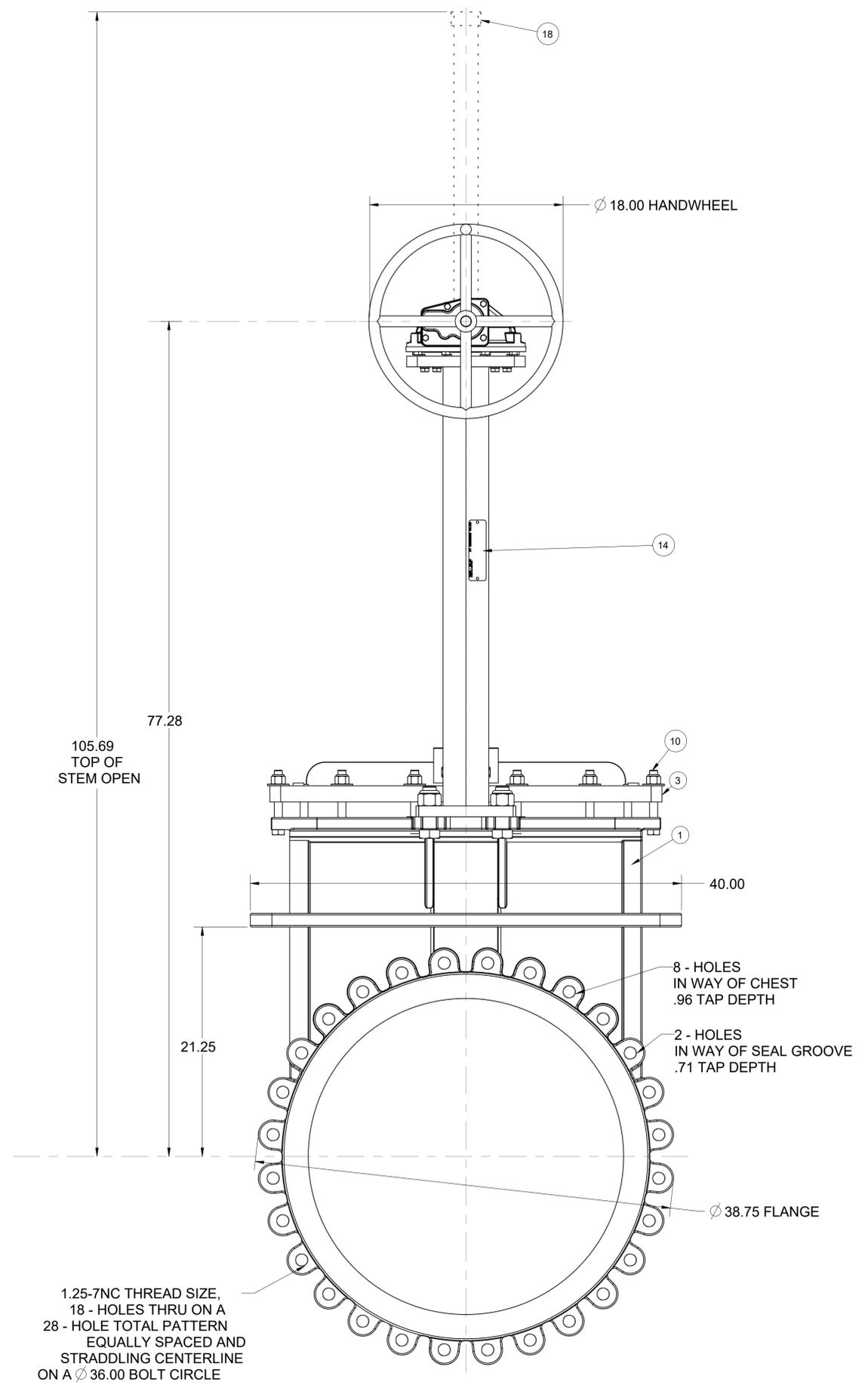
Customer:	HESCO	Order Number:	190017398
Customer P.O.:	50698	Order Line No:	200
Item Number:	FV-C6720195900	Item Description:	30-C67-R-316-EBU-BG4-BL-CWP/150-ANSI-G2-GSUH-ACRSC-PG5-YM1-ST1-FT2-OR1-QFE
Drawing Number:	D19-0006	Drawing Rev. No:	1

SIZE: 30"
FIGURE NO.: C67
SERIES: R - ALLOY STEEL WETTED PARTS, CARBON STEEL EXTERIOR
BODY: CAST 316 SS
SEAL MATERIAL: EPDM
SPECIAL SEAL ATTRIBUTES: SEAL COLOR - BLACK
BODY AND GATE RATING (CWP): 150.00 PSI G
FLANGE DRILLING: ANSI 125/150
GATE MATERIAL: 316 SS
CHEST LINER: UHMW (160°F MAX.)
PACKING: ACRYLIC / SILICONE
PACKING GLAND MATERIAL: CARBON STEEL
YOKE MATERIAL: CARBON STEEL
STEM MATERIAL: 304 SS
FASTENERS: 316 SS
MANUAL OPERATOR: 4:1 BG4 BEVEL GEAR
ACTUATOR ORIENTATION: HW POSITION: PARALLEL TO GATE
QA OPTIONS: CERTIFIED HYDROSTATIC TEST REPORTS

Tagging and Additional Information

PARTS LIST	
ITEM	DESCRIPTION
1	BODY
2	GATE
3	PACKING GLAND
4	PACKING
5	STEM ASSEMBLY
6	YOKE
7	BEVEL GEAR 4:1 RATIO
8	STEMNUT
10	GLAND FASTENERS
11	STEM CLP FASTENERS
12	YOKE FASTENERS
14	SERIAL NUMBER TAG
15	OPERATOR FASTENERS
16	PACKING SUPPORT
17	U-SEAL
18	STOP NUT

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NOTES:

1. MATERIALS OF CONSTRUCTION ARE CUSTOMER SPECIFIED AND ARE LABELED ON CERTIFIED DATA SHEET.
2. OPERATOR MAY REQUIRE EXTERNAL SUPPORT BY OTHERS IF VALVES ARE INSTALLED IN ANY OTHER POSITION THAN STEM VERTICAL.
3. CONSTRUCTION DETAILS OTHER THAN THOSE IDENTIFIED BY DIMENSIONS MAY VARY SLIGHTLY, IF SPACE LIMITATIONS ARE CRITICAL CONTACT CUSTOMER SERVICE.

REV.	DATE	DESCRIPTION	EN NO	BY	CK'D
1	2/26/19	ROTATED BEVEL GEAR HW TO PARALLEL W/GATE		CLL	CLL
0	1/30/19	RELEASE		CLL	CLL

**30" C67 150 CWP
BEVEL GEAR OPERATOR
CRITICAL DIMENSIONS AND PARTS LIST**

<p align="center">Engineered Valves Amory, Mississippi USA</p>	<table border="1"> <tr> <td>DRAWN</td> <td>CLL</td> <td>DATE</td> <td>1/29/19</td> <td>Drawing no</td> </tr> <tr> <td>CK'D</td> <td>CLL</td> <td>DATE</td> <td>1/30/19</td> <td rowspan="2">D19-0006</td> </tr> <tr> <td>APPV'D</td> <td>ENGR</td> <td>ORDER</td> <td></td> </tr> <tr> <td>SCALE</td> <td>0.156</td> <td>ORDER</td> <td></td> <td>SHEET 1 of 1</td> </tr> </table>	DRAWN	CLL	DATE	1/29/19	Drawing no	CK'D	CLL	DATE	1/30/19	D19-0006	APPV'D	ENGR	ORDER		SCALE	0.156	ORDER		SHEET 1 of 1
	DRAWN	CLL	DATE	1/29/19	Drawing no															
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	APPV'D	ENGR	ORDER																	
SCALE	0.156	ORDER		SHEET 1 of 1																

Fabri-Valve®

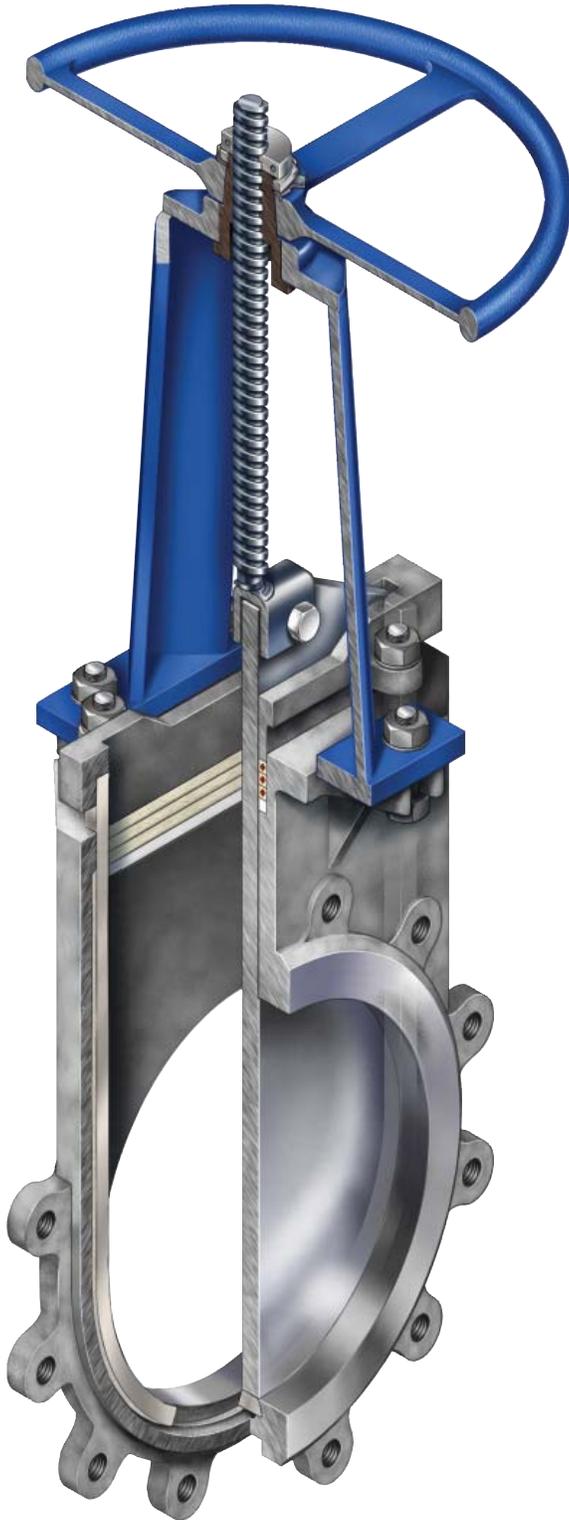
C67 Bi-Directional
Knife Gate Valve



ITT

ENGINEERED FOR LIFE

C67 Bi-Directional Knife Gate Valve



The Fabri-Valve Figure C67 features a unique, patented*, perimeter seal that provides bi-directional shutoff. The seal is retained in the valve body by its trapezoidal shape. A relief has been cast into the valve body behind the seal. Designed to overcome the problems experienced with existing perimeter seal designs, the relief greatly reduces seal compression set; the shape of the seal eliminates leakage due to seat rollover, eliminates seal pullout due to fluid velocity, and eliminates grooves that collect material and prevent the valve from properly closing. This unique valve design is available in stainless steel and carbon steel. Stainless steel bodied valves have white EPDM seals as standard. Carbon steel bodied valves have black EPDM seals as standard. Black Viton or white Viton, AFLAS, Hycar, Hypalon, Neoprene, HNBR, and other seal materials are available as options.

All Figure C67 handwheel actuated knife gate valves include a provision for a locking device.

Specifications

Size Range

2" – 36"

Pressure Rating

- 2"-24" 150 psi (10.3 bar) CWP (cold working pressure)
- 30" 100 psi (6.9 bar)
- 36" 80 psi (5.5 bar)

Consult factory for higher pressure designs.

Temperature Rating

- EPDM Seat -50°F (-45°C) to 280°F (138°C)
- Viton Seat -30°F(-34°C) to 350°F (177°C)

Flange Drilling

ANSI 125/150 Drilling

Testing

Every Fabri-Valve Figure C67 valve is fully tested prior to shipment. Testing includes a body shell test, a seat test and a cycling test to insure proper functioning of moving parts. Additional testing is also available. Please let us know your requirements.

- Standard Shell test: Hydro test at 1.5 times the rated CWP (cold working pressure) – Zero allowable leakage
- Standard Resilient Seat test: Hydro test at 15 psi (1 bar) and rated CWP

Energized cored packing and packing supports are standard with 6" (DN 150) and larger Figure C67 valves

*U.S. Patent #5, 154,397

Pressure/Temperature Ratings

The table below is the Maximum Pressure Temperature Ratings for the metallic components only. When checking pressure/temperature ratings, check the temperature rating and chemical compatibility of the packing material and the resilient seat material. In a majority of knife gate valve designs, the temperature limit or the chemical compatibility of the seat and/or packing material determines the practical pressure/temperature limitations.

Figure C67							
Pressure-Temperature Rating -psi							
Temp		Cast 304	Cast 304L	Cast 316	Cast 316L	Cast 317L	Cast WCB A-216
°F	°C						
150	66	150	150	150	150	150	150
200	93	142	142	150	150	135	150
250	121	135	135	142	142	128	150
300	149	129	129	134	134	121	150
350	177	123	123	128	128	116	150
400	204	118	118	123	123	112	150
450	232	114	114	118	118	108	150
500	260	111	111	114	114	105	150

Shutoff Performance

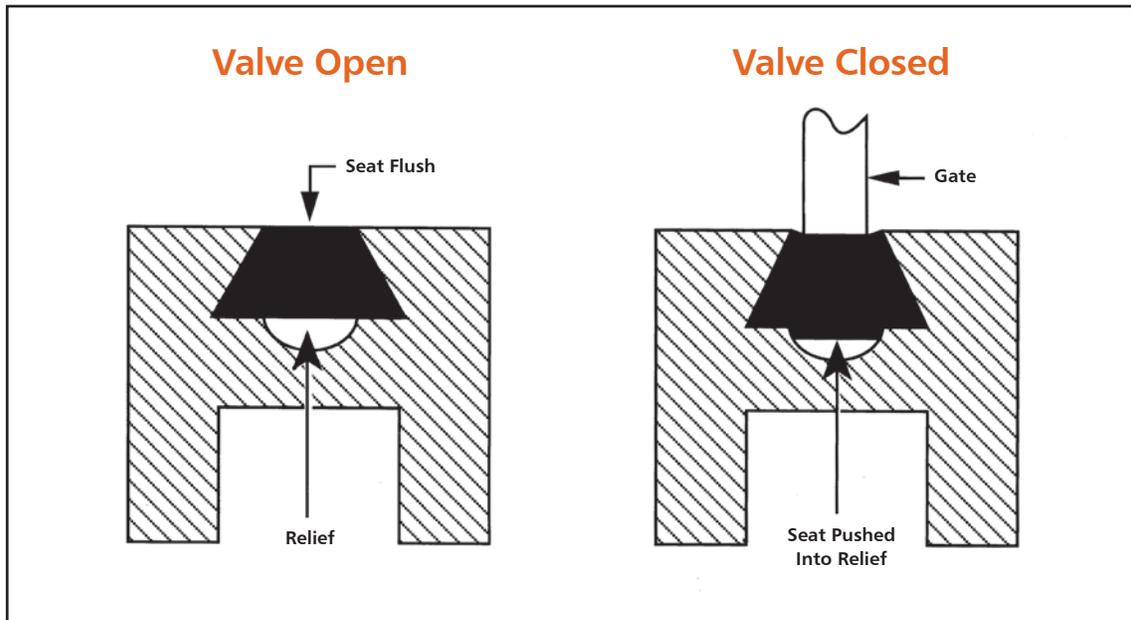
Zero leakage. All sizes.

Flow Coefficients

The Cv values below represent U.S. gallons per minute 60°F water through a 100% open valve at a pressure drop of 1 psi. The metric equivalent, Kv, is the flow of water at 16°C through the valve in cubic meters per hour at a pressure drop of 1 kg/cm². To convert Cv to Kv, multiply the Cv by 0.8569.

Figure C67 Knife Gate Valves							
C _v Ratings, Port Diameter and Area							
Valve Size		Standard Port			With V-Seat		
		C _v	Port I. D. Inches	Port Area Sq. In.	C _v	Port I.D. Inches	Port Area Sq. In.
2	50	288	2.00	3.1	165	2.00	2.8
3	75	648	3.00	7.1	355	3.00	6.3
4	100	1,152	4.00	12.6	515	4.00	9.5
6	150	2,592	6.00	28.3	1,350	6.00	24.9
8	200	4,608	8.00	50.3	2,050	8.00	38.1
10	250	7,208	10.00	78.5	3,200	10.00	59.0
12	300	10,400	12.00	113.1	4,450	12.00	82.3
14	350	12,650	13.25	137.9	5,350	13.25	98.8
16	400	16,750	15.25	182.6	6,950	15.25	128.4
18	450	21,450	17.25	233.7	10,700	17.25	198.2
20	500	26,700	19.25	291.0	13,250	19.25	245.4
24	600	38,900	23.25	424.6	15,400	23.25	284.7
30	750	61,600	29.25	671.9			
36	900	89,460	35.25	975.9			

Consult Factory



Dimensions: C67 with Handwheel or Cylinder

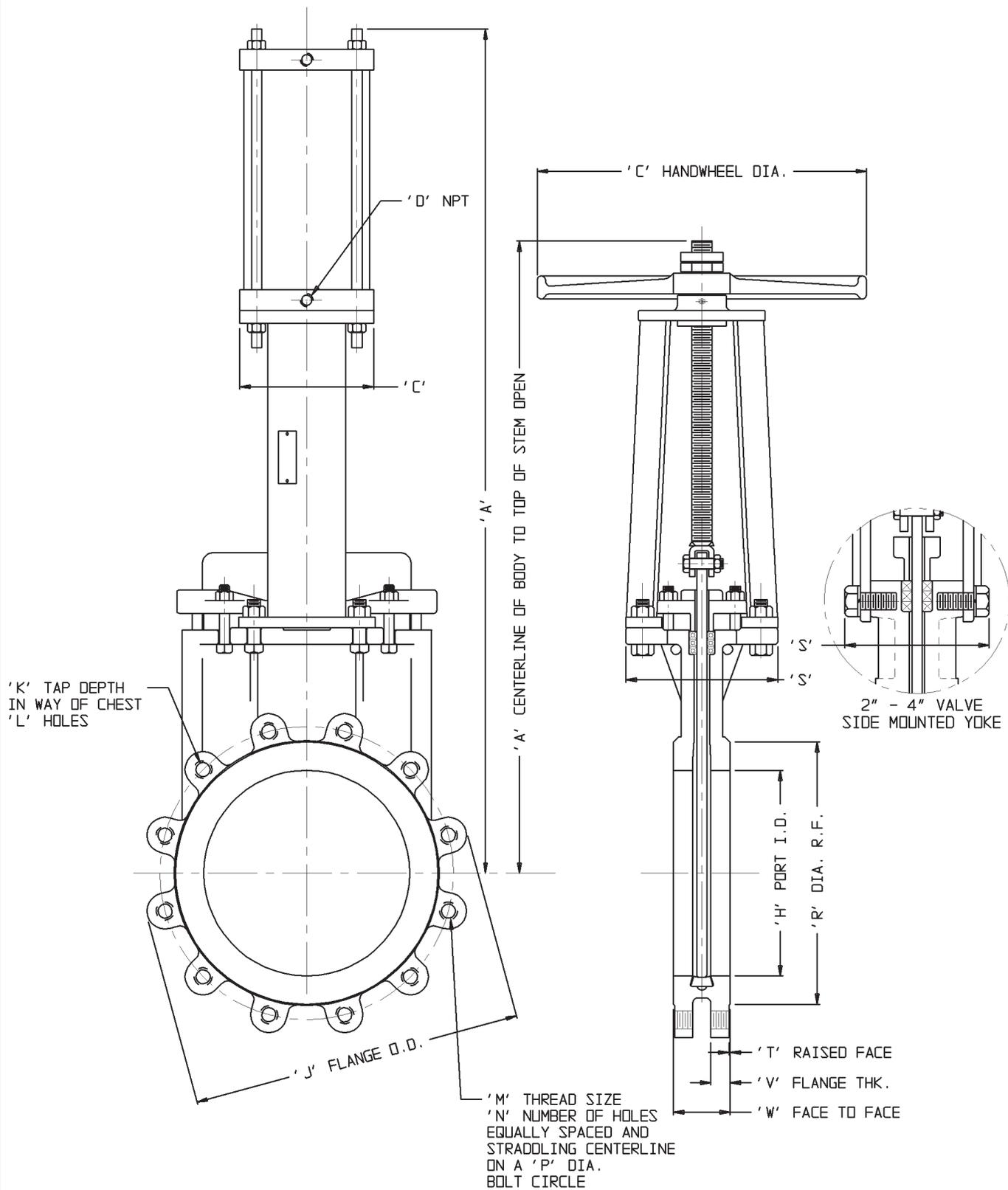
Valve Size		TABLE 1 DIMENSION Inches (mm) C67 with HANDWHEEL OR CYLINDER																		Weight *			
Inches	DN	A			C			D		H	J	K	L	M	N	P	R	S	T	V	W	lb	kg
		HW	2-1/2 CYL	3-1/4 CYL	HW	2-1/2 CYL	3-1/4 CYL	2-1/2 CYL	3-1/4 CYL														
2	50	14-7/8 (378)	18-3/16 (462)	16-7/16 (418)	10 (254)	3 (76)	4 (102)	3/8-18	1/4-18	2 (51)	6 (152)	27/64 (11)	2	5/8-11NC	4	4-3/4 (121)	3-5/8 (92)	4 (102)	1/16 (2)	9/16 (14)	1-7/8 (48)	17	8
3	80	17-5/8 (448)	20-11/16 (525)	19-3/16 (487)	10 (254)	3 (76)	4 (102)	3/8-18	1/4-18	3 (76)	7-1/2 (191)	23/64 (9)	2	5/8-11NC	4	6 (152)	5 (127)	4 (102)	1/16 (2)	9/16 (14)	2 (51)	21	10
4	100	19-13/16 (503)	21-15/16 (557)	22-11/16 (576)	10 (254)	4 (102)	4-1/2 (114)	1/4-18	3/8-18	4 (102)	9 (229)	27/64 (11)	2	5/8-11NC	8	7-1/2 (191)	6-3/16 (157)	4 (102)	1/16 (2)	11/16 (17)	2 (51)	30	14
6	150	27-3/8 (695)	29-9/16 (751)	29-15/16 (760)	16 (406)	4-1/2 (114)	6-1/2 (165)	3/8-18	3/8-18	6 (152)	11 (279)	7/16 (11)	2	3/4-10NC	8	9-1/2 (241)	8-1/2 (216)	7-3/8 (187)	1/16 (2)	5/8 (16)	2-1/4 (57)	75	34
8	200	34-3/16 (868)	36-3/8 (924)	36-7/8 (937)	16 (406)	6-1/2 (165)	8-5/8 (219)	3/8-18	3/8-18	8 (203)	13-1/2 (343)	21/32 (17)	2	3/4-10NC	8	11-3/4 (298)	10-5/8 (270)	7-3/8 (187)	1/16 (2)	13/16 (21)	2-3/4 (70)	95	45
10	250	39-5/8 (1006)	42-9/16 (1081)	43-5/16 (1100)	16 (406)	8-5/8 (219)	10-7/8 (276)	3/8-18	1/2-14	10 (254)	16 (406)	9/16 (14)	4	7/8-9NC	12	14-1/4 (362)	12-3/4 (324)	7-3/8 (187)	1/16 (2)	15/16 (24)	2-3/4 (70)	139	63
12	300	46-1/4 (1175)	49 (1245)	49-3/4 (1264)	20 (508)	8-5/8 (219)	10-7/8 (276)	3/8-18	1/2-14	12 (305)	19 (483)	1/2 (13)	4	7/8-9NC	12	17 (432)	15 (381)	7-1/2 (191)	3/16 (5)	1 (25)	3 (76)	197	87
14	350	51-9/16 (1310)	55-1/16 (1399)	56-3/16 (1427)	20 (508)	12-3/4 (324)	14-3/4 (375)	1/2-14	3/4-14	13-1/4 (337)	21 (533)	1/2 (13)	4	1-8NC	12	18-3/4 (476)	16-1/4 (413)	7-3/4 (197)	3/16 (5)	15/16 (24)	3 (76)	301	147
16	400	59-3/16 (1503)	62-3/8 (1584)	63-1/2 (1613)	20 (508)	12-3/4 (324)	14-3/4 (375)	1/2-14	3/4-14	15-1/4 (387)	23-1/2 (597)	5/8 (16)	6	1-8NC	16	21-1/4 (540)	18-1/2 (470)	11-1/4 (286)	3/16 (5)	1-1/16 (27)	3-1/2 (89)	379	180
18	450	66-1/2 (1689)	70-1/16 (1780)	70-11/16 (1795)	30 (762)	12-3/4 (324)	14-3/4 (375)	1/2-14	3/4-14	17-1/4 (438)	25 (635)	19/32 (15)	6	1-1/8-7NC	16	22-3/4 (578)	21 (533)	11-1/4 (286)	3/16 (5)	1-1/16 (27)	3-1/2 (89)	467	212
20	500	72-7/8 (1851)	77-1/4 (1962)	77-3/4 (1975)	30 (762)	14-3/4 (375)	17 (432)	3/4-14	3/4-14	19-1/4 (489)	27-1/2 (699)	31/32 (25)	8	1-1/8-7NC	20	25 (635)	23 (584)	14 (356)	3/16 (5)	1-3/16 (30)	4-1/2 (114)	523	237
24	600	84-3/4 (2153)	88-9/16 (2249)	90-1/2 (2299)	30 (762)	17 (432)	19 (483)	3/4-14	3/4-14	23-1/4 (591)	32 (813)	29/32 (23)	8	1-1/4-7NC	20	29-1/2 (749)	27-1/4 (692)	14-1/8 (359)	3/16 (5)	1-5/16 (33)	4-1/2 (114)	713	321
30	750	N/A	106-15/16 (2716)	108-13/16 (2764)	N/A	17 (432)	19 (483)	3/4-14	3/4-14	29-1/4 (591)	38-3/4 (984)	15/16 (24)	10	1-1/4-7NC	28	36 (914)	33-3/4 (857)	15 (381)	3/16 (5)	1-5/16 (33)	4-1/2 (114)	Consult Factory	
36	900	N/A	130-15/16 (3326)	131-11/16 (3345)	N/A	19 (483)	21 (533)	3/4-14	3/4-14	35-1/4 (895)	46 (1168)	1 (25)	12	1-1/2-6NC	32	42-3/4 (1086)	40-1/4 (1022)	19 (483)	3/16 (5)	1-3/8 (35)	5-1/2 (140)		

* Figures C67R and C67S with Handwheel

Reference Dimensions in (parentheses)

C67 with Handwheel or Cylinder

Refer to table on page 4 for dimensions



Dimensions: C67 with Bevel Gear

Valve Size		TABLE 2 DIMENSION Inches (mm) C67 W/BEVEL GEAR																
Inches	DN	A	B	C	D	E	H	J	K	L	M	N	P	R	S	T	V	W
6	150	26-11/16 (678)	20-11/16 (525)	12 (305)	12-3/8 (314)	6-1/2 (165)	6 (152)	11 (279)	7/16 (11)	2	3/4-10NC	8	9-1/2 (241)	8-1/2 (216)	7-3/8 (187)	1/16 (2)	5/8 (16)	2-1/4 (57)
8	200	34-1/4 (870)	25-1/2 (648)	12 (305)	12-3/8 (314)	6-1/2 (165)	8 (203)	13-1/2 (343)	21/32 (17)	2	3/4-10NC	8	11-3/4 (298)	10-5/8 (270)	7-3/8 (187)	1/16 (2)	13/16 (21)	2-3/4 (70)
10	250	39-5/8 (1006)	29-1/16 (738)	12 (305)	12-3/8 (314)	6-1/2 (165)	10 (254)	16 (406)	9/16 (14)	4	7/8-9NC	12	14-1/4 (362)	12-3/4 (324)	7-3/8 (187)	1/16 (2)	15/16 (24)	2-3/4 (70)
12	300	46-1/4 (1175)	33-7/16 (849)	12 (305)	12-3/8 (314)	6-1/2 (165)	12 (305)	19 (483)	1/2 (13)	4	7/8-9NC	12	17 (432)	15 (381)	7-1/2 (191)	3/16 (5)	1 (25)	3 (76)
14	350	51-9/16 (1310)	37-1/16 (941)	12 (305)	12-3/8 (314)	6-1/2 (165)	13-1/4 (337)	21 (533)	1/2 (13)	4	1-8NC	12	18-3/4 (476)	16-1/4 (413)	7-3/4 (197)	3/16 (5)	15/16 (24)	3 (76)
16	400	59-3/16 (1503)	43 (1092)	12 (305)	12-1/16 (306)	6-1/2 (165)	15-1/4 (387)	23-1/2 (597)	5/8 (16)	6	1-8NC	16	21-1/4 (540)	18-1/2 (470)	11-1/4 (286)	3/16 (5)	1-1/16 (27)	3-1/2 (89)
18	450	66-1/2 (1689)	47 (1194)	12 (305)	12-1/16 (306)	6-1/2 (165)	17-1/4 (438)	25 (635)	19/32 (15)	6	1-1/8-7NC	16	22-3/4 (578)	21 (533)	11-1/4 (286)	3/16 (5)	1-1/16 (27)	3-1/2 (89)
20	500	72-7/8 (1851)	51-3/8 (1305)	12 (305)	12-1/16 (306)	6-1/2 (165)	19-1/4 (489)	27-1/2 (699)	31/32 (25)	8	1-1/8-7NC	20	25 (635)	23 (584)	14 (356)	3/16 (5)	1-3/16 (30)	4-1/2 (114)
24	600	84-3/4 (2029)	59-3/8 (1508)	12 (305)	12-1/16 (306)	6-1/2 (165)	23-1/4 (591)	32 (813)	29/32 (23)	8	1-1/4-7NC	20	29-1/2 (749)	27-1/4 (692)	14-1/8 (359)	3/16 (5)	1-5/16 (33)	4-1/2 (114)
30	750	106-3/16 (1851)	77-1/4 (1305)	18 (457)	12-1/16 (306)	6-1/2 (165)	29-1/4 (743)	38-3/4 (984)	15/16 (24)	10	1-1/4-7NC	28	36 (914)	33-3/4 (857)	15 (381)	3/16 (5)	1-5/16 (33)	4-1/2 (114)
36	900	129-1/16 (2153)	94 (1508)	24 (610)	12-1/16 (306)	6-1/2 (165)	35-1/4 (895)	46 (1168)	1 (25)	12	1-1/2-6NC	32	42-3/4 (1086)	40-1/4 (1022)	19 (483)	3/16 (5)	1-3/8 (35)	5-1/2 (140)

6" - 14" Valves have a bevel gear ratio of 3:1
 16" - 36" Valves have a bevel gear ratio of 4:1

Reference Dimensions in (parentheses)

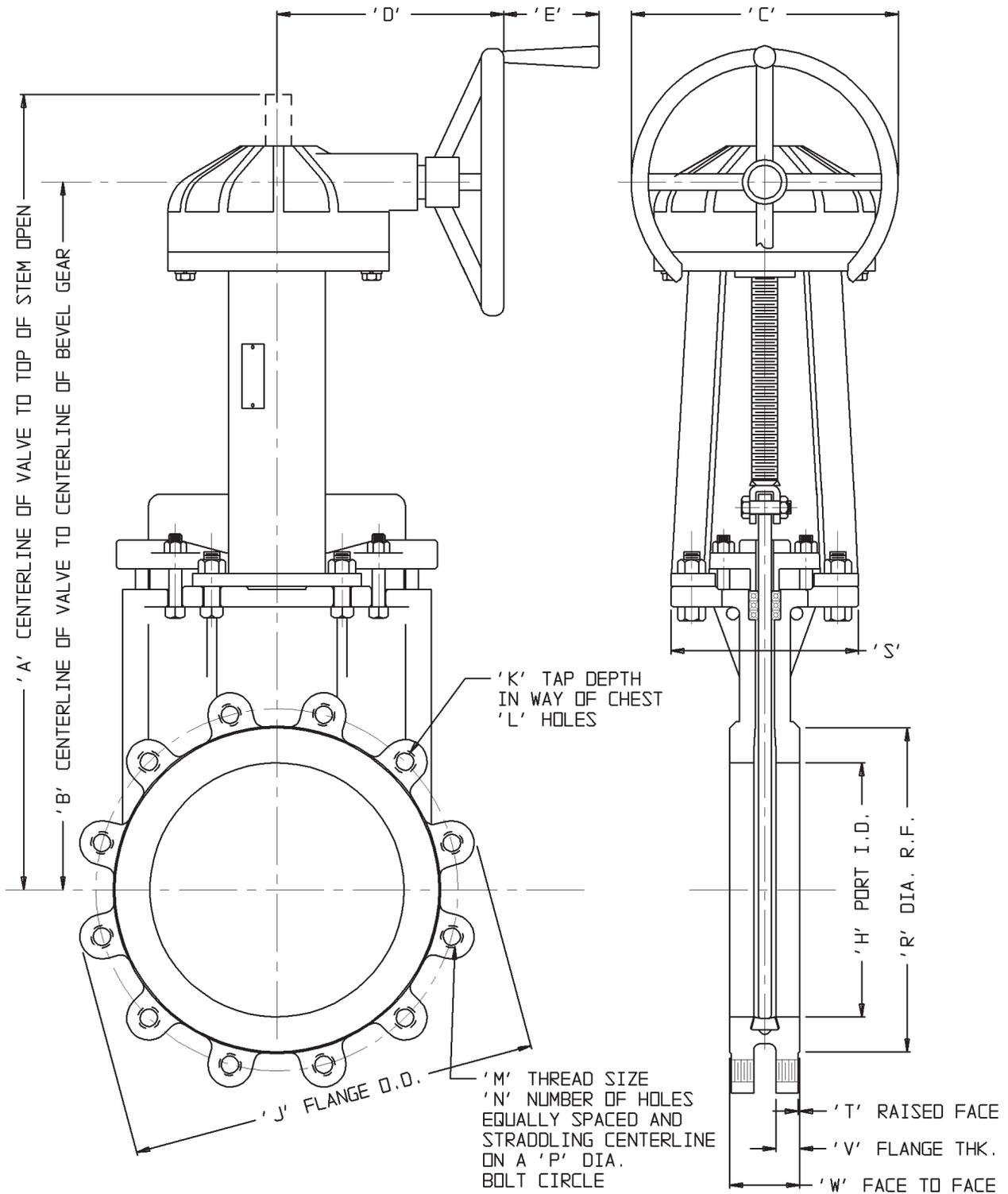
Materials of Construction

Part	Materials		
	C67R 2" - 36"	C67S 2" - 36"	C67R-WCB 2" - 36"
Body and Chest	Solid, one piece, cast 304, 316 or 317L stainless steel.	Solid, one piece, cast 304, 316 or 317L stainless steel.	Solid, one piece, cast carbon steel
Seat	Elastomer, white EPDM std.	Elastomer, white EPDM std.	Elastomer, black EPDM standard
Gate	Same grade as body	Same grade as body	304 stainless steel
Yoke 2" - 4" 6" - 36"	Ductile iron Carbon steel	Cast 304 stainless steel 304 stainless steel	Ductile iron Carbon steel
Yoke Fasteners	Plated steel	Stainless steel	Plated steel
Stem	304 stainless steel	304 stainless steel	304 stainless steel
Stem Nut	Acid resistant bronze	Acid resistant bronze	Acid resistant bronze
Lubrication Fitting	Plated steel	Plated steel	Plated steel
Packing	Acrylic/PTFE ¹ /Silicone	Acrylic/PTFE ¹ /Silicone	Acrylic/PTFE ¹ /Silicone
Packing Follower	Ductile iron/Carbon steel	304 stainless steel	Ductile iron
Follower Bolts	Plated steel	Stainless steel	Plated steel
Handwheel	Cast iron	Cast iron	Cast iron
Handwheel Retaining Nut	Malleable iron	Stainless steel	Malleable Iron
Tab Washer	Stainless steel	Stainless steel	Stainless steel
Travel Stop	Plated steel	Stainless steel	Plated steel

¹ PTFE/Graphite/Viton packing is standard with Viton and AFLAS seals.

C67 with Bevel Gear

Refer to table on page 6 for dimensions



STANDARD TERMS AND CONDITIONS of ITT INDUSTRIAL PROCESS (IP) (hereinafter referred to as Seller)

WARRANTY - Company warrants title to the product(s) and, except as noted with respect to items not of Company's manufacturer, also warrants the product(s) on date of shipment to Purchaser, to be of the kind and quality described herein, and free of defects in workmanship and material. This warranty is expressly in lieu of all other warranties, including but not limited to implied warranties of merchantability and fitness, and constitutes the only warranty of the company with respect to the product(s).

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company of any item of product(s), Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof. Company shall remedy such nonconformance by, at Company's option, adjustment or repair or replacement of the item and any affected part of the product(s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Company hereunder. Company shall have the right of disposal of parts replaced by it. Purchaser agrees to notify Company, in writing, of any apparent defects in design, material or workmanship, prior to performing any corrective action back chargeable to the Company. Purchaser shall provide a detailed estimate of the material, labor costs associated with proposed remedy for expeditious review and approval by the Company.

Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factories or authorized service centers, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instructions or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representatives.

Any separately listed item of the product(s) which is not manufactured by the company is not warranted by the company and shall be covered only by the express warranty, if any, of the manufacturer thereof.

This states purchaser's exclusive remedy against company and its suppliers relating to the product(s), whether in contract or in tort or under any other legal theory, and whether arising out of warranties, representations, instructions, installations or defects from any cause. Company and its suppliers shall have no obligation as to any product which has been improperly stored or handled, or which has not been operated or maintained according to instructions in Company or supplier furnished manuals.

LIMITATION OF LIABILITY - Neither Company nor its suppliers shall be liable, whether in contract or in tort or under any other legal theory, for loss of use, revenue or profit, or for cost of capital or of substitute use or performance, or for incidental, indirect, or special or consequential damages, or for any other loss or cost of similar type, or for claims by Purchaser for damages of Purchaser's customers. Likewise, Company shall not, under any circumstances, be liable for the fault, negligence, or wrongful acts of Purchaser or Purchaser's employees, or Purchaser's other contractors or suppliers. In no event shall company be liable in excess of the sales price of the part(s) or product found defective.

GENERAL - (a) Company will comply with all laws applicable to Company. Compliance with OSHA or similar federal, state or local laws during any operation or use of the product(s) is the sole responsibility of Purchaser. (b) The laws of the State of New York shall govern the validity, interpretation and enforcement of any contract of which these provisions are a part, without giving effect to any rules governing the conflict of laws. (c) This document and any other documents specifically referred to as being a part hereof, constitute the entire contract on the subject matter, and it shall not be modified except in writing signed by both parties. Unless otherwise specified, any reference to Purchaser's order is for identification only. Assignment may be made only with written consent of both parties.

ACCEPTANCE - The determination of compliance with performance guarantees will be based on results of factory tests under controlled conditions with calibrated instruments and tested per standards of the Hydraulic Institute, ISO standards, API standards, or other nationally recognized accreditation standards mutually acceptable to Company and Purchaser.

SHIPMENT - The term "shipment" means delivery to the initial carrier in accordance with the delivery terms of this order. Company may make partial shipments. Company shall select method of transportation and route, unless terms are f.o.b. point of shipment and Purchaser specifies the method and route and is to pay the freight costs in addition to the price. When terms are f.o.b. destination or freight allowed to destination, "destination" means common carrier delivery point (within the continental United States, excluding Alaska) nearest the destination. For movement outside the United States, company shall arrange for inland carriage to port of exit and shall cooperate with Purchaser's agents in making necessary arrangements for overseas carriage and preparing necessary documents.

SPECIAL SHIPPING DEVICES - On shipments to a destination in the continental United States or Canada, Company has the right to add to the invoice, as a separate item, the value of any special shipping device (barrel, reel, tarpaulin, cradle, crib and the like) used to contain or protect the product(s) invoiced, while in transit. Full credit will be given on the return to Company of the device in a reusable condition, f.o.b. destination, freight prepaid.

DELAYS - If Company suffers delay in performance due to any cause beyond its control, including but not limited to act of God, war, act or failure to act of government, act or omission of Purchaser, fire, flood, strike or labor troubles, sabotage, or delay in obtaining from others suitable services, materials, components, equipment or transportation, the time of performance shall be extended a period of time equal to the period of the delay and its consequences. Company will give to Purchaser notice in writing within a reasonable time after Company becomes aware of any such delay.

NONCANCELLATION - Purchaser may not cancel or terminate for convenience, or direct suspension of manufacture, except on mutually acceptable terms.

STORAGE - Any item of the product(s) on which manufacture or shipment is delayed by causes within Purchaser's control, or by causes which affect Purchaser's ability to receive the product(s), may be placed in storage by Company for Purchaser's account and risk.

TITLE AND INSURANCE - Title to the product(s) and risk of loss or damage shall pass to Purchaser at the f.o.b. point, except that a security interest in the product(s) and proceeds and any replacement shall remain in Company, regardless of mode of attachment to realty or other property, until the full price has been paid in cash. Purchaser agrees to do all acts necessary to perfect and maintain said security interest, and to protect Company's interest by adequately insuring the product(s) against loss or damage from any external cause with Company named as insured or co-insured.

**STANDARD TERMS AND CONDITIONS
of ITT INDUSTRIAL PROCESS (IP)**
(hereinafter referred to as Seller)
continued

INSPECTIONS / EXPEDITING - The Company wishes to clarify that it will have to restrict access to agreed upon reasonable times and only for the purpose of conducting those inspections agreed upon. We request 72 hours notice prior to each visit. We request notification prior to visits to our subcontractors and require that we accompany inspectors/expeditors on their visit(s).

TERMS OF PAYMENT - Unless otherwise stated all payments shall be Letter of Credit or Net Thirty (30) Days and in United States dollars, and a pro rata payment shall become due as each shipment is made. If shipment is delayed by Purchaser, date of readiness for shipment shall be deemed to be date of shipment for payment purposes. If at any time in Company's judgment Purchaser may be or may become unable or unwilling to meet the terms specified, Company may require satisfactory assurances or full or partial payment as a condition to commencing or continuing manufacture or making shipment; and may, if shipment has been made, recover the product(s) from the carrier, pending receipt of such assurances.

TAXES - Any applicable duties or sales, use, excise, value added or similar taxes will be added to the price and invoiced separately (unless acceptable exemption certificate is furnished).

PRODUCT RETURN - Products can be returned for credit only after receiving Company's authorization and shipping instructions. Consignor's name and address must be plainly written on the shipping tag.

PATENTS - Company shall pay costs and damages finally awarded in any suit against Purchaser or its vendees to the extent based upon a finding that the design or construction of the product(s) as furnished infringes a United States patent (except infringement occurring as a result of incorporating a design or modification at Purchaser's request) provided that Purchaser promptly notifies Company of any charge of such infringement, and Company is given the right at its expense to settle such charge and to defend or control the defense of any suit based upon such charge. This paragraph sets forth company's exclusive liability with respect to patents.

BUYER DATA - Timely performance is contingent upon the Purchaser supplying to the Company, when needed, all required technical information, including drawing approval, and all required commercial documentation.

NUCLEAR - Purchaser represents and warrants that the product(s) covered by this contract shall not be used in or in connection with a nuclear facility or application.

PRICES - The prices stated herein will remain firm for the period up to the stated date of shipment providing the shipment is not delayed by the customer. If shipment is delayed by the customer beyond the shipment date quoted herein, the prices will be based on the prices in effect at time of shipment, including storage and material handling costs. In no event shall the adjusted price be less than the original order price, including change orders. Prices are F.O.B. Shipping Point, unless otherwise specified. When price includes transportation and other charges pertaining to the shipment of goods, any increase in transportation rates and other charges will be for the account of the purchaser. There will be an extra charge for any test other than that which may be normally run by the Company, or for any test performed to suit the convenience of the purchaser.

CONTROLLING PROVISIONS - These terms and conditions shall control with respect to any purchase order or sale of the Company's products. No waiver, alteration or modification of these terms and conditions whether on Purchaser's purchase order or otherwise shall be valid unless the waiver, alteration or modification is specifically accepted in writing and signed by an authorized representative of the Company.

EXPORT - If this transaction involves EXPORT, the following additional terms and conditions shall apply:

- Compliance is required for ALL applicable US export laws, and the export laws of the country from where the product is exported.
- **PACKING** - when packing is in IP scope of supply, equipment will be packed, boxed or crated in accordance with the Company's standard commercial practice, for under deck export shipment, unless otherwise agreed.
- **LETTER OF CREDIT** - Unless otherwise specified in writing, payment shall be made by irrevocable letter of credit in form acceptable to Company, confirmed by a major USA bank, acceptable to the company and providing for payment in full in United States dollars against presentation of United States inland shipping documents and invoices, such letter of credit to be established prior to company's acceptance of the order. The letter of credit shall also provide that in the event Company is, for any reason beyond its control, prevented from making shipment from Company's factory or delivery at the port of embarkation, a certificate of manufacture of the whole or any part of the goods shall constitute delivery of such whole or any part of the goods and payment in full of any and all drafts drawn against the letter of credit for the goods so "delivered" shall be made upon presentation of such certificates of manufacture in lieu of United States inland shipping documents. In the event that Company is prevented by law, or otherwise, from making shipment from Company's factory or delivery at port of embarkation of the goods or any part thereof, on completion of manufacture, Company reserved the right to place the goods in storage for the Purchaser's account and risk. Any charges incurred in this connection will be for the account of the Purchaser at cost and will be payable upon demand. In regions where Letters of Credit are not available, surety bonds will be utilized in lieu of the bank guarantee.
- **COMPANY AS AGENT** - If Company makes or arranges for ocean shipment, Company shall act as agent for the Purchaser and reserves the right to procure full insurance coverage, including war risk insurance, at the expense of the Purchaser. All expenses incurred in this connection will be payable upon demand to the Company. If Company as agent applies for or secures manufacturing, financing, exporting or other licenses required by the United States Government, or any department thereof, Company shall make such applications or secure such licenses solely as agent for the purchaser, and assumes no responsibility therefore.

2.2 Check Valves



Submittal Data Sheet

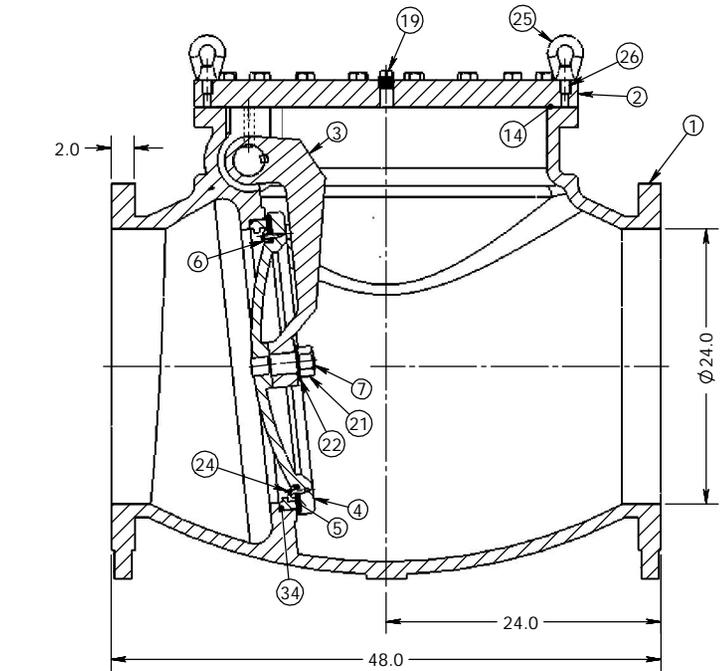
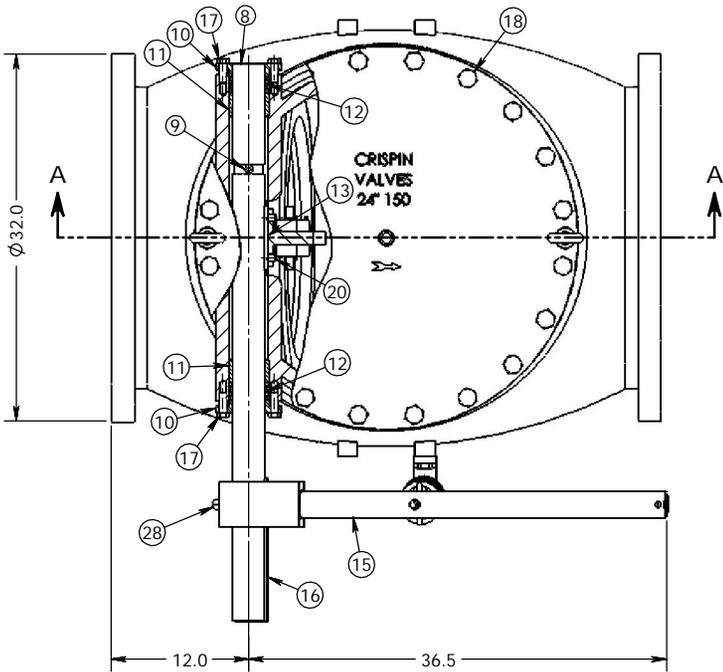
Item	Item	Qty	Part Number/Description
		4	BG04A14SWL241-LS 24" flanged lever & spring check valve.
Style:	SWL		Swing check valve
Size:	24		Twenty-four inches
End Connection:	Flg - 150		Flanged, drilled to Class 125/150 pattern
Body Material:	DI		Ductile iron
Packing:	TFE		PTFE-impregnated, interlocking braid
Seat Material:	Buna		Nitrile butadiene rubber
Service Class:	250B		250 psi rated working pressure
Disc/Plug:	DI		Ductile iron
Shaft:	304		Type 304 stainless steel
Paint:	141		Tnemec N141 epoxy, 8 mils
Act Type:	LS		Lever and spring
Accessories:			
Accessories:			
Accessories:			
SPECIAL FEATURES			

RELATED DOCUMENTS

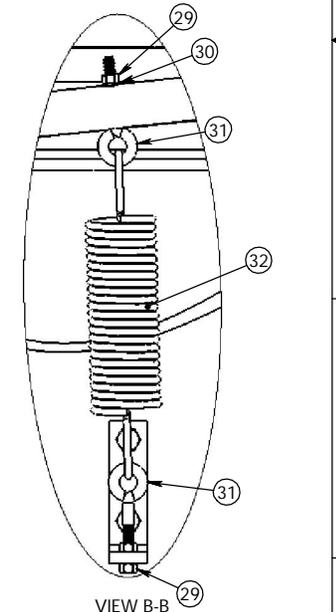
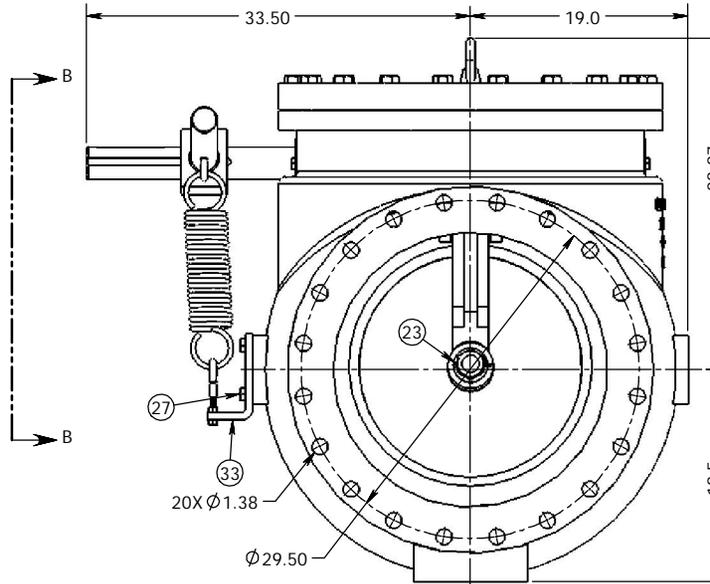
- Crispin/K-Flo Warranty
- Operations and Maintenance manual
- Factory Drawing
- Series Brochure
- Tnemec 140 Data Sheet

SPEC EXCEPTIONS

We take Exception to the following specification requirements:



SECTION A-A



VIEW B-B

PARTS LIST					
KEY	PART NUMBER	REV	DESCRIPTION	MATERIAL	QTY
1	SWL24-1F-4	2	BODY & SEAT ASSEMBLY	A536 GR 65-45-12 & A351 GR CF8M	1
2	SWL24-2		COVER	DUCTILE IRON A536 Gr 65-45-12	1
3	SWL24-3		DISC ARM	DUCTILE IRON A536 Gr 65-45-12	1
4	SWL24-5		DISC	DUCTILE IRON A536 Gr 65-45-12	1
5	SWL24-6		DISC SEAT	D2000 BUNA N RUBBER 70 DUROMETER	1
6	SWL24-7		SEAT RETAINER	AISI 304	1
7	SWL18-11		DISC SHAFT	AISI 304	1
8	SWL24-15AC	1	PIVOT SHAFT	A276 TYPE 304	1
9	SWL24-15A		PIVOT SHAFT PIN	BEARING BRONZE ALLOY 932 (SAE 660)	1
10	SWL24-16		PACKING GLAND	CARBON STEEL	2
11	SWL24-18	1	PIVOT SHAFT BUSHING	BEARING BRONZE ALLOY 932 (SAE 660)	2
12	SWL24-22		PACKING	PTFE IMPREGNATED, INTERLOCK BRAID	8
13	SWL24-23		INNER PIVOT SHAFT KEY	316 SS	1
14	SWL24-24		COVER GASKET	KLINGERSIL C-4401	1
15	SWL24-32WELD	1	LEVER WELDMENT	CARBON STEEL	1
16	SWL24-32D	2	OUTER PIVOT SHAFT KEY	316 SS	1
17	KHHCS.625X1.75		HHCS, 5/8"-11 UNC x 1.75" LG.	18-8 STAINLESS STEEL	4
18	KHHCS1.0X3.75		HHCS, 1"-8 UNC x 3.75" LG.	STEEL, GR 5, ZINC PLTD	20
19	KPLG1		PIPE PLUG, SQ HD, 1" NPTF	CARBON STEEL	1
20	SHSS.5-13X.75		SOC HD SET SCREW, 1/2"-13 x 3/4" LG.	AISI TYPE 316	2
21	KFHN1.5-6		STD HEX HD NUT, 1.5"-6 UNC	18-8 STAINLESS STEEL	1
22	KFW1.5		FLAT WASHER, 1.5"	18-8 STAINLESS STEEL	1
23	KCP.187X3		COTTER PIN, Ø 0.187" X 3.0" LG.	18-8 STAINLESS STEEL	1
24	RHPMS.313X1.25		RHPMS, 5/16"-18 UNC x 1.25" LG.	STAINLESS STEEL	12
25	KEN.75-10		EYE NUT, 3/4"-10	CARBON STEEL	2
26	KSD.75X2.5		STUD, 3/4"-10 NC x 2.5" LG.	A108 GR 1035 CARBON STEEL	2
27	KHHCS.75X1.75		HHCS, 3/4"-10 UNC x 1.75" LG.	STEEL, GR 5, ZINC PLTD	2
28	KSOHSS.625X1.25		SQ HD SET SCREW, 5/8-11 x 1.25" LG.	CARBON STEEL	1
29	KFHN.5-13		STD HEX HEAD NUT, 1/2"-13 UNC	STEEL, ZINC PLATED	3
30	KLW.5		LOCK WASHER, 1/2"	STEEL, ZINC PLATED	1
31	9489T39		EYE BOLT, 1/2"-13 NC x 4" SHANK LG.	STEEL, ZINC PLATED	2
32	LS24-2		SPRING	OIL TEMPERED SPRING STEEL	1
33	LSL30-1		SPRING BRACKET	CARBON STEEL	1
34	AS568A-474		O-RING SIZE -474	BUNA N DUROMETER 70	1

- NOTES:
- 250 PSIG MAX. WORKING PRESSURE
 - 500 PSIG HYDROSTATIC TEST PRESSURE
 - APPROXIMATE WEIGHT: 3350 LBS.
 - VALVE WILL BE PAINTED/COATED IN ACCORDANCE WITH ORDER REQUIREMENTS.
 - MANUFACTURED IN ACCORDANCE WITH ANSI/AWWA C508, LATEST REVISION.

REV.	DESCRIPTION	DATE	APP'D
1 to 4	SEE IMBEDDED DESIGN JOURNAL.doc	10/07/11	hWg

DRAWN		NAME	DATE	CRISPIN VALVES	
hWg		hWg	10/18/10	TITLE:	
CHECKED		hWg	10/18/10	24" CLASS 150 SWING CHECK VALVE w/ LEVER SPRING	
DIMENSIONS ARE IN INCHES					
DO NOT SCALE DRAWING					
FILE LOCATION: W:\Drawings\PARIS\SWING_CHECK\GAS00-0A				SIZE	DWG. NO.
FILE NAME: SWL241.LS4				C	SWL241-LS
				REV	4
				SCALE: 0.12:1	WT: 3349.83 LB
				SHEET 1 OF 1	



PRODUCT PROFILE

GENERIC DESCRIPTION	Modified Polyamine Epoxy
COMMON USAGE	High solids coating offering high-build edge protection and excellent corrosion resistance. For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps, and equipment, as well as other steel and concrete substrates. It provides excellent resistance to abrasion and is suitable for immersion service in potable water, crude oil, and finished fuels.
COLORS	Available in the following standard industrial colors: 1211 Red, 1253 Gray, 1255 Beige, 1256 Blue and 35GR Black. Note: Epoxies chalk with extended exposure to sunlight. Lack of ventilation, incomplete mixing, miscatalyzation or the use of heaters that emit carbon dioxide and carbon monoxide during application and initial stages of curing may cause yellowing to occur. Important: Due to the product's curing agent chemistry, color variations can be pronounced. However, these changes in color are aesthetic only and will not affect performance or certifications. Contact your Tnemec representative for more information.
SPECIAL QUALIFICATIONS	Certified by NSF International in accordance with NSF/ANSI Std. 61 . Seven day ambient air cured Series 141 is qualified for use on tanks and reservoirs of 500 gallons (1893 L) capacity and greater, pipes 22 inches (56 cm) in diameter and greater, fittings 1 inch (2.54 cm) in diameter and greater, valves 4 inches (10 cm) in diameter and greater, and pumps 4 inches (10 cm) in diameter and greater. When cured for 30 days at ambient air temperature, Series 141 is qualified for use on pipes 10 inches (25.4 cm) in diameter and greater, fittings 3/4 inch (1.9 cm) in diameter and greater, valves 2 1/2 inches (6.35 cm) in diameter and greater, and pumps 4 inches (10 cm) in diameter and greater. Reference the "Search Listings" section of the NSF website at www.nsf.org for details on the maximum allowable DFT, certified colors, and primer and topcoat compatibility for use in potable water. Series 141 conforms to API 652 for lining above ground storage tanks. Contact your Tnemec representative for additional information.
PERFORMANCE CRITERIA	Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS	Steel: Self-priming, 1, 20, FC20, 27, 27WB, 37H, L69, L69F, N69, N69F, V69, V69F, 90E-92, 90G-1K97, 90-97, H90-97, 90G-98, 91-H ₂ O, H91-H ₂ O, 94-H ₂ O, 135, L140, L140F, N140, N140F, V140, V140F, 394, 530 Concrete: Self-priming, 20, FC20, 27, 27WB, L69, L69F, N69, N69F, V69, V69F, L140, L140F, N140, N140F, V140, V140F, 215, 217, 218 CMU: Self-priming or Series 130, 215, 218, 1254
TOPCOATS	Exterior: Series 73, 180, 1028, 1029, 1074, 1074U, 1075, 1075U. Note: The following maximum recoat time applies when using Series 73, 180, 1074, 1074U, 1075, or 1075U: fourteen (14) days. If this time limit is exceeded, Series 141 must be uniformly scarified prior to topcoating.

SURFACE PREPARATION

PRIMED STEEL	Immersion Service: Scarify the Series 20, FC20, L69, L69F, N69, N69F, V69, V69F, L140, L140F, N140, N140F, V140 or V140F prime coat surface by brush-blasting with fine abrasive before topcoating if it has been exterior exposed for 30 days or longer and 141 is the specified topcoat.
STEEL	Immersion Service: SSPC-SP10/NACE 2 Near-White Blast Cleaning with a minimum angular anchor profile of 2.0 mils Non-Immersion Service: SSPC-SP6/NACE 3 Commercial Blast Cleaning with a minimum angular anchor profile of 2.0 mils. Note: Abrasive blast cleaning generally produces the best coating performance. If conditions will not permit this, Series 141 may be applied to SSPC-SP2 or SP3 Hand or Power Tool Cleaned surfaces.
CONCRETE	Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). Verify concrete dryness in accordance with ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" (moisture vapor transmission should not exceed three pounds per 1,000 square feet in a 24 hour period), F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes" (relative humidity should not exceed 80%), or D 4263 "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method" (no moisture present). Prepare concrete surfaces in accordance with NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide a minimum ICRI-CSP 3 surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.
ALL SURFACES	Must be clean, dry and free of oil, grease, chalk and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS	82% ± 2.0% (mixed) †
RECOMMENDED DFT	4.0 to 18.0 mils (100 to 455 microns) in a one coat application. Note: Thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative. Maximum dry film thickness for NSF exposure is 18.0 mils.

EPOXOLINE® | SERIES 141

CURING TIME AT 5 MILS DFT

Potable Water Applications:

Temperature	To Handle	To Topcoat	Immersion
90°F (32°C)	3 hours	4 hours ‡	7 days
75°F (24°C)	4 hours	5 hours ‡	7 days
65°F (18°C)	7 hours	9 hours ‡	8 days
55°F (13°C)	13 hours	18 hours ‡	9 days
45°F (7°C)	20 hours	24 hours ‡	13 days
40°F (4°C)	22 hours	28 hours ‡	18 days
35°F (0°C)	64 hours	72 hours ‡	30 days

Curing time varies with surface temperature, air movement, humidity and film thickness.

‡ **Note:** Specific application requirements, including cure schedules and environmental conditions, must be followed when topcoating Series 141. Contact Tnemec Technical Service for detailed instructions. **Note:** Maximum recoat time with itself is seven days. **Note:** For one-coat pipe and valve applications, allow 30 days cure at 75°F (24°C) prior to immersion. Refer to product listing on www.NSF.org for specific potable water return to service information.

Non-Potable Water Applications:

Temperature	To Handle	To Topcoat	Immersion
75°F (24°C)	3 hours	4 hours ‡	5 days
40°F (4°C)	4 hours	5 hours ‡	14 days

Cure time varies with surface temperature, air movement, humidity and film thickness.

‡ **Note:** Specific application requirements, including cure schedules and environmental conditions, must be followed when topcoating Series 141. Contact Tnemec Technical Service for detailed instructions. **Note:** Maximum recoat time with itself is seven days.

VOLATILE ORGANIC COMPOUNDS

EPA Method 24

Unthinned: 0.90 lbs/gallon (107 grams/litre)

Thinned 5% (No. 60 Thinner): 1.21 lbs/gallon (145 grams/litre)

Thinned 10% (No. 4 Thinner): 1.45 lbs/gallon (173 grams/litre) †

HAPS

Unthinned: 1.27 lbs/gal solids **Thinned 5% (No. 60):** 1.28 lbs/gal solids **Thinned 10% (No. 4):** 1.95 lbs/gal solids

THEORETICAL COVERAGE

1,315 mil sq ft/gal (32.2 m²/L at 25 microns). See APPLICATION for coverage rates. †

NUMBER OF COMPONENTS

Two: Part A (amine) and Part B (epoxy)

MIXING RATIO

By volume: Two (Part A) to one (Part B)

PACKAGING

	PART A (Partially Filled)	PART B (Partially Filled)	When Mixed
Large Kit	1-6 gallon pail	1-3 gallon pail	5 gallons
Small Kit	1-1 gallon can	1-1 gallon can	1 gallon

NET WEIGHT PER GALLON

13.33 ± 0.25 lbs (6.05 ± .11 kg) †

STORAGE TEMPERATURE

Minimum 20°F (-7°C) Maximum 110°F (43°C)

Prior to application, the material temperature should be above 60°F (16°C). It is suggested the material be stored at this temperature at least 48 hours prior to use.

TEMPERATURE RESISTANCE

(Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)

SHELF LIFE

12 months at recommended storage temperature.

FLASH POINT - SETA

Part A: 91°F (33°C) Part B: 111°F (44°C)

HEALTH & SAFETY

This product contains chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.

Keep out of the reach of children.

APPLICATION

COVERAGE RATES

	Dry MILS (Microns)	Wet MILS (Microns)	Sq Ft/Gal (m ² /Gal)
Minimum	4.0 (100)	5.0 (125)	329 (30.5)
Maximum	18.0 (455)	22.0 (560)	73 (6.8)

Note: Maximum of 18.0 mils DFT in one coat. **Maximum total dry film thickness for NSF exposure is 18.0 mils.** Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. Reference the "Search Listings" section of the NSF website at www.nsf.org for details on the maximum allowable DFT. †

MIXING

Mix the entire contents of Part A and Part B separately. Scrape all of the Part B into the Part A pail by using a flexible spatula. Use a variable speed drill with a PS Jiffy blade and mix the blended components for a minimum of two minutes. Apply the mixed material within pot life limits after agitation. Both components must be above 50°F (10°C) prior to mixing. For optimum application properties, the material temperature should be above 60°F (16°C). For applications to surfaces between 35°F to 50°F (2°C to 10°C) allow mixed material to stand 30 minutes and restir before use. **Note:** A large volume of material will set up quickly if not applied or lessened in mass. **Caution: Do not reseal mixed material. An explosion hazard may be created.**

THINNING

Caution: Do not add thinner to Part A prior to mixing with Part B. For airless spray, brush or roller, thin up to 5% per gallon with No. 4 Thinner or No. 60 Thinner. For air spray, thin up to 10% per gallon with No. 4 or No. 60 Thinner.

POT LIFE

2 hours at 77°F (21°C) 1 hour at 90°F (32°C)

SPRAY LIFE

1 hour at 77°F (21°C) 30 minutes at 90°F (32°C)

EPOXOLINE® | SERIES 141

APPLICATION EQUIPMENT

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	75-100 psi (5.2-6.9 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.017"-0.021" (430-535 microns)	3000-3800 psi (207-262 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.

Roller: Roller application optional when environmental restrictions do not allow spraying. Use 3/8" or 1/2" (9.5 mm to 12.7 mm) synthetic woven nap covers.

Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes.

SURFACE TEMPERATURE

Minimum 35°F (2°C) Maximum 135°F (57°C).

The surface should be dry and at least 5°F (3°C) above the dew point. Coating will not cure below minimum surface temperature.

CLEANUP

Flush and clean all equipment immediately after use with the recommended thinner or MEK.

† Values may vary with color.

WARRANTY & LIMITATION OF SELLER'S LIABILITY: Tnemec Company, Inc. warrants only that its coatings represented herein meet the formulation standards of Tnemec Company, Inc. THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPH SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. The buyer's sole and exclusive remedy against Tnemec Company, Inc. shall be for replacement of the product in the event a defective condition of the product should be found to exist and the exclusive remedy shall not have failed its essential purpose as long as Tnemec is willing to provide comparable replacement product to the buyer. NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, ENVIRONMENTAL INJURIES OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO THE BUYER. Technical and application information herein is provided for the purpose of establishing a general profile of the coating and proper coating application procedures. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests, accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating.

The SWL Series Swing Check Valves

- Meets AWWA C-508 Standards (Full Waterway)
 - Accepts Air and Oil Cushion
 - Swing Check Valve Solution



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Since 1905

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Swing Check Valve

SWL Swing Check Valve

SWL SERIES

Applications

- Water and Waste-water Systems
- Pump Discharge
- Valve Vaults

Features Include

- Both lever-and-weight and outside lever-and-spring designs available.
- Optional Air Cushion (Commercial or Bronze Cylinder Designs available).
- Ductile iron body with Ductile iron disc and 316 ss Seat standard.
- Valve Disc allows "full flow" through the valve
- Buna-N Rubber faced Discs standard.
- Optional double outside levers for weight or spring
- Available in sizes 3" thru 36"

The "SWL" series Swing Check Valve from Crispin Valve is an ideal solution for most check valve applications. Designed completely in-house using advanced 3D modeling and FEA technology, the SWL offers the same Crispin quality that you've come to expect from all of our products.

The SWL is available in Outside Lever/Weight, Lever/Spring, Air Cushion, and Oil Control configurations. Only produced in Ductile Iron with #150 flanged ends, the SWL swing check valve is intended for all swing check applications up to and including a 250 psi operating pressure.

Standard with 316ss seats and available with a variety of industry-approved epoxy coatings, the SWL offers flexibility in tackling hard water and corrosive environments.

Operation

Once pump pressure exceeds the back pressure on the down-stream side of the valve disc, the SWL Swing Check Valve moves the disc out of the flow by displacing the seat disc to the upper portion of the valve body. This creates full flow through the unit for both water and sewage.

Upon pump shut down, the disc will stroke closed when velocity begins to slow and stop. With the incorporation of a rubberized disc face, the resultant drip-tight seating will protect the system from costly leakage.

Design

- Body Seat

The threaded-in 316 stainless steel seat provides firm, water-tight retention in the body. This design can handle repeated stroking of the typical swing check application without vibration or loosening.

- **Standard Rubber-Faced Discs**

Standard on all sizes, the rubber-faced disc configuration provides drip-tight sealing.

- **Adjustable Packing**

Perfect for standard check valves where expensive maintenance rebuilds are not justified, the adjustable packing allows for fine tuning of sealing joints over time.

- **Bronze and Stainless Trim**

Standard in all units, the SWL's bronze and stainless steel trim provides excellent protection against corrosion.

- **Limit Switches**

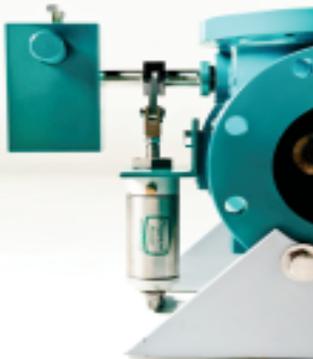
Mountable on all valves sizes, electric limit switches are available upon customer's request.

- **Full Waterway Flow Area**

With a flow area that is greater than or equal to the nominal valve size, the SWL swing check valve has a lower head loss characteristic than a Silent Check valve, and can be mounted in both the horizontal and vertical positions.

- **Serviceable**

The disc and clapper of the SWL can be removed from the valve while it is still in line. ■



Swing Check Valve

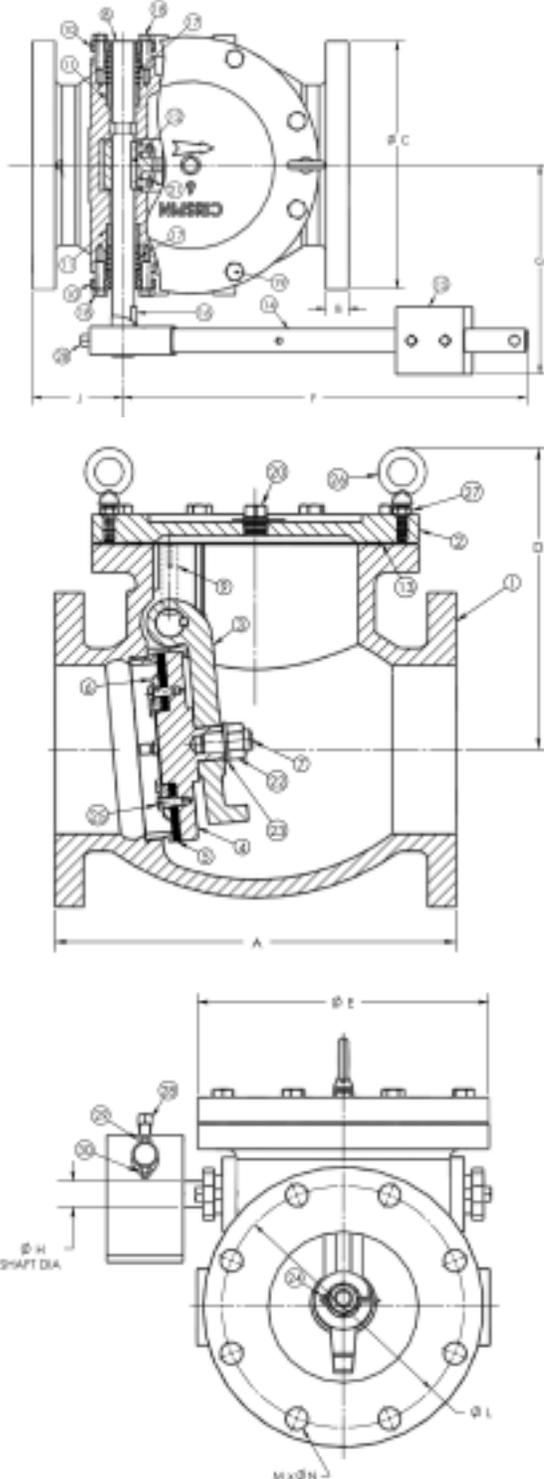


SWL Swing Check Valve

Swing Check Design Features

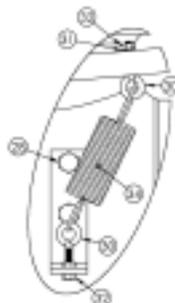
SWL SERIES

SWL-LW Series Parts List



ITEM	DESCRIPTION	MATERIAL
1	BODY/SEAT ASSY	A536 GR.65-45-12 & A351 GR CF8M
2	COVER	A536 GR.65-45-12 DUCTILE IRON
3	DISC ARM	A536 GR.65-45-12 DUCTILE IRON
4	DISC	A536 GR.65-45-12 DUCTILE IRON
5	DISC SEAT	D2000 BUNA-N RUBBER
6	SEAT RETAINER	A240 TYPE 316 S/S
7	STUD	18-8 STAINLESS STEEL
8	PIVOT SHAFT	A276 TYPE 304
9	PIVOT SHAFT PIN	BEARING BRONZE ALLOY 932
10	PACKING GLAND	CARBON STEEL
11	PT SFT BUSHING	BEARING BRONZE ALLOY 932
12	INNER PIVOT SHAFT KEY	A276 TYPE 316 S/S
13	COVER GASKET	KLINGERSIL C-4401
14	LEVER WELDMENT	CARBON STEEL
15	LEVER WEIGHT	ASTM A36
16	OUTER PIVOT SHAFT KEY	A276 TYPE 316
17	PACKING	PTFE IMPREGNATED, INTERLOCK BRAID
18	HX HD SCREW	18-8 STAINLESS STEEL
19	HHCS	STEEL, GR 5, ZINC-PLATED
20	PIPE PLUG SQ HD	CARBON STEEL
21	HHCS	18-8 STAINLESS STEEL
22	FINISH HEX NUT	18-8 STAINLESS STEEL
23	FLAT WASHER	18-8 STAINLESS STEEL
24	COTTER PIN	STEEL, ZINC-PLATED
25	HHCS	18-8 STAINLESS STEEL
26	EYEBOLT W/ SHOULDER	STEEL, ZINC-PLATED
27	HEX HEAD JAM NUT	STEEL, ZINC-PLATED
28	SQ HD SET SCREW,	CARBON STEEL
29	HHCS	STEEL, GR 5, ZINC-PLATED
30	STD HEX HEAD NUT	STEEL, ZINC-PLATED

Optional LS (Lever & Spring) configuration available ←



#	DESCRIPTION	MATERIAL
30	EYE BOLT	STEEL, ZINC-PLATED
31	LOCK WASHER	STEEL, ZINC-PLATED
32	HEX HEAD NUT	STEEL, ZINC-PLATED
33	SPRING BRACKET	CARBON STEEL
34	EXT. SPRING	MUSIC WIRE



Swing Check Valve

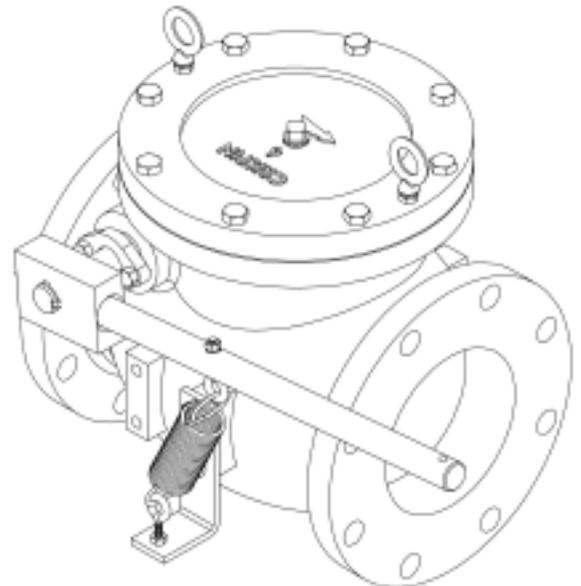
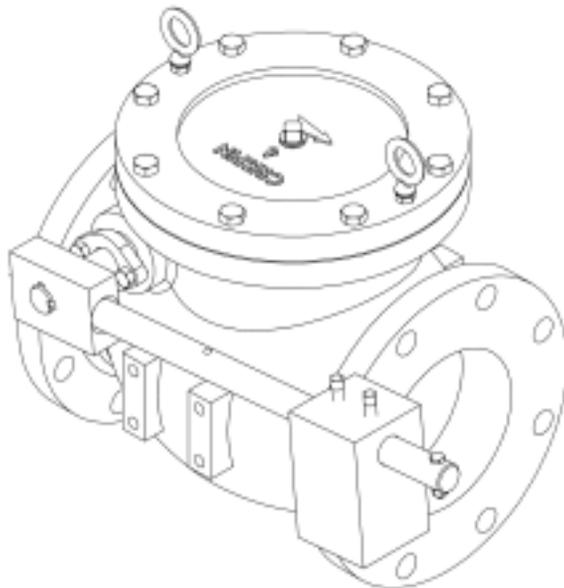
Swing Check Valve

“SWL” Series Dimensions

(both LW—Lever and Weight and LS—Lever and Spring)

SWL SERIES

SIZE	MODEL #	A	B	ØC	D	ØE	F	G	ØH	J	ØL	M x ØN	WT (lb)
3	SWL31-LW	9.50	.75	7.50	8.20	7.31	12.00	6.80	.75	3.00	6.00	4 x .75	68
4	SWL41-LW	11.50	.94	9.00	9.00	8.06	12.00	7.23	.87	3.75	7.50	8 x .75	98
6	SWL61-LW	14.00	1.00	11.00	10.54	11.42	18.00	9.29	1.00	4.02	9.50	8 x .88	188
8	SWL81-LW	19.50	1.12	13.50	12.50	13.19	18.00	11.10	1.25	5.75	11.75	8 x .88	317
10	SWL101-LW	24.50	1.19	16.00	14.94	16.50	18.00	13.20	1.25	7.25	14.25	12 x 1.00	500
12	SWL121-LW	27.50	1.25	19.00	16.63	18.25	18.00	14.41	1.50	7.75	17.00	12 x 1.00	670
14	SWL141-LW	31.00	1.38	21.00	18.94	21.50	24.75	16.90	2.00	8.50	18.75	12 x 1.12	1000
16	SWL161-LW	36.00	1.44	23.50	21.83	24.50	24.75	18.41	2.00	10.00	21.25	16 x 1.12	1328
18	SWL181-LW	40.00	1.56	25.00	22.80	27.25	30.75	20.91	2.00	11.00	22.75	16 x 1.25	1888
20	SWL201-LW	40.00	1.69	27.50	24.82	29.25	30.75	22.91	2.00	10.00	25.00	20 x 1.25	2200
24	SWL241-LW	48.00	1.88	32.00	28.88	33.50	36.68	26.22	2.75	12.00	29.50	20 x 1.38	3519
30	SWL301-LW	60.00	2.18	38.75	35.63	41.75	37.06	31.91	3.12	15.00	36.00	28 x 1.38	6248
36	SWL361-LW	63.00	2.44	46.00	40.31	48.50	44.00	37.41	3.50	13.50	42.75	32 x 1.62	9135



Notes:

1. 250 PSIG Max. Working Pressure
2. 500 PSIG Hydrostatic Shell Test Pressure
3. Valve will be painted externally with phenolic alkyd primer.



Swing Check Valve

Manufactured in compliance with ANSI/AWWA C512

Date: July, 2016

Specifications for SWL Swing Check Valves

GENERAL:

Check valves shall be ductile iron body, bronze and stainless mounted, full opening swing type. Valve body shall be enlarged to allow disc to swing in the waterway. When valve is full open, body design shall permit a “full flow” thru the valve equal to the nominal pipe diameter. They shall comply with AWWA Standard C-508’s latest revision.

RATING:

Check valves shall be rated at 250 psi water working pressure, 500 psi hydrostatic test for structural soundness (3” thru 36”). Seat tightness at rated working pressure shall be in accordance with and fully conform to AWWA C-508.

END CONFIGURATIONS

Check valves shall be furnished with type of end connection as follows: 150# ANSI flanged ends.

MATERIALS:

All Ductile iron shall conform to ASTM-A-536 GR 65-45-12. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed.

Discs shall be Ductile Iron and rubber-faced for sizes thru 3”-36”.

Hinge pins shall be 304 Stainless Steel rotating in bronze bearings.

Bolts shall be electro-zinc plated steel with hex heads and hex nuts in accordance with ASTM A-307 and A-563 respectively.

DESIGN:

Check valves shall be constructed to permit top entry for complete removal of internal components without removing the valve from the line. Gaskets shall be conventional in all sizes 3” - 36”.

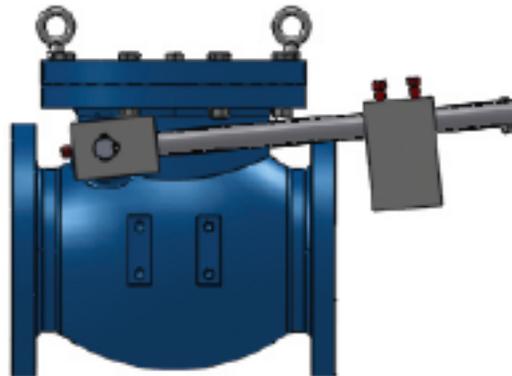
All valves 3”-36” and larger shall have extended hinge pins for addition of levers and springs if required. Valves shall be suitable for installation in either horizontal or vertical position.

PAINTING:

The inside and outside of all valves, together with the working parts except bronze and machined surfaces, shall be coated in accordance with AWWA standards and per the specific project specifications as provided.

MARKING:

Marking shall be in accordance with AWWA C-508 and shall include size, working pressure, and cast arrow to indicate direction of flow, and name of manufacturer.





Terms and Conditions

- PAYMENT TERMS:** 1% 10 days; Net 30 days from date of invoice, with approved credit.
- ALL PRICES:** f.o.b. Berwick, Pennsylvania and are exclusive of any taxes.
- ORDERS:** Orders accepted by the factory may not be cancelled, or shipment deferred without advance written consent of the factory. These orders shall be subject to cancellation charges.
- VALVE RETURNS:** Valves will only be accepted by the factory if the shipping label states a return authorization number issued by the factory. A restocking charge shall apply to all returns.
- SPECIAL MATERIALS OF CONSTRUCTION:** For pricing and delivery information of valves to be manufactured of special material of construction, please consult the factory. Valves manufactured of special materials of construction can not be returned or the order cancelled.
- EXPORT SHIPMENTS:** Valves to be packaged for export shipment will carry an additional minimum charge of 5% of the list price.
- DELIVERY:** All valves will be shipped as quickly as possible from the factory upon receipt of the customer's Purchase Order or, when possible, on the date specified by the customer. We will not be responsible for delays in shipping due to conditions beyond our control.
- CLAIMS:** Any claims for shortage or damaged products must be made in writing within five (5) days after receipt of shipment.

Warranty

The manufacturer warrants the workmanship and materials to be free from defect for a period of one (1) year from the date of shipment from the factory. The manufacturer shall replace any parts deemed defective during the said time period, provided that the product has been properly applied and used for the purpose intended. The manufacturer must be notified of the alleged defect and provided with the proper data as to the application. The manufacturer at its discretion will repair or replace the product, f.o.b. factory.

The manufacturer shall not be liable to the buyer or others for any consequential or incidental damage. The unit shall not be disassembled in any way by the buyer, unless written permission and instruction is provided by the manufacturer—otherwise the warranty is void. The buyer agrees that the manufacturer shall not be liable for any loss, cost, expenses, or damages from the product, its uses, installation or replacement, instructions, labeling, technical data, description of the product, its uses or warnings or lack of any of the foregoing.

NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESSED OR IMPLIED, SHALL APPLY.

These products are produced under the manufacturer's program for quality control for municipal water and waste water systems. Please consult the factory when using these valves on other system applications. These products are not manufactured, sold, or intended for personal family or household use.

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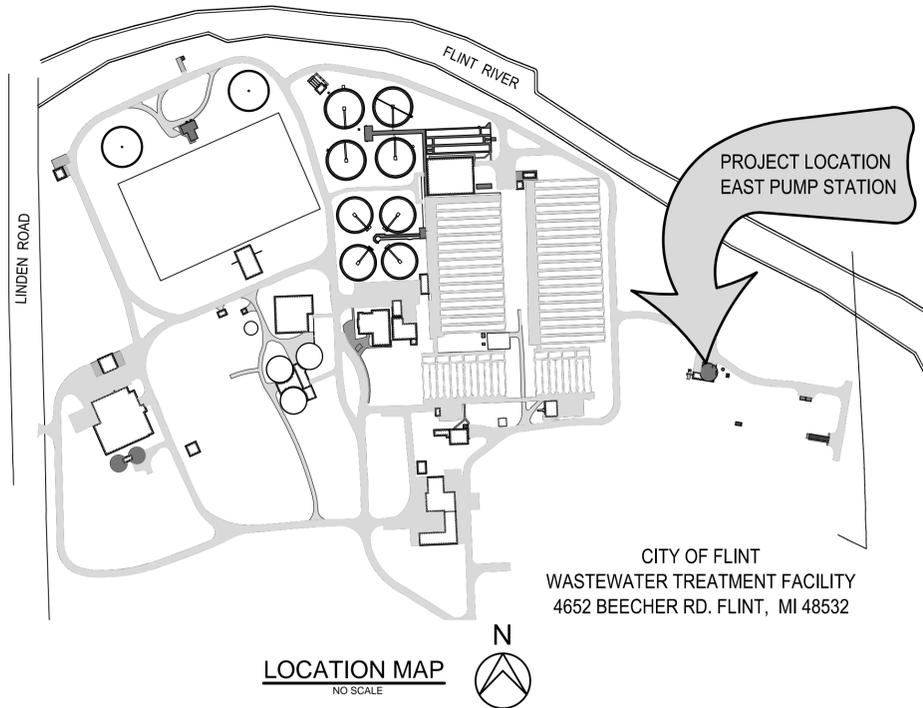
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v:\2015\10\20151005\00_East_Pump_Station\Drawings\01\01_CoverSheet.dwg

Hansen, Draw

LIST OF DRAWINGS

SHEET NO.	SHEET TITLE
COVER	COVER SHEET
PROCESS	
P-1	DEMOLITION PLAN AT ELEV. 652'-0"± AND GROUND FLOOR
P-2	DEMOLITION SECTIONS
P-3	NEW PUMP PLAN AND DETAILS
P-4	NEW PUMP SECTIONS
P-5	PHOTOS AND MISCELLANEOUS WORK ITEMS
ELECTRICAL	
DE-1	DEMOLITION ELECTRICAL PLAN FL. EL. 711'-0"
E-1	ELECTRICAL PLAN FL. EL. 711'-0" NOTES AND LEGEND
E-2	ELECTRICAL PLAN FL. EL. 699'-6" AND FL. EL. 688'-0"
E-3	ELECTRICAL PLAN FL. EL. 652'-0" AND ELECTRICAL SECTION
E-4	MISCELLANEOUS DETAILS
REFERENCE	
REF-1	EXISTING PUMP STATION PLAN @ ELEV. 654'-0"
REF-2	EXISTING PUMP STATION PLAN @ ELEV. 667'-0"
REF-3	EXISTING PUMP STATION PLAN @ ELEV. 678'-6"
REF-4	EXISTING PUMP STATION PLAN @ ELEV. 690'-0"
REF-5	EXISTING PUMP STATION PLAN @ ELEV. 701'-6"
REF-6	EXISTING PUMP STATION PLAN @ ELEV. 713'-0"
REF-7	EXISTING PUMP STATION SECTIONS



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT NO. _____
DATE _____

CITY OF FLINT

MUNICIPAL WASTEWATER TREATMENT FACILITY EAST PUMP STATION PUMP REPLACEMENT



CITY OF FLINT, MICHIGAN PUBLIC UTILITIES DEPARTMENT

ISSUED FOR BIDS
5-1-2019

JOB NO. 20151005

CITY ADMINISTRATION

ROBERT CASE - WPCF SUPERINTENDENT
ROB BINCSIK - PUBLIC WORKS DIRECTOR
INEZ M. BROWN - CITY CLERK

PREPARED BY:



555 HULET DRIVE P.O. BOX 824
BLOOMFIELD HILLS, MICH. 48303 - 0824

PHONE: (248) 454-6300
FAX (1st. Floor): (248) 454-6312
FAX (2nd. Floor): (248) 338-2592
WEB SITE: [http:// www.hrc-engr.com](http://www.hrc-engr.com)

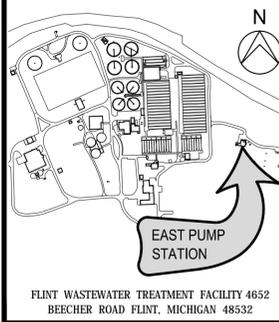
CITY COUNCIL

DR. KAREN WEAVER - MAYOR
ERIC MAYS - FIRST WARD
MAURICE DAVIS - SECOND WARD
SANTINO J. GUERRA - THIRD WARD
KATE FIELDS - FOURTH WARD
JERRI WINFREY-CARTER - FIFTH WARD
HERBERT WINFREY - SIXTH WARD
MONICA GALLOWAY - SEVENTH WARD
ALLAN GRIGGS - EIGHTH WARD
EVA WORHTING - NINTH WARD



HRC
HUBBELL, ROTH & CLARK, INC
 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE P.O. BOX 824
 BLOOMFIELD HILLS, MICH. 48303-0824
 PHONE: (248) 454-6300
 FAX (1st. Floor): (248) 454-6312
 FAX (2nd. Floor): (248) 338-2592
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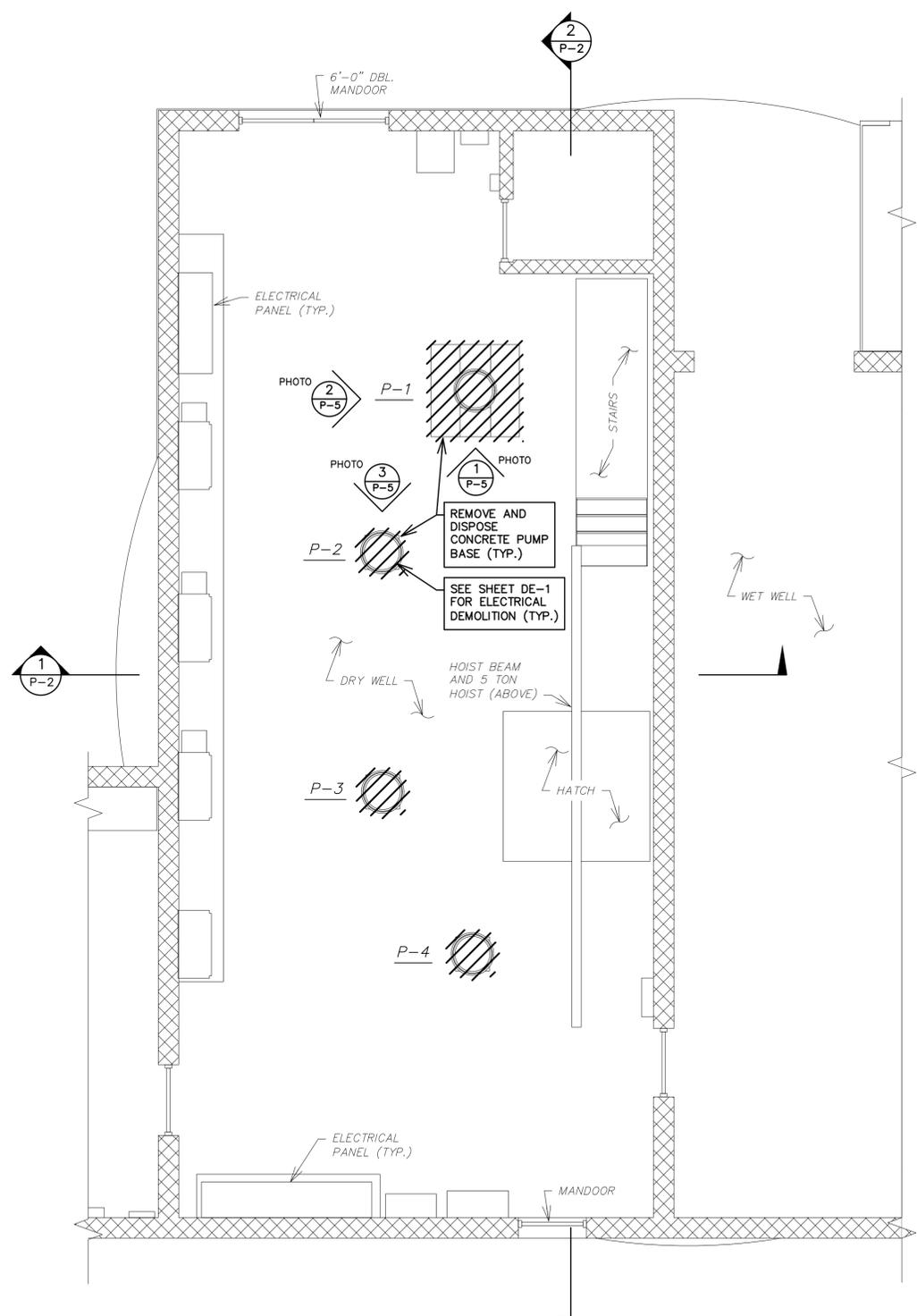
5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	D.M.H.
DRAWN	T.W.R.
CHECKED	N.B.
APPROVED	T.S.W.



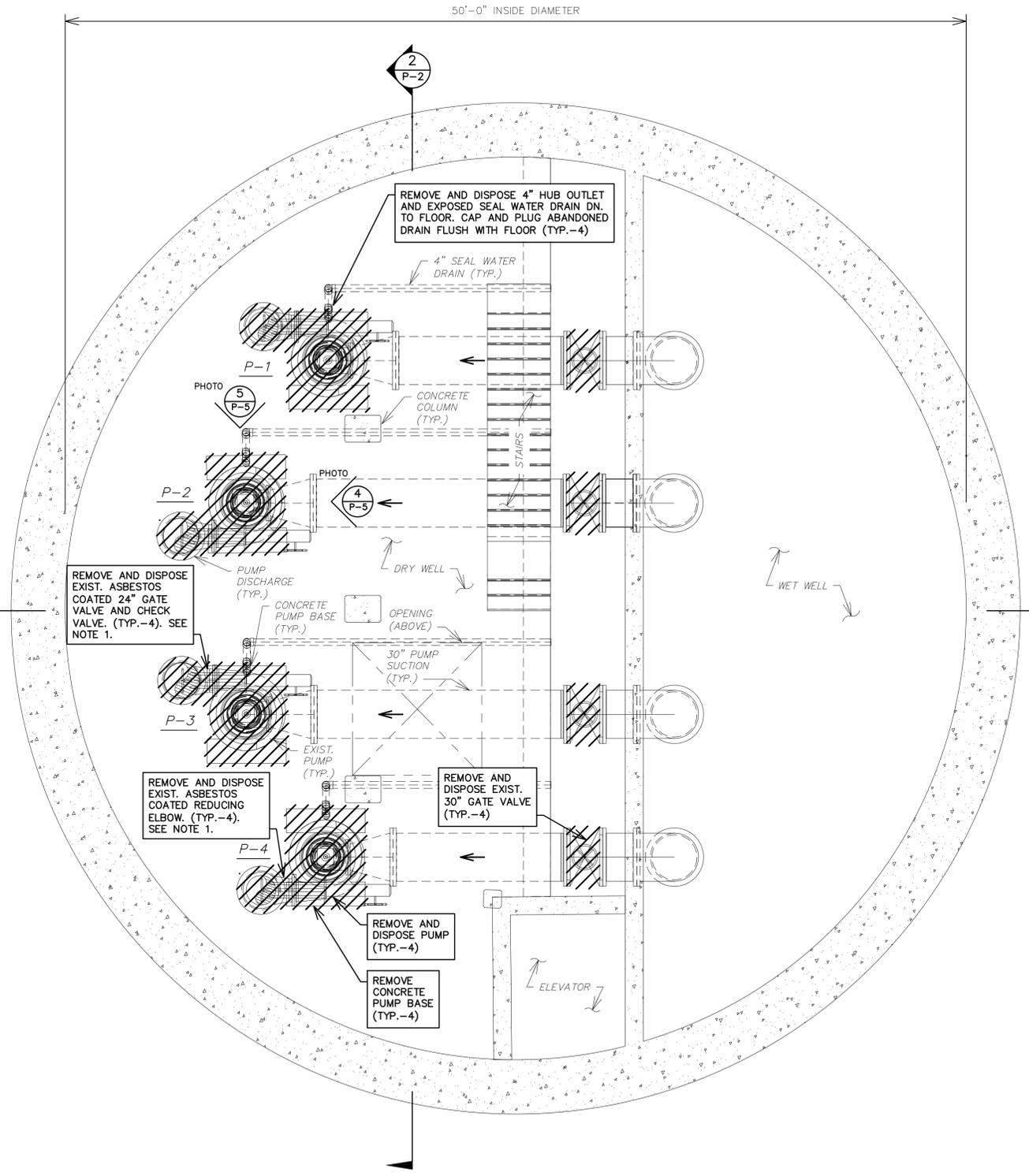
CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**

**DEMOLITION PLAN AT
 ELEV. 652'-0"**
 AND GROUND FLOOR

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. P-1 OF



PLAN @ ELEV. 711'-0"±
 SCALE: 1/4" = 1'-0"



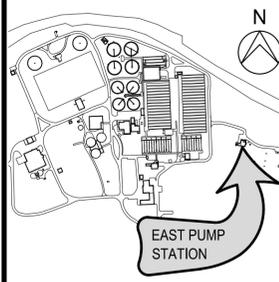
PLAN @ ELEV. 652'-0"±
 SCALE: 1/4" = 1'-0"

- NOTES:**
1. THE CONTRACTOR SHALL PROPERLY REMOVE AND DISPOSE OF ASBESTOS COATING ON VALVES AND PIPE. SEE SPECIFICATIONS FOR FURTHER INFORMATION.
 2. REMOVE AND DISPOSE EXISTING SEAL WATER PIPING AND ELECTRICAL TO EACH PUMP. CAP THE EXISTING WATER LINE AT THE WALL OF THE ROOM. SEE SHEET DE-1 FOR ELECTRICAL DEMOLITION.



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 555 HULET DRIVE P.O. BOX 824
 BLOOMFIELD HILLS, MICH. 48303-0824
 PHONE: (248) 454-6300
 FAX (1st Floor): (248) 454-6312
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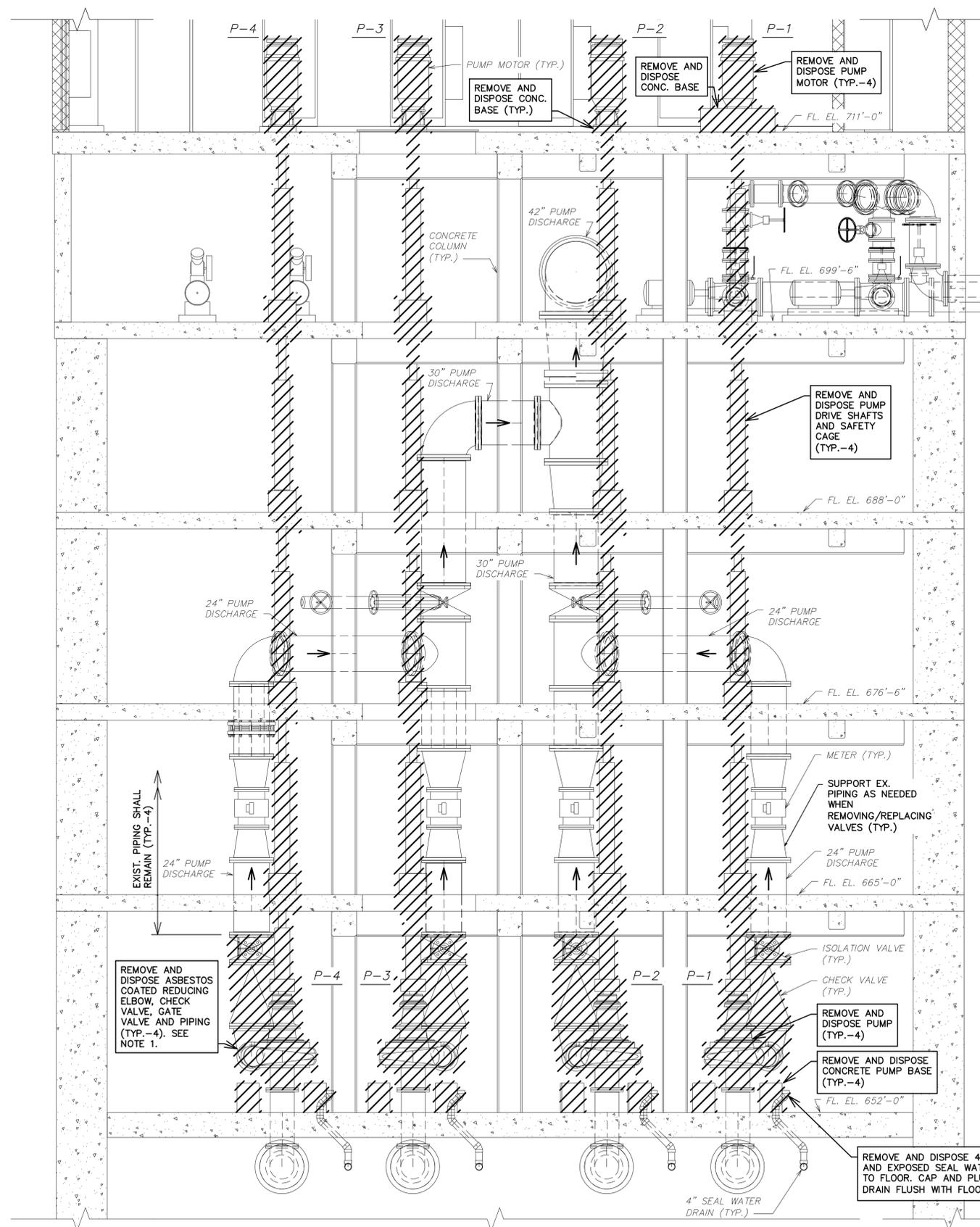
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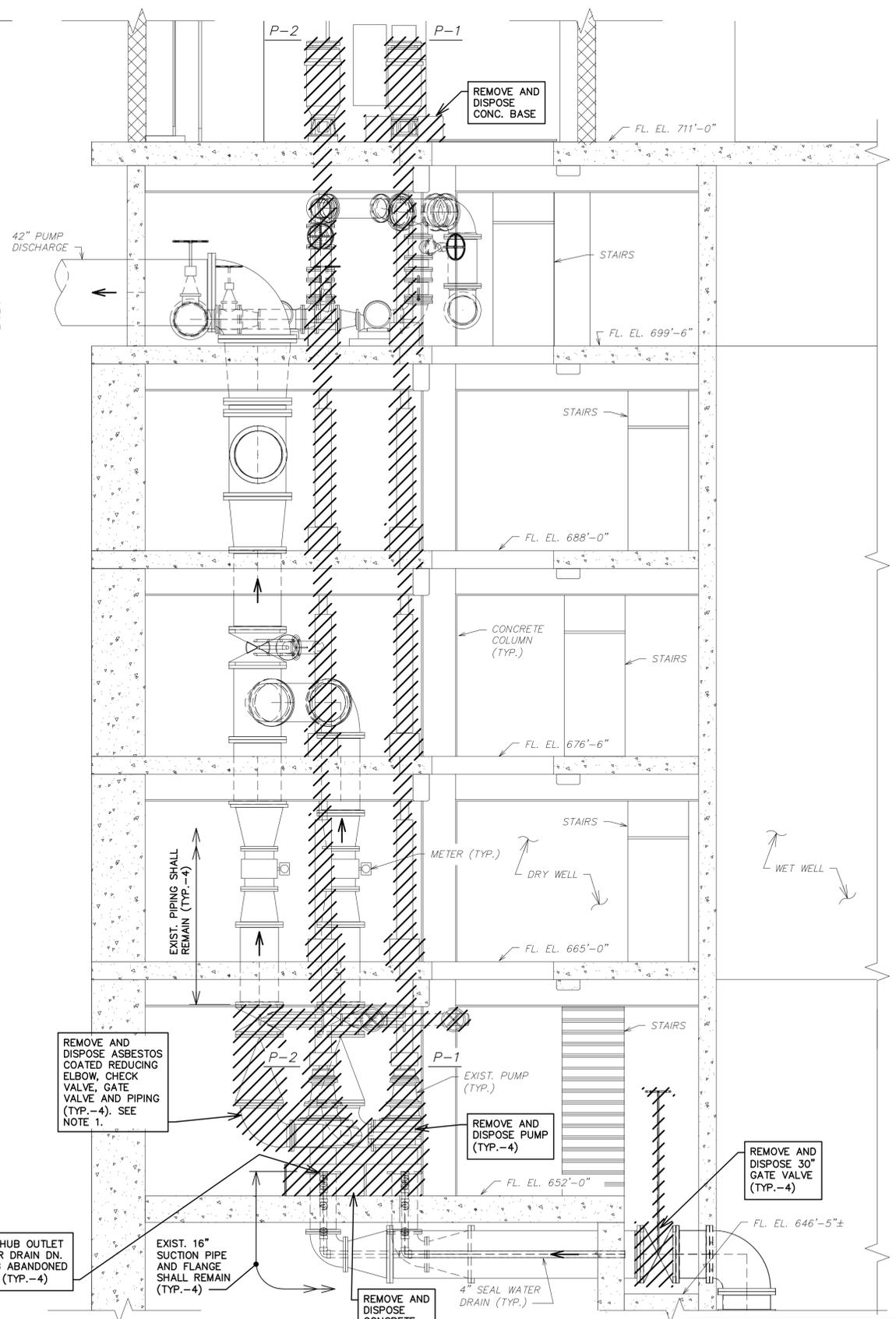
CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**

DEMOLITION SECTIONS

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. P-2 OF



SECTION 2
 SCALE: 1/4" = 1'-0"



SECTION 1
 SCALE: 1/4" = 1'-0"

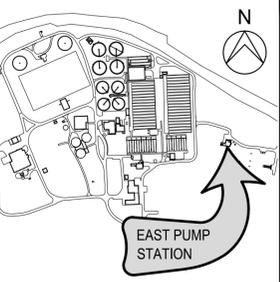
NOTICE:
 ELEVATIONS SHOWN ARE
 BASED ON N.A.V.D. 88 DATUM.

- NOTES:**
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 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE P.O. BOX 824
 BLOOMFIELD HILLS, MICH. 48303-0824
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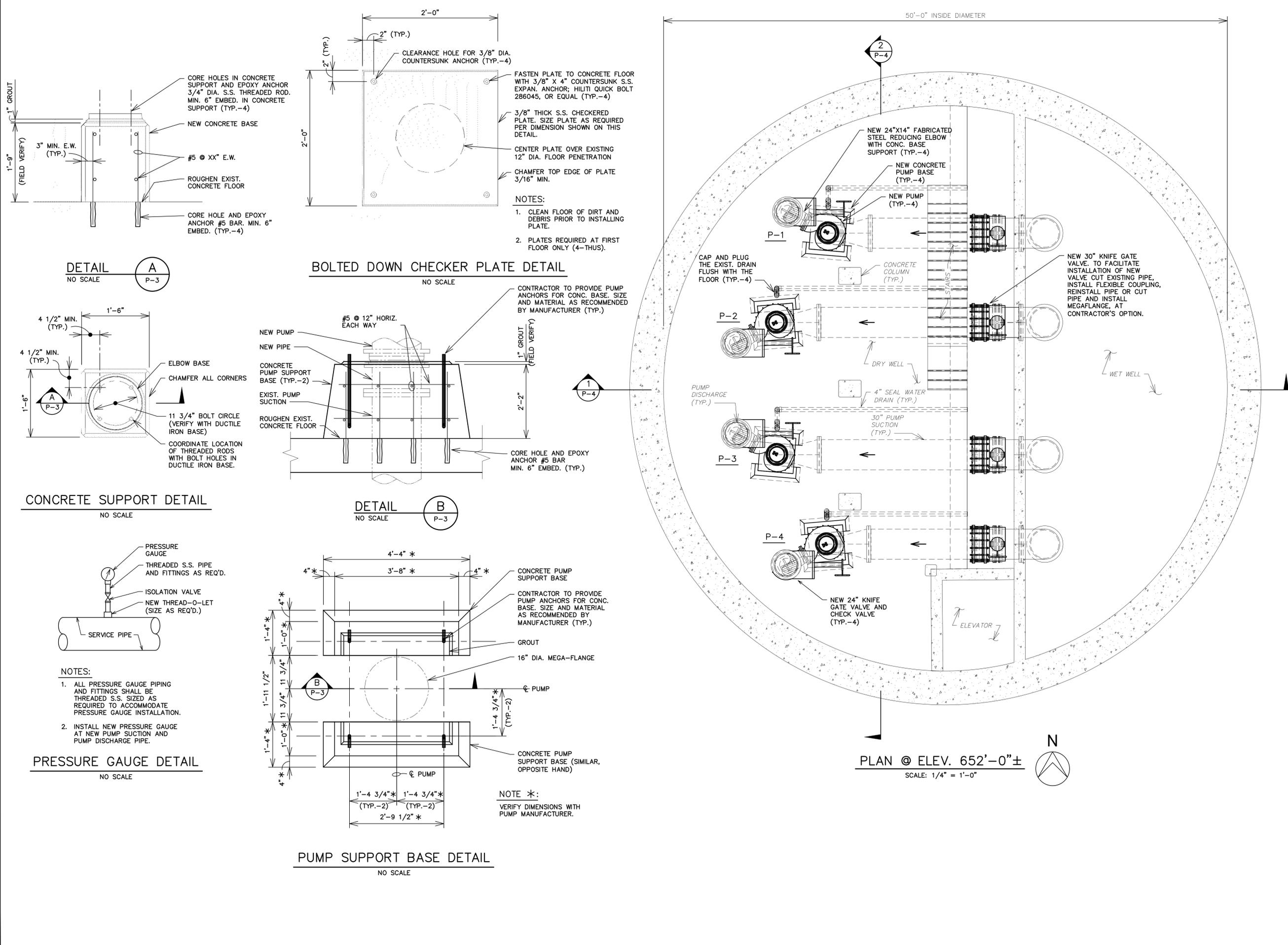
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CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**

**NEW PUMP PLAN
 AND DETAILS**

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. P-3 OF



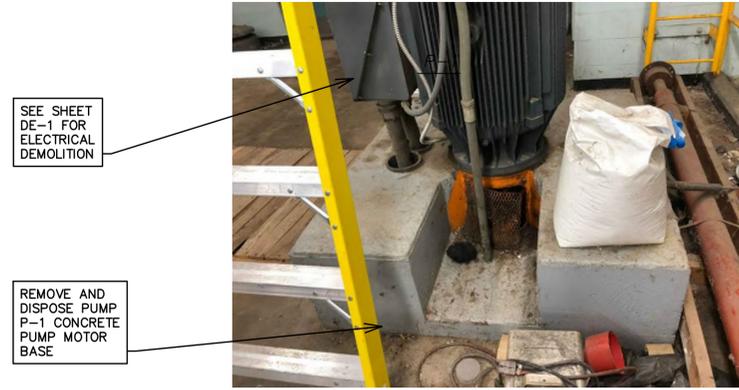


PHOTO 1
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PHOTO 2
NO SCALE P-1



PHOTO 3
NO SCALE P-1

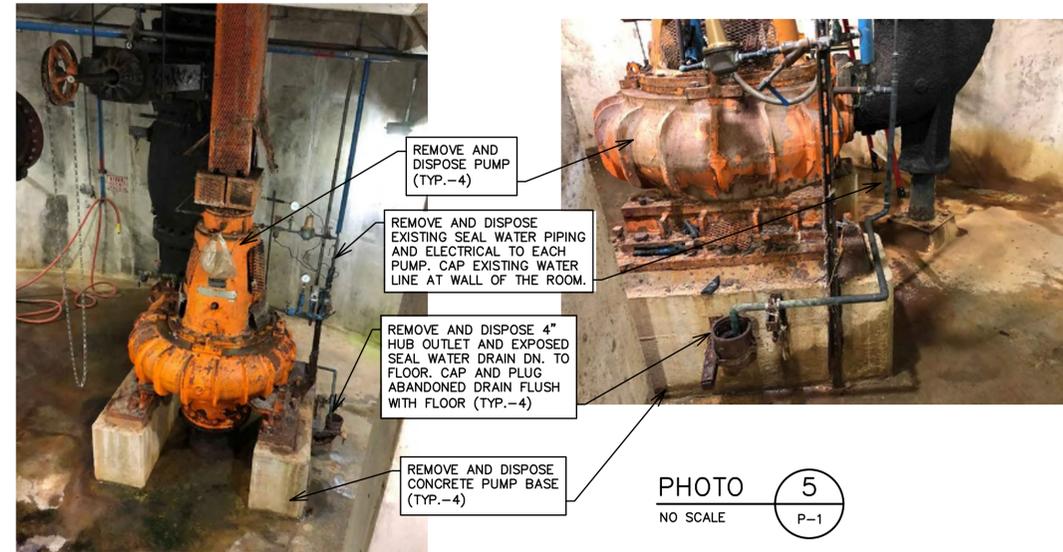


PHOTO 4
NO SCALE P-1



REMOVE AND REPLACE EXISTING RESTRAINT RODS ON PIPE FLANGES WHERE NOTED ON SHEET P-4 WITH SYMBOL BELOW. WORK TO INCLUDE COATING/ASBESTOS REMOVAL IN AFFECTED WORK AREA, REMOVE AND REPLACE THE BOLTS/NUTS IN FLANGE WHICH ATTACH THE STEEL CLIP. REMOVE AND REPLACE THE STEEL CLIP, REMOVE AND REPLACE THE STEEL ROD. TYPICAL FOR 32 LOCATIONS (NEW STEEL CLIPS). IN SOME CASES RODS CONNECT THRU THE FLOOR TO STEEL CLIPS ON EITHER SIDE. IN SOME CASES THE RODS ARE CONNECTED TO A POINT ON THE FLOOR/CEILING AND DO NOT GO THRU THE FLOOR. IN EITHER CASE, THE STEEL CLIP IS TO BE REPLACED AND THE ROD CONNECTING TO IT REPLACED AND RECONNECTED AS IS CURRENTLY CONNECTED. LENGTH OF RODS VARY-FIELD VERIFY. ASSUME DIAMETER OF STEEL RODS TO BE 1-1/4" (FIELD VERIFY). ASSUME STEEL CLIPS TO BE 3/8" THICK, MATCH EXISTING CLIP SIZE TO ACCOMMODATE BOLTS/ROD. SEE PIPING SPECIFICATIONS FOR NUTS/BOLTS/RODS MATERIAL REQUIREMENTS. STEEL CLIPS TO BE GALVANIZED STEEL, A36.

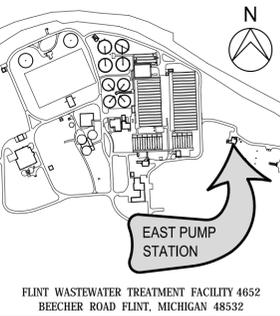
WORK AREA SYMBOL 1

PHOTO 6
NO SCALE N/A



HRC
HUBBELL, ROTH & CLARK, INC
 CONSULTING ENGINEERS SINCE 1915
 800 EAST WILSON AVENUE, SUITE 200
 ANN ARBOR, MICHIGAN 48106-1502
 PHONE: (313) 938-4399
 FAX (EAST): (313) 938-6312
 FAX (2nd Floor): (248) 338-2592
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CITY OF FLINT
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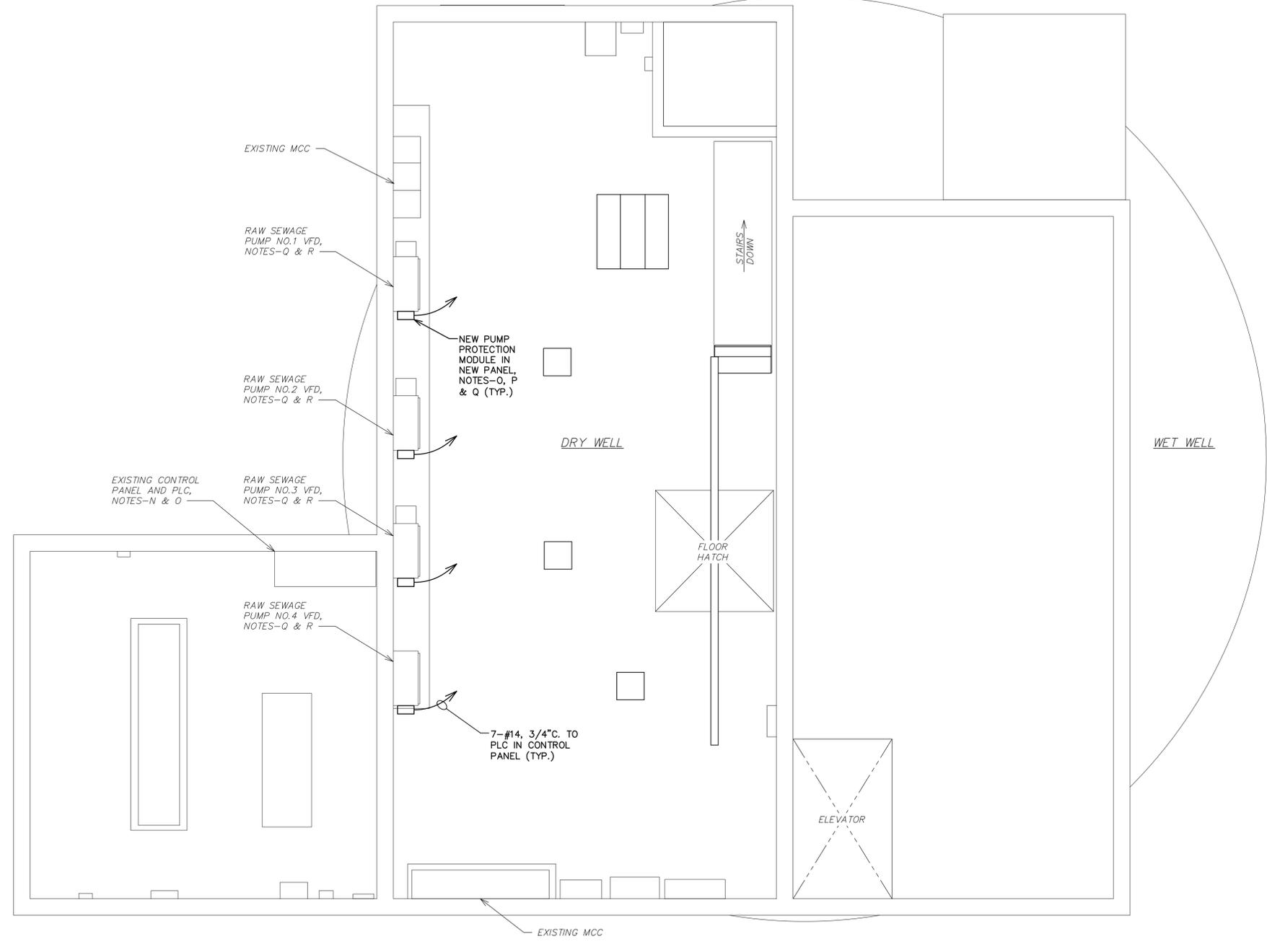
PHOTOS AND MISCELLANEOUS
 WORK ITEMS

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. P-5 OF

ELECTRICAL LEGEND	
T	TRANSFORMER
■	LIGHTING PANELBOARD
▨	DISTRIBUTION PANELBOARD
CP	CONTROL PANEL
J.B.	JUNCTION BOX
P.B.	PULL BOX
Ⓜ	MOTOR, 3 PHASE
—	CONDUIT RUN EXPOSED
—GC—	BUILDING GROUND CONDUCTOR
—RGS—	DIRECT BURIAL R.G.S. CONDUIT
—PVC—	DIRECT BURIAL POLYVINYL CHLORIDE CONDUIT
W.T.X.	WATERTIGHT, CORROSION RESISTANT (NEMA 4X)
C.	CONDUIT
VFD	VARIABLE FREQUENCY DRIVE
MCC.	MOTOR CONTROL CENTER

GENERAL ELECTRICAL NOTES:
(APPLY TO ALL DRAWINGS)

- A. THE CONTRACTOR SHALL VISIT THE JOB SITE AND THOROUGHLY CHECK THE FIELD CONDITIONS AND THE EXISTING ELECTRICAL INSTALLATION AND UTILITIES (ELECTRICAL AND TELEPHONE) PRIOR TO SUBMITTING HIS BID.
- B. OTHER PROJECTS ARE, OR MAY BE, UNDER CONSTRUCTION AT THIS SITE, AND THIS CONTRACTOR SHALL COORDINATE WITH THEM SO AS NOT TO DELAY THEIR SCHEDULES OR IMPEDE THEIR WORK.
- C. PROVIDE WATERTIGHT HUBS AT CONDUIT ENTRANCES TO ALL WATERTIGHT (NEMA TYPE 4 & 4X) ENCLOSURES MOUNTED INDOORS. ALL NEMA TYPE 4 & 4X ENCLOSURES, EXCEPT THOSE IN CORROSIVE AREAS, SHALL BE EQUIPPED WITH A DRAIN/BREATHING FITTING.
- D. EXPANSION OR EXPANSION/DEFLECTION FITTINGS SHALL BE PROVIDED FOR ALL CONDUITS CROSSING BUILDING EXPANSION JOINTS.
- E. ALL POWER FEEDERS SHALL BE RUN IN INDIVIDUAL CONDUITS, FROM SOURCE TO LOAD, AS INDICATED IN SCHEDULES, WIRING DIAGRAMS, OR BY HOME RUNS ON THE PLANS.
- F. ALL CONDUITS SHALL BE ROUTED TO AVOID OPENINGS IN FLOORS, ROOFS, AND WALLS. LADDERS UP WALLS SHALL NOT BE CROSSED BY EXPOSED CONDUIT RUNS. PROVIDE THE MINIMUM CLEAR SPACE REQUIRED BY ALL GOVERNING CODES BETWEEN HANDRAILS AND ALL ELECTRICAL ENCLOSURES AND RACEWAYS, WHICH IN NO CASE SHALL BE LESS THAN 1 1/2" CLEAR.
- G. ALL CONDUITS FOR 480VAC POWER FEEDERS, BRANCH CIRCUITS, AND INSTRUMENTATION SHALL BE RUN EXPOSED OVERHEAD, UNLESS SHOWN OTHERWISE ON THE PLANS.
- H. ALL ELECTRICAL FLOOR MOUNTED EQUIPMENT SUCH AS MOTORS, CONTROL PANELS, AND METALLIC SUPPORT RACKS SHALL HAVE A #2 (UNLESS OTHERWISE NOTED) BARE GROUND CONDUCTOR TIE BETWEEN THE MOTOR FRAME, ENCLOSURE, OR SUPPORT LEG AND THE BUILDING GROUND SYSTEM.
- I. GROUND CONDUCTOR SPLICING AND BONDING SHALL BE ACCOMPLISHED BY THE USE OF EXOTHERMIC WELDING.
- J. PROVIDE A GREEN GROUND CONDUCTOR IN ALL SYSTEMS CONDUITS, EXCEPT INSTRUMENT SIGNAL AND ALARM CONDUITS, INCLUDING BRANCH CIRCUIT CONDUITS FOR LIGHTING AND RECEPTACLES. GROUND CONDUCTOR SIZING SHALL BE PER N.E.C. TABLE 250-95 (MINIMUM) WHERE NOT SIZED ON THE DRAWINGS.
- K. COORDINATE EXACT LOCATION AND MOUNTING HEIGHTS OF ALL DEVICES WITH MECHANICAL PIPING AND DUCTWORK BEFORE INSTALLATION.
- L. ALL THREADED MECHANICAL CONNECTIONS ON ELECTRICAL EQUIPMENT (CONDUIT, COUPLINGS, JUNCTION BOXES, ETC.) INSTALLED WITHIN WET AREAS, HAZARDOUS AREAS, OR OUTDOORS SHALL BE COATED WITH ANTI-SEIZE COMPOUND PRIOR TO INSTALLATION.
- M. ALL WALL MOUNTED ELECTRICAL EQUIPMENT SHALL HAVE A 1/2" (MINIMUM) AIR SPACE BETWEEN WALL AND EQUIPMENT (PROVIDE NON-CORROSIVE SPACERS OR BRACKETS AS REQUIRED).
- N. IN THE EXISTING CONTROL PANEL, FURNISH AND INSTALL FOUR (4) NEW 24 VDC POWER SUPPLIES, ONE (1) FOR EACH PUMP PROTECTION PANEL. POWER SUPPLY SHALL BE PHOENIX CONTACT OR APPROVED EQUAL. FOR EACH POWER SUPPLY FURNISH AND INSTALL ONE (1) FUSED TERMINAL, WITH 5 AMP FUSE, FOR OVERLOAD PROTECTION.
- O. CONNECT THE "SEAL LEAK" AND "MOTOR HIGH TEMP" SIGNALS FROM EACH PUMP TO SPARE INPUTS IN THE PLC. REVISE THE PLC PROGRAMMING, SCADA SYSTEM, AND DISPLAY SCREENS TO INCORPORATE THE NEW ALARMS. CONDUIT TO THE PLC MAY BE RE-USED WHERE POSSIBLE.
- P. FURNISH AND INSTALL NEW NEMA TYPE 4X, STAINLESS STEEL BOX WITH HINGED COVER, 12" X 12" X 8" MINIMUM TO MOUNT MOTOR PROTECTION MODULES. INSTALL THE OWNER FURNISHED MOTOR PROTECTION MODULES IN THE ENCLOSURE. CUT OPENING IN THE PANEL TO MOUNT MOTOR PROTECTION MODULE DISPLAY IN/ON THE PANEL DOOR.
- Q. FOR EACH VFD, CONNECT PUMP PERMISSIVE CONTACT FROM THE ASSOCIATED MOTOR PROTECTION PANEL TO THE VFD. COORDINATE CONNECTION AND SET-UP OF THE EXISTING VFD.
- R. EXISTING VFD'S ARE ALLEN BRADLEY, POWERFLEX 700H SERIES A, CATALOG NUMBER 20C D 300 A 0 ANNNNB0



ELECTRICAL PLAN EL. 711'-0"
SCALE: 1/4" = 1'-0"



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CONSULTING ENGINEERS SINCE 1915

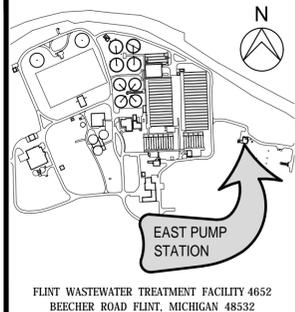
5835 CHURCH STREET
ANN ARBOR, MICH. 48106-4808

PHONE: (810) 808-8200
FAX (810) 808-6312
FAX (2nd Floor): (248) 338-2592

WEB SITE: <http://www.hrc-engr.com>

DATE	ADDITIONS AND/OR REVISIONS
5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW

DESIGNED	R.H.W.
DRAWN	B.T.L.
CHECKED	R.H.W.
APPROVED	



CITY OF FLINT

WPC FACILITY
EAST PUMP STATION
PUMP REPLACEMENT

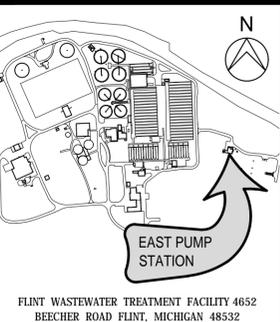
ELECTRICAL PLAN
FL. EL. 711'-0"
NOTES AND LEGEND

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. E-1 OF



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HUBBELL, ROTH & CLARK, INC
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 583 CHURCH STREET
 ANN ARBOR, MICH. 48106-1502
 PHONE: (810) 808-8200
 FAX (810) 808-6312
 FAX (2nd Floor): (248) 338-2592
 WEB SITE: <http://www.hrc-engr.com>

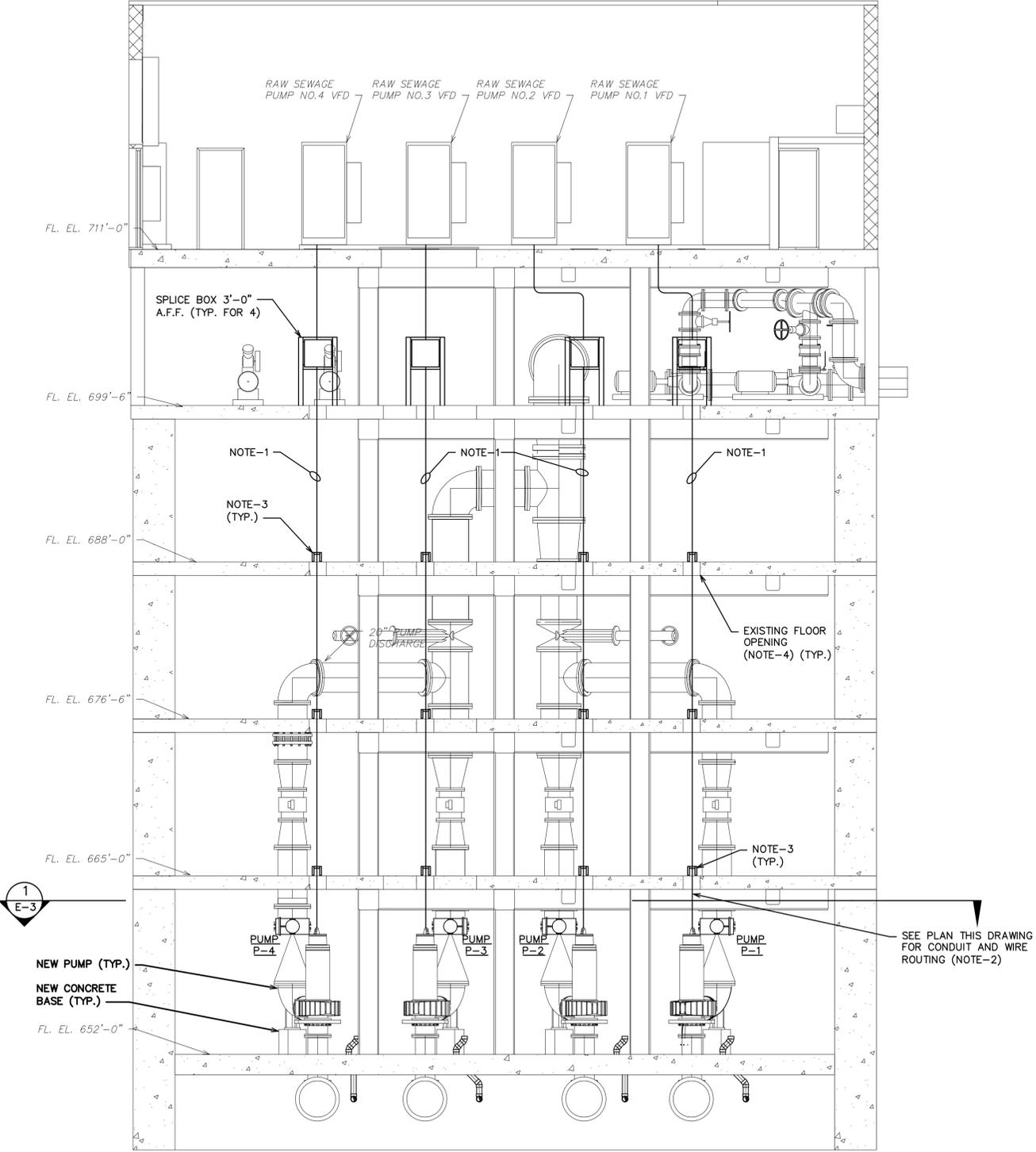
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APPROVED	



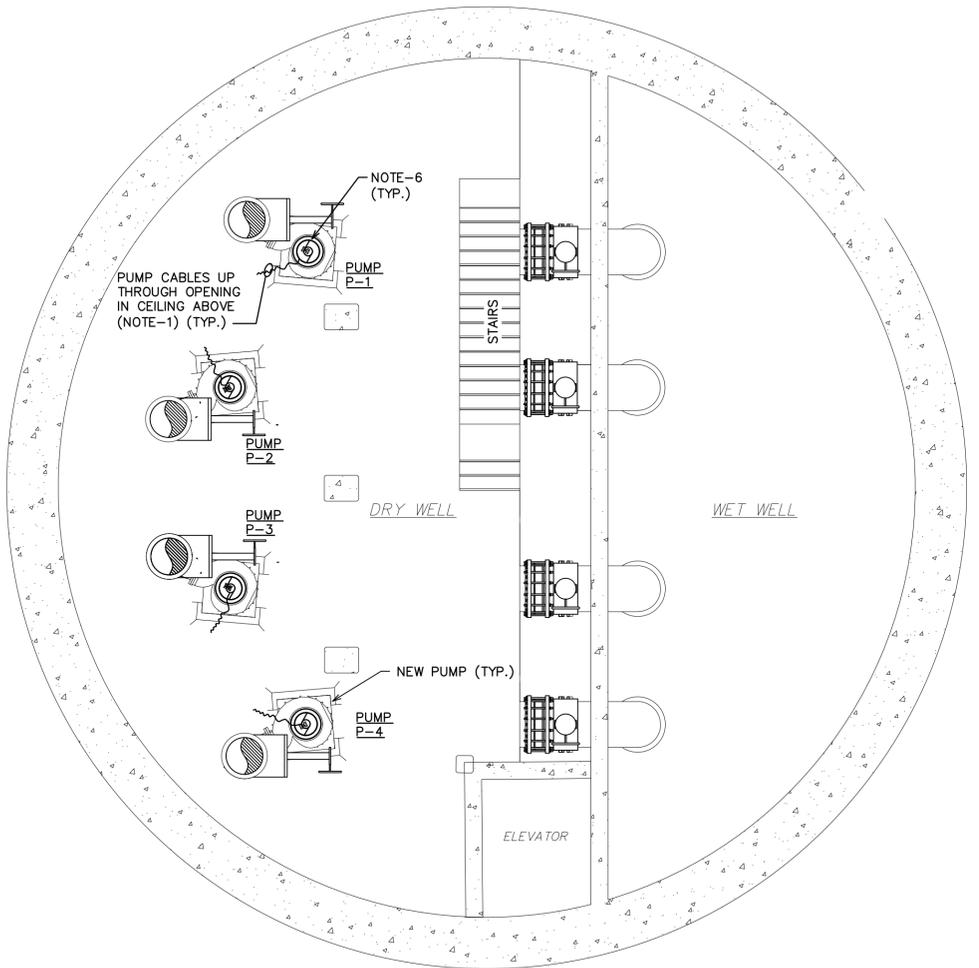
CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**

ELECTRICAL SECTIONS

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. E-3 OF

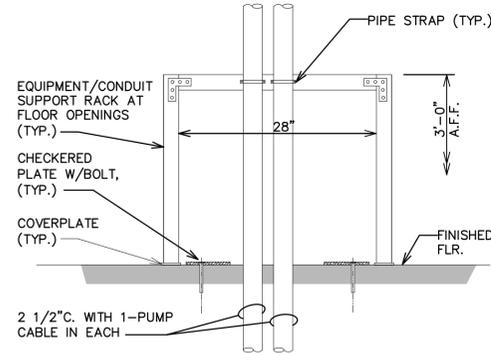


SECTION 1
 SCALE: 3/16" = 1'-0"

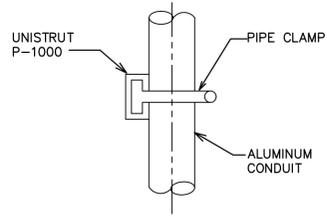


ELECTRICAL PLAN EL. 652'-0"
 SCALE: 3/16" = 1'-0"

- NOTES:**
- 2-2 1/2" C. WITH 1-PUMP POWER & MONITORING CABLE IN EACH.
 - CONDUIT ROUTING DOWN TO SUPPORT RACK, SEE PLAN THIS DWG.
 - EQUIPMENT RACK TO SUPPORT CONDUITS.
 - COORDINATE LOCATION OF EQUIPMENT RACK TO NOT INTERFERE WITH VALVE OR PUMP REMOVAL.
 - PROVIDE AND INSTALL COVERPLATE, SEE DETAIL ON DWG. #E-4.
 - INSTALL MOTOR DISCONNECT SIGN FOR EACH MOTOR.



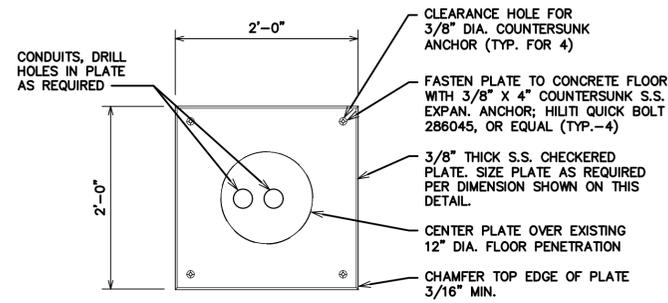
EQUIPMENT/CONDUIT SUPPORT RACK ABOVE CHECKERED PLATE OPENING DETAIL
N.T.S.
(SEE DWG. #E-3 FOR CONDUIT OPENING LOCATIONS)



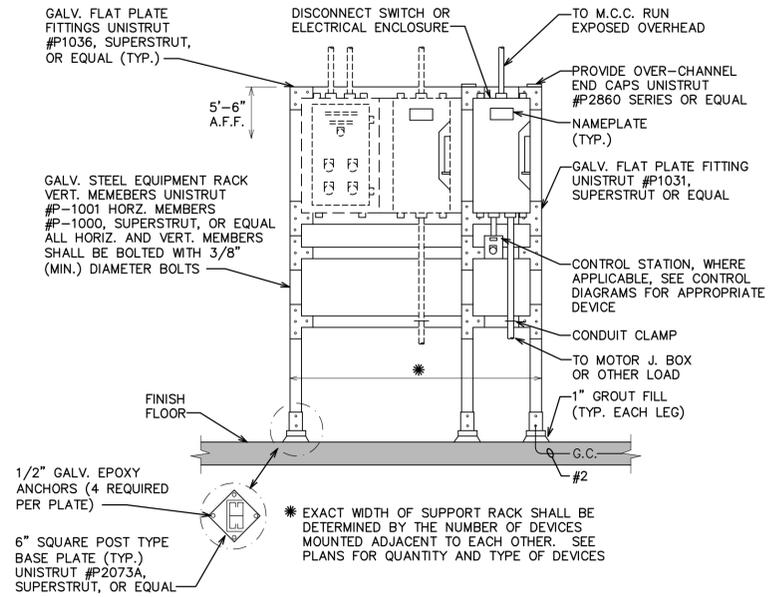
TYPICAL CONDUIT VERTICAL RISER SUPPORT DETAIL
N.T.S.

MOTOR DISCONNECT SWITCH IS LOCATED ON VFD AT FLOOR ELEVATION 711'-0"

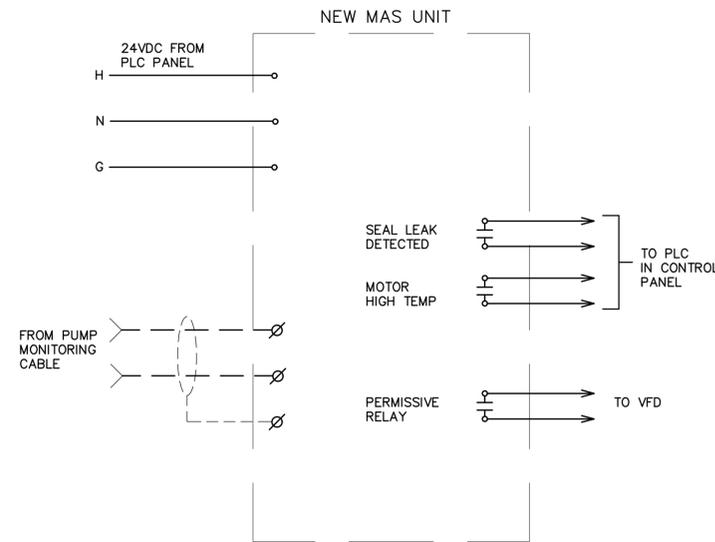
MOTOR DISCONNECT SIGN DETAIL
NO SCALE
(LAMACOID NAMEPLATE WITH WHITE LETTERS ON A RED BACKGROUND)



BOLTED DOWN CHECKER PLATE DETAIL
NO SCALE



EQUIPMENT/CONDUIT SUPPORT RACK ON CONCRETE SLAB DETAIL
N.T.S.

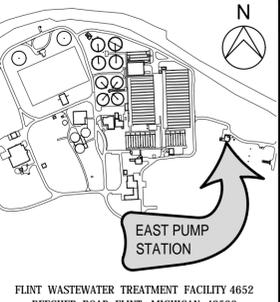


MOTOR PROTECTION UNIT WIRING DIAGRAM
NO SCALE



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HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
5835 CHIMNEY CREEK
FLINT, MICH. 48820-4808
PHONE: (810) 808-8288
FAX (810) 808-6312
FAX (2nd Floor): (248) 338-2592
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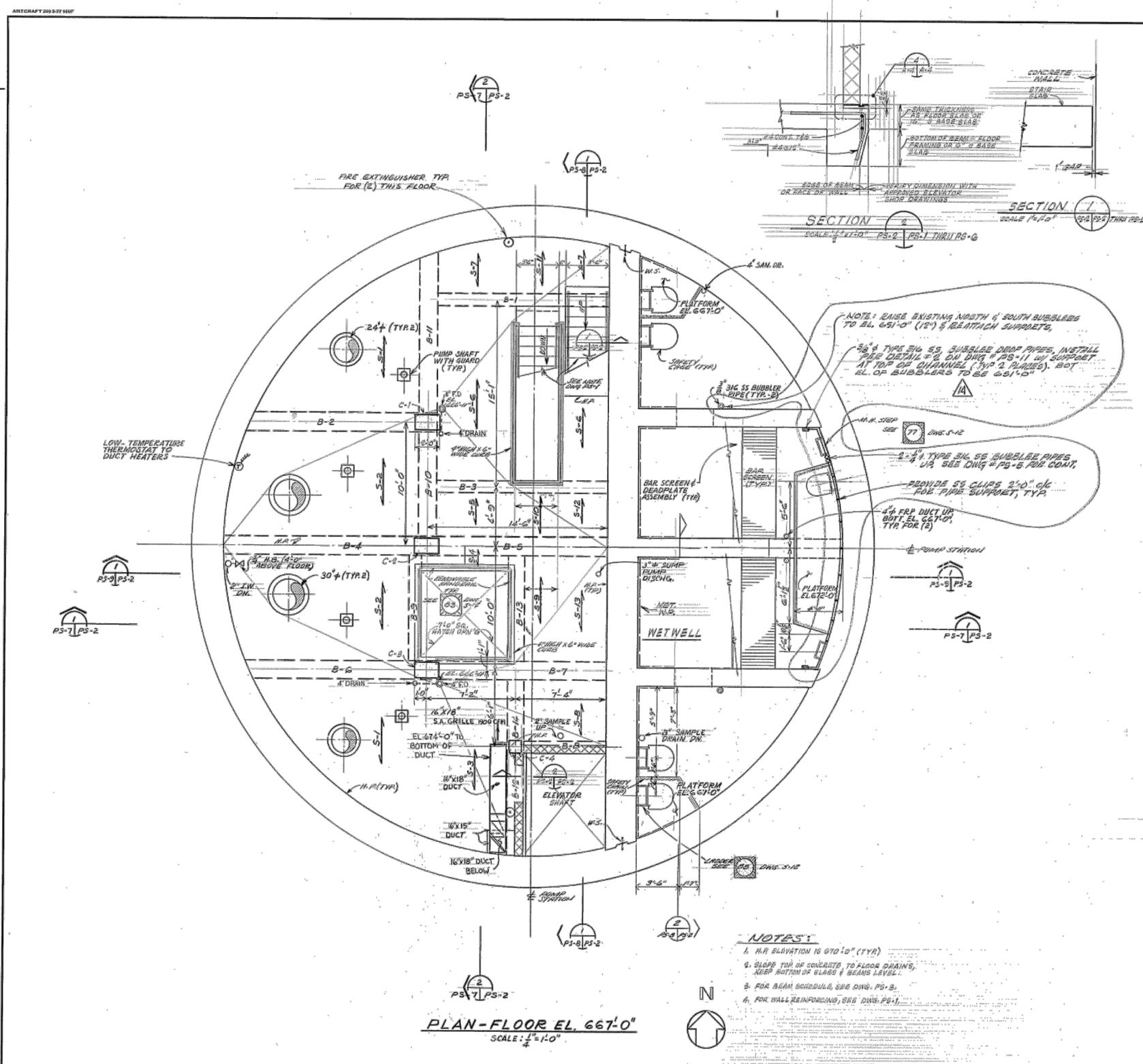
5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	R.H.W.
DRAWN	B.T.L.
CHECKED	R.H.W.
APPROVED	



CITY OF FLINT
WPC FACILITY EAST PUMP STATION PUMP REPLACEMENT

MISCELLANEOUS DETAILS

HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. E-4 OF



CONCRETE SLAB SCHEDULE

SLAB	THICKNESS	REINFORCEMENT	TENSILE	REMARKS
S-1	150	#4@12"	#4@12" T18	AT EL. 667'-0" EXTEND BOT. REIN. THRU SLAB.
S-2	150	#4@12"	#4@12" T18	PROVIDE SLAB TOP REIN. OVER S-1.
S-3	150	#4@12"	#4@12" T18	PROVIDE ADDL. REIN. AT 12" ON MATCH SEE SECT. 1/PS-2.
S-4	150	#4@12"	#4@12" T18	PROVIDE 1" HOOK AT GRAB CURB.
S-5	150	#4@12"	#4@12" T18	SEE S-4 & S-6.
S-6	150	#4@12"	#4@12" T18	PROVIDE 1" HOOK AT GRAB CURB.
S-7	150	#4@12"	#4@12" T18	SEE S-6.
S-8	150	#4@12"	#4@12" T18	SEE S-9 OR S-13.
S-9	150	#4@12"	#4@12" T18	#4@12" CONT. THRU S-8 & S-10.
S-10	150	#4@12"	#4@12" T18	SEE S-9.
S-11	150	#4@12"	#4@12" T18	#4@12" T18.
S-12	150	#4@12"	#4@12" T18	SEE S-6 & S-13.
S-13	150	#4@12"	#4@12" T18	#4@12" CONT. THRU S-8 & EXTENDED 3'-0" INTO S-12.
S-14	250	#4@12"	#4@12" T18	#4@12" EXTENDED 3'-0" INTO S-15.
S-15	250	#4@12"	#4@12" T18	#4@12" EXTENDED 3'-0" INTO S-14.
S-16	250	#4@12"	#4@12" T18	PROVIDE ADDL. REIN. AT 12" ON MATCH SEE SECT. 1/PS-2.
S-17	250	#4@12"	#4@12" T18	#4@12" CONT. THRU S-17 & EXTENDED 3'-0" INTO S-18.
S-18	250	#4@12"	#4@12" T18	#4@12" CONT. THRU S-17 & S-18.
S-19	100	#4@12"	#4@12" T18	#4@12" CONT. EXTEND 3'-0" INTO S-18.
S-20	250	#4@12"	#4@12" T18	#4@12" CONT. THRU S-22.
S-21	100	#4@12"	#4@12" T18	#4@12" CONT.
S-22	150	#4@12"	#4@12" T18	#4@12" CONT. THRU S-22, S-24, & EXTENDED 10'-0" INTO S-23.
S-23	150	#4@12"	#4@12" T18	SEE S-22.
S-24	150	#4@12"	#4@12" T18	SEE S-22 & ADD #5@12" X 15'-0" EXTENDED.
S-25	150	#4@12"	#4@12" T18	SEE S-22, S-24 & S-25, ADD #4@12" X 6'-0" @ S-25.
S-26	150	#4@12"	#4@12" T18	#4@12" CONT. EXTEND 3'-0" INTO S-25 & 3'-0" INTO S-26.
S-27	250	#4@12"	#4@12" T18	#4@12" CONT. THRU S-27 & S-27.
S-28	250	#4@12"	#4@12" T18	#4@12" CONT. THRU S-29.
S-29	250	#4@12"	#4@12" T18	SEE S-28.
S-30	150	#4@12"	#4@12" T18	SEE S-28 & S-30.
S-31	150	#4@12"	#4@12" T18	SEE S-28 & S-31.
S-32	150	#4@12"	#4@12" T18	#4@12" CONT. EXTEND 3'-0" INTO S-31.
S-33	150	#4@12"	#4@12" T18	#4@12" CONT. THRU S-33, EXTEND 3'-0" INTO S-32.
S-34	150	#4@12"	#4@12" T18	#4@12" CONT. EXTEND 3'-0" INTO S-31.
S-35	150	#4@12"	#4@12" T18	SEE S-31 & ADD #4@12" X 3'-0" INTO S-31.

CONCRETE SLAB NOTES

1. TOP REIN. ENDING AT BEAMS SHALL BE PROVIDED WITH A STANDARD HOOK. THIS HOOK SHALL EITHER BE FABRICATED IN TOP REIN. OR PROVIDED BY A BRAD DOWEL SPACED WITH TOP REIN. LOCATE VERT. LEG. OF HOOK AT FAR FACE OF SUPPLEMENTARY MEMBER.
2. ANY CONT. TOP REIN. SPLICES REQ'D. SHALL BE AT MIDSPAN.
3. TEMP. REIN. SHALL BE SPICED 1/4 ADJACENT SLAB TEMP. REIN. OR EMBEDDED INTO ADJACENT BEAMS.
4. FULL TENSION SPICE AND EMBEDMENT LENGTHS SHALL BE PROVIDED.
5. ADDITIONAL TOP REIN. SHALL BE CENTERED OVER SUPPORT UNLESS NOTED.
6. PROVIDE ADDITIONAL REIN. AS NOTED ON PLAN, SECTIONS & DETAILS.
7. SLAB THICKNESS AND TOP SURFACE ELEVATION VARY TO PROVIDE FOR FLOOR DRAINAGE AS SHOWN. KEEP BOTTOM OF SLABS LEVEL.
8. SEE DWGS. S-10, S-11 & S-12 FOR TYP. DETAILS, NOTES & ADDITIONAL REINFORCING.
9. FOR TOP REINFORCING INTO SLABS FROM WALLS, SEE SECTIONS PS-2, PS-3 & PS-4.

NOTES

1. M.A. ELEVATION IS 670'-0" (TYP.)
2. SLOPE TOP OF CONCRETE TO FLOOR DRAIN. KEEP BOTTOM OF SLAB & BEAMS LEVEL.
3. FOR BEAM SCHEDULES SEE DWG. PS-3.
4. FOR WALL REINFORCING, SEE DWG. PS-1.

RETENTION-TREATMENT TANK AND PUMP STATION
JOB NO. 77033

PLAN-EL. 667'-0" & SLAB SCHEDULE

DATE	ADDITIONS AND/OR REVISIONS	DATE	ADDITIONS AND/OR REVISIONS	SCALE
7-30-77				AS NOTED
3-20-78	ISSUED FOR BIDS			
5-10-77	DATA REVISIONS			

CITY OF FLINT, MICHIGAN WASTEWATER SYSTEM IMPROVEMENTS POLLUTION CONTROL PROGRAM CONTRACT #81	HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS P.O. BOX 824 2323 FRANKLIN ROAD BLOOMFIELD HILLS, MICHIGAN 48303	SHEET NO. PS-2 OF 11 DRAWER 234
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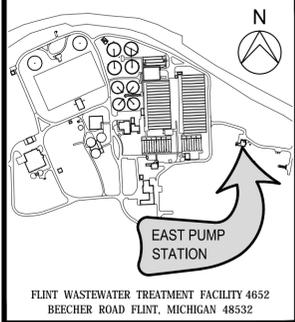
NOTICE:
ELEVATIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON N.A.V.D. 88 DATUM. SUBTRACT 2'-0" FROM ELEVATIONS SHOWN ON THIS REFERENCE DRAWING TO CONVERT TO N.A.V.D. 88 DATUM.

NOTICE:
THIS DRAWING HAS BEEN COPIED FROM A PREVIOUS CONSTRUCTION PROJECT AND IS PROVIDED FOR INFORMATION ONLY. NO GUARANTEE IS MADE, OR SHOULD BE ASSUMED AS TO THE COMPLETENESS OR ACCURACY OF THE INFORMATION SHOWN ON THIS DRAWING. PARTIES UTILIZING THIS INFORMATION SHALL FIELD VERIFY THE ACCURACY AND COMPLETENESS PRIOR TO CONSTRUCTION ACTIVITIES. THIS DRAWING IS NOT TO SCALE.



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HUBBELL, ROTH & CLARK, INC.
CONSULTING ENGINEERS SINCE 1915
555 HULET DRIVE
BLOOMFIELD HILLS, MICH. 48303-0824
PHONE: (248) 454-6300
FAX (1st Floor): (248) 454-6312
FAX (2nd Floor): (248) 338-2592
WEB SITE: <http://www.hrc-engr.com>

5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	
DRAWN	T.W.R.
CHECKED	
APPROVED	



CITY OF FLINT

WPC FACILITY
EAST PUMP STATION
PUMP REPLACEMENT

EXISTING PUMP STATION
PLAN @ ELEV. 667'-0"
- FOR REFERENCE ONLY

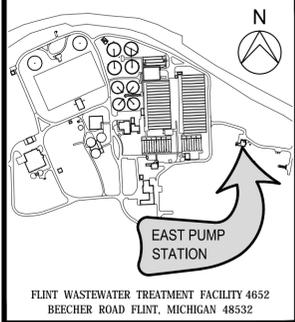
HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. REF-2 OF 2

ARCHITECT 00 937 000



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 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE P.O. BOX 824
 BLOOMFIELD HILLS, MICH. 48303-0824
 PHONE: (248) 454-6300
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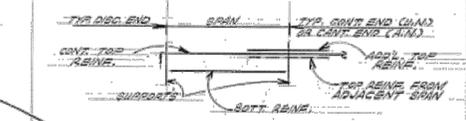
CITY OF FLINT
WPC FACILITY
EAST PUMP STATION
PUMP REPLACEMENT

EXISTING PUMP STATION
 PLAN @ ELEV. 678'-6"
 - FOR REFERENCE ONLY

HRC JOB NO.	SCALE
20151005	AS NOTED
DATE	SHEET NO.
MAY 2019	REF-3
	OF
	234

CONCRETE BEAM NOTES

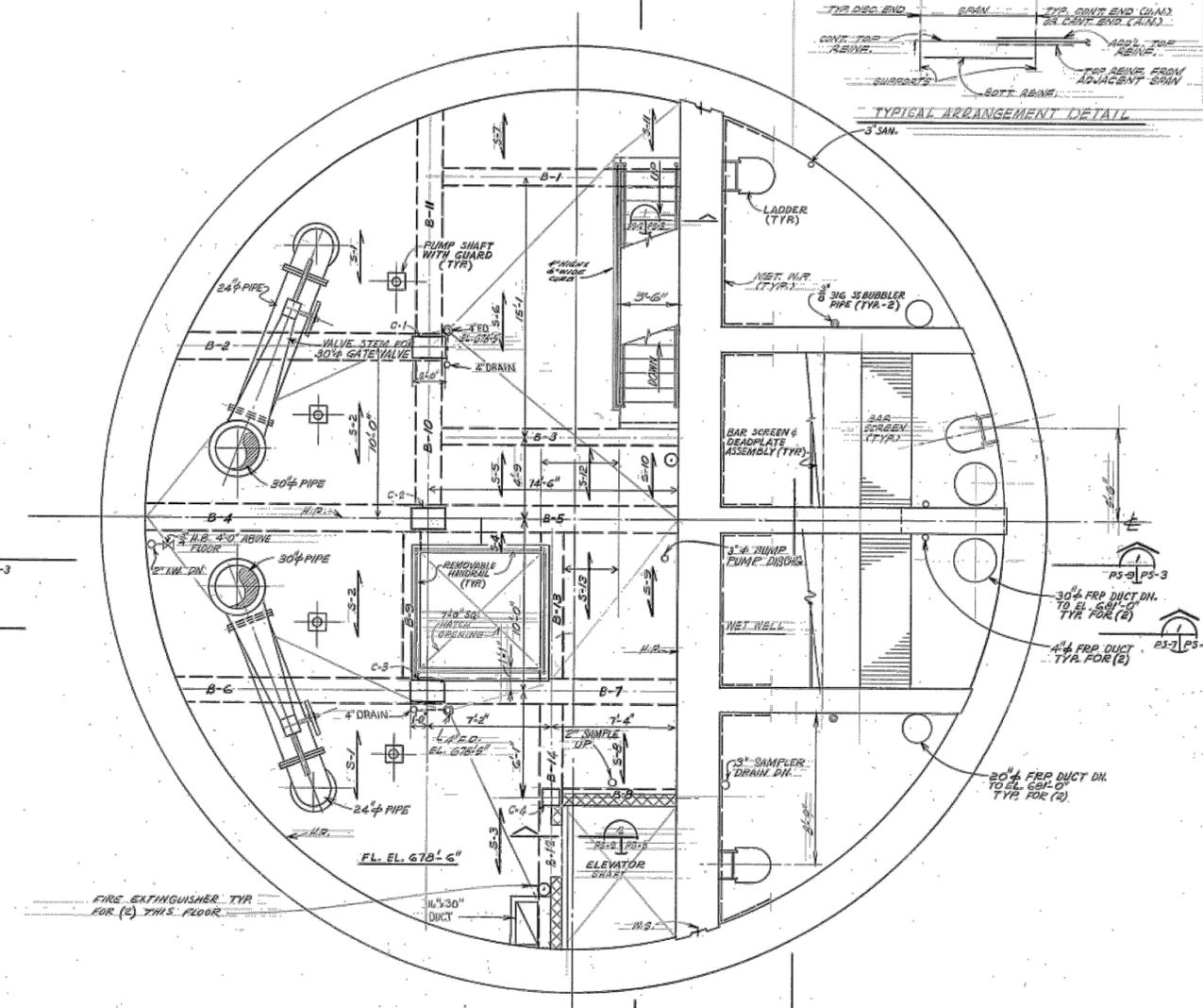
1. TOP REIN. AT DISC. ENDS SHALL BE PROVIDED WITH A STANDARD HOOK. THE HOOK SHALL BE EITHER SEGREGATED BY THE BEAMS OR PROVIDED BY A BENT DOWNWARD SPICED WITH THE BEAMS. LOCATE WITH LESS OF HOOK AT THE FACE OF SUPPORTING MEMBER.
2. ADDITIONAL TOP REIN. SHALL BE CENTERED OVER SUPPORT, UNLESS NOTED.
3. PROVIDE BEAM ROCKERS IN WALLS, WHERE REQUIRED, A MIN. OF 6" DEEP INTO WALL.
4. SEE DWS. PS-1 FOR TYP. DETAILS AND NOTES.
5. PROVIDE ADDITIONAL REIN. AS NOTED ON PLANS, SECTIONS & DETAILS.
6. BEAM STIRRUPS SHALL BE ASTM A 615-75 GRADE 60 FOR PS DWGS.



CONCRETE BEAM SCHEDULE

MEMBER	SHAPE	SIZE		EIGHTH	CONTINUOUS	TOP REINFORCEMENT		REARRANGEMENT (SEE DETAIL)	CLOSED STIRRUPS	REMARKS
		WIDTH (IN)	DEPTH (IN)			ADDITIONAL	ARRANGEMENT			
B-1	IF	18	24	33	3-1/2	2-27	3-7 DWLS. EA. END	6" x 6"	#3	10" THRU-OUT
B-2	IF	18	20	27	4-0	2-46	3-7 DWLS. EA. END	6" x 6"	#3	12" THRU-OUT
B-3	IF	18	24	33	3-1/2	2-47	3-7 DWLS. EA. END	6" x 6"	#3	10" THRU-OUT
B-4	IF	18	20	20	4-47	2-47	3-7 DWLS. AT WALL, 2-7 DWLS. AT 0-5	6" x 6"	#3	12" THRU-OUT
B-5	IF	18	20	20	4-46	SEE B-4	3-7 DWLS. AT WALL & 2-7 DWLS. AT 0-5	6" x 6"	#3	12" THRU-OUT
B-6	IF	18	20	27	4-47	2-47	3-7 DWLS. AT WALL, 2-7 DWLS. AT 0-5	6" x 6"	#3	12" THRU-OUT
B-7	IF	18	20	27	4-47	SEE B-6	3-7 DWLS. AT WALL & 2-7 DWLS. AT 0-5	6" x 6"	#3	12" THRU-OUT
B-8	IF	12	14	14	2-45	2-45	2-6 DWLS. AT WALL	6" x 6"	#3	4" THRU-OUT
B-9	IF	12	18	17	2-46	2-45	2-6 DWLS. AT WALL	6" x 6"	#3	6" THRU-OUT
B-10	IF	18	24	25	4-46	3-47	3-6 DWLS. DISC. END 2-46 DWLS. AT 0-5	6" x 6"	#3	10" THRU-OUT
B-11	IF	18	24	25	4-47	SEE B-10	3-7 DWLS. AT WALL, 2-7 DWLS. AT 0-5	6" x 6"	#3	10" THRU-OUT
B-12	IF	14	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-13	IF	14	18	17	2-46	SEE B-12	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-14	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-15	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-16	IF	18	24	25	4-46	2-47	4-6 DWLS. AT WALL, 4-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-17	IF	18	24	25	4-46	3-47	3-6 DWLS. AT WALL, 3-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-18	IF	18	24	25	4-47	SEE B-17	3-6 DWLS. AT WALL, 3-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-19	IF	18	24	25	4-46	2-47	3-6 DWLS. AT WALL, 3-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-20	IF	18	24	25	4-46	SEE B-19	3-6 DWLS. AT WALL, 3-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-21	IF	12	18	18	2-47	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-22	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-23	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-24	IF	18	24	25	4-46	2-47	4-6 DWLS. AT WALL, 4-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-25	IF	18	24	25	4-47	SEE B-24	4-6 DWLS. AT WALL, 4-6 DWLS. AT B-5	6" x 6"	#3	10" THRU-OUT
B-26	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-27	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-28	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-29	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-30	IF	12	18	18	2-47	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-31	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-32	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-33	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-34	IF	12	18	18	2-47	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-35	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-36	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-37	IF	12	18	18	2-47	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
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B-39	IF	12	18	18	2-46	2-45	2-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-40	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT
B-41	IF	16	20	20	3-46	3-45	3-6 DWLS. AT B-5	6" x 6"	#3	6" THRU-OUT

- NOTES:**
1. M.R. ELEVATION IS 678'-6" (TYP)
 2. SLOPE TOP OF CONCRETE TO FLOOR DRAINS. KEEP BOTTOM OF SLABS & BEAMS LEVEL
 3. SEE DWS. PS-2 FOR SLAB SCHEDULE
 4. SEE DWS. PS-1 FOR WALL REINFORCEMENT



RETENTION-TREATMENT TANK AND PUMP STATION
 JOB NO. 77033
PUMP STATION
PLAN EL. 678'-6" & BEAM SCHEDULE

DATE	ADDITIONS AND/OR REVISIONS	DATE	ADDITIONS AND/OR REVISIONS	SCALE
4-7-20	0.0.4 3	7-30-77		AS NOTED
10-12-79	RISK 2B	DR. C.P. 24		
3-20-78	ISSUED FOR BIDS	CK. D.B.		
5-17-77	DATE RESUBMITTAL	APP. D.B.		

CITY OF FLINT, MICHIGAN
WASTEWATER SYSTEM IMPROVEMENTS
POLLUTION CONTROL PROGRAM
 CONTRACT #81

HUBBELL, ROTH & CLARK, INC.
 CONSULTING ENGINEERS
 P.O. BOX 824
 2323 FRANKLIN ROAD
 BLOOMFIELD HILLS, MICHIGAN 48313

NOTICE:
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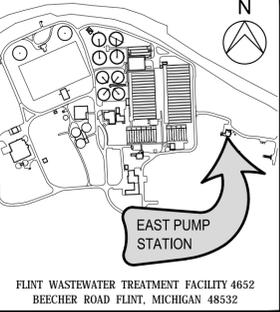
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4/29/2019 11:45 AM HRC_00w_Cic.ctb V:\2015\10\20151005\00_East_Pump_Station\Orthos\DWGS\REF04_plot.dwg HRC - Drew



HRC
HUBBELL, ROTH & CLARK, INC
 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE
 BLOOMFIELD HILLS, MICH. 48303-0824
 PHONE: (248) 454-8300
 FAX (1st Floor): (248) 454-6312
 FAX (2nd Floor): (248) 338-2592
 WEB SITE: http://www.hrc-engr.com

5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	
DRAWN	T.W.R.
CHECKED	
APPROVED	



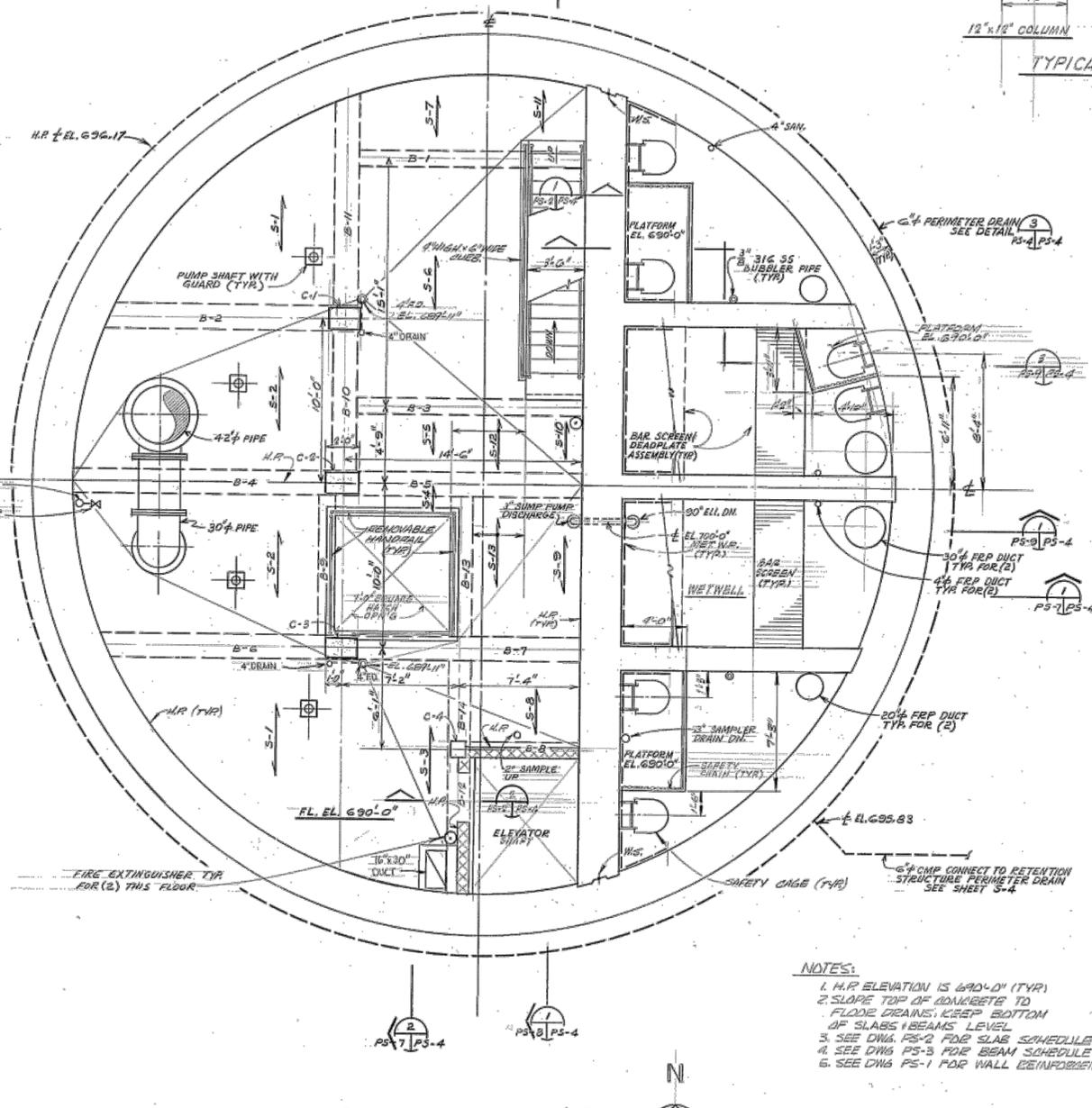
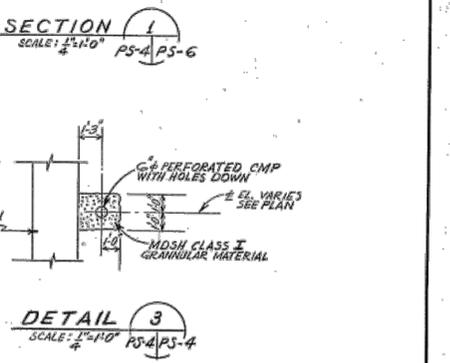
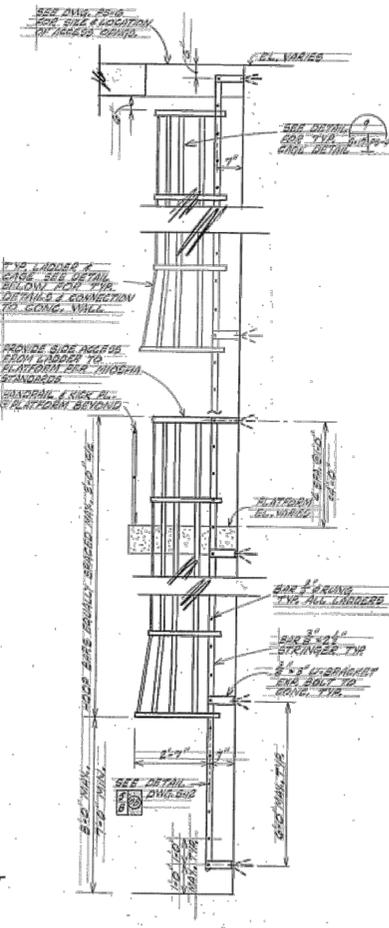
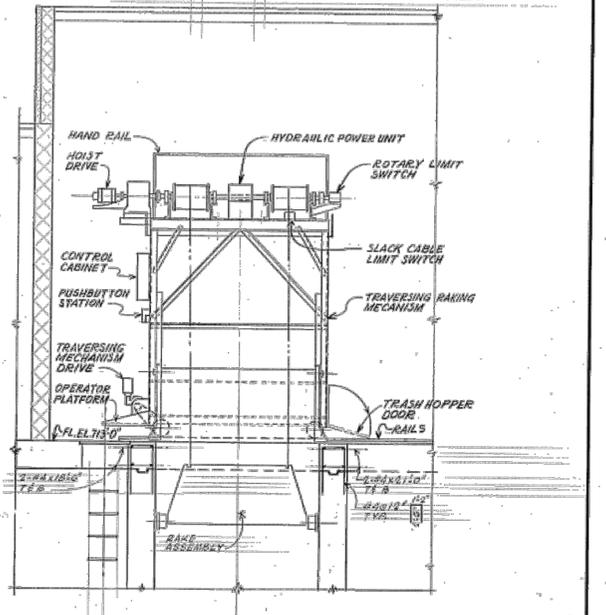
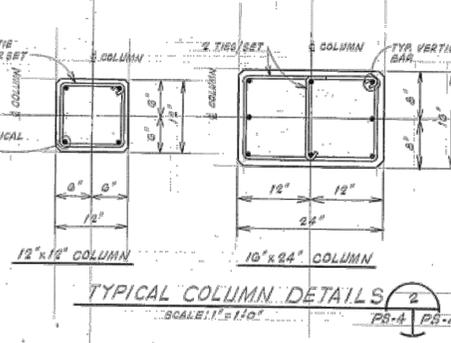
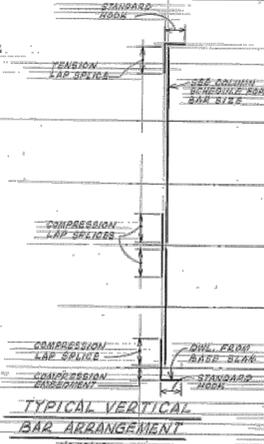
CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**

EXISTING PUMP STATION
 PLAN @ ELEV. 690'-0"
 - FOR REFERENCE ONLY

HRC JOB NO.	SCALE
20151005	AS NOTED
DATE	SHEET NO.
MAY 2019	REF-4

LOCATION/ITEM	MARK	C-1	C-2	C-3	C-4
PL. EL. 718'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 701'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 690'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 678'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 667'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 656'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 645'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 634'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 623'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 612'-0"		16"x24"	16"x24"	16"x24"	12"x12"
PL. EL. 601'-0"		16"x24"	16"x24"	16"x24"	12"x12"

CONCRETE COLUMN NOTES
 1. USE 2" DIA. TIES @ 4" ABOVE & BELOW FLOOR FORMING IN EACH COLUMN.
 2. SEE DWG. PS-2 FOR TYPICAL DETAILS & NOTES.
 3. SEE TYPICAL COLUMN DETAILS FOR NO. OF TIES PER SET.
 4. SEE SLAB BAR ORIENTATION OF 16"x24" COLUMNS.

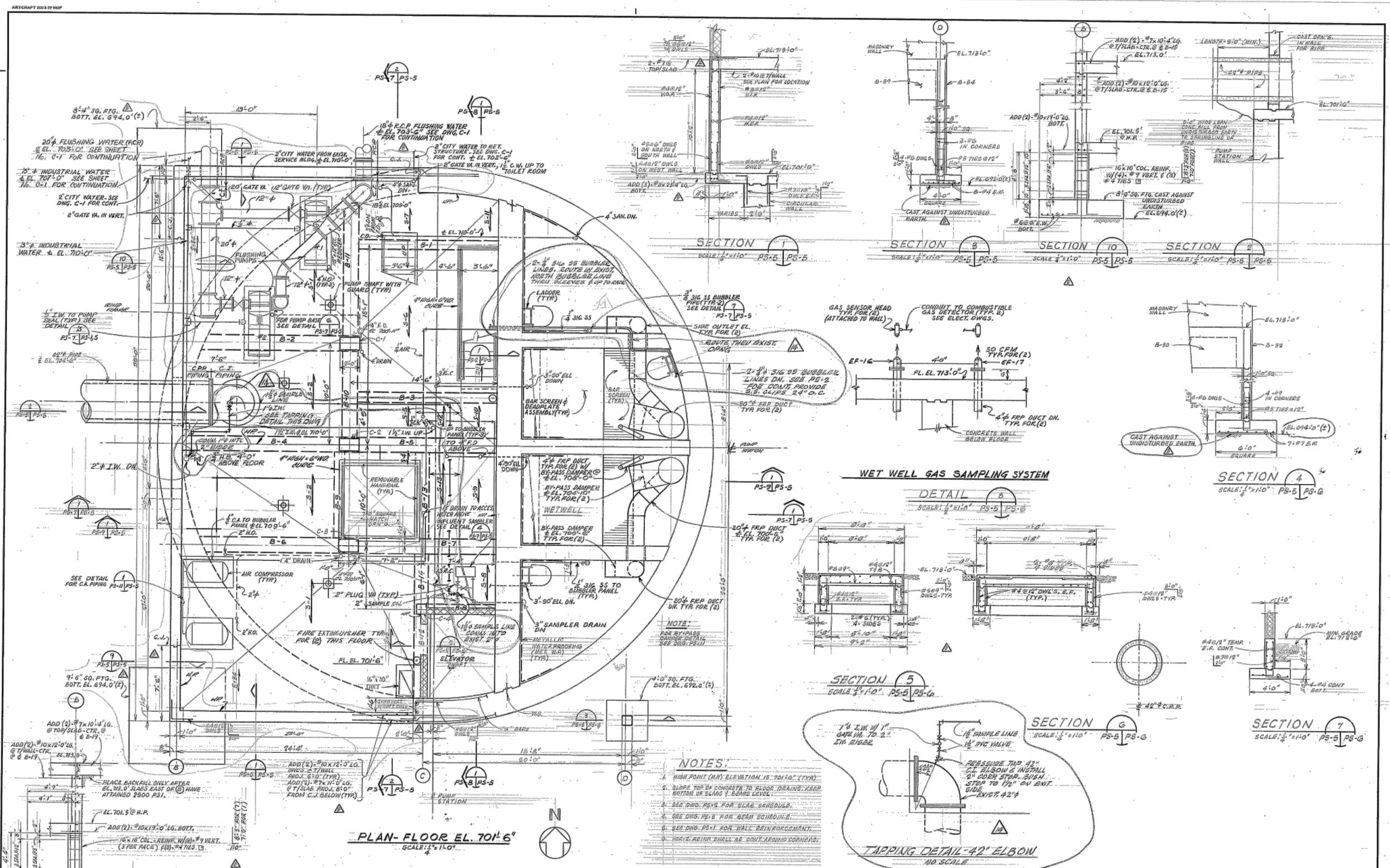


- NOTES:**
- H.P. ELEVATION IS 690'-0" (TYP)
 - SLOPE TOP OF CONCRETE TO FLOOR DRAINS. KEEP BOTTOM OF SLABS & BEAMS LEVEL
 - SEE DWG. PS-2 FOR SLAB SCHEDULE
 - SEE DWG. PS-3 FOR BEAM SCHEDULE
 - SEE DWG. PS-1 FOR WALL REINFORCEMENT

RETENTION-TREATMENT TANK AND PUMP STATION JOB NO. 77033		DATE 7-30-77		CITY OF FLINT, MICHIGAN		HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS		SHEET NO. PS-4	
PLAN-EL. 690'-0"		DR. C.P.		WASTEWATER SYSTEM IMPROVEMENTS POLLUTION CONTROL PROGRAM CONTRACT NO. 1		P.O. BOX 824 2323 FRANKLIN ROAD BLOOMFIELD HILLS, MICHIGAN 48013		OF 11	
DATE		ISSUED FOR BIDS 3-20-78		CK. M.J.W.				DRAWER 234	
ADDITIONS AND/OR REVISIONS		DATE		APP. D.E.				SCALE AS NOTED	
		7-15-77		CH.R. RESUBMITTAL					

NOTICE:
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NOTES:

1. HIGH POINT (M.P.) ELEVATION IS 701.10' (TYP.)
2. SLOPE TOP OF CONCRETE TO FLOOR DRAINAGE. KEEP BOTTOM OF SLABS & BEAM LEVEL.
3. SEE DWG. PS-3 FOR SLAB SCHEDULES.
4. SEE DWG. PS-3 FOR BEAM SCHEDULES.
5. SEE DWG. PS-1 FOR WALL REINFORCEMENT.
6. WET WELL BRIMS SHALL BE CONT. AROUND CORNERS.

RETENTION-TREATMENT TANK AND PUMP STATION
 JOB # 77033
PUMP STATION
 PLAN EL. 701'-6"

DATE	ADDITIONS AND/OR REVISIONS	DATE	ADDITIONS AND/OR REVISIONS	SCALE
MAY 1982	2-D-116			
4-7-80	C.O. 2			
10-12-77	R.C.G. #2			
3-20-18	REMOVED FROM ARCH			
7/10/17	DNIA, REGULATORY			

CITY OF FLINT, MICHIGAN
WASTEWATER SYSTEM IMPROVEMENTS
POLLUTION CONTROL PROGRAM
 CONTRACT # 1

HUBBELL, ROTH & CLARK, INC.
 CONSULTING ENGINEERS
 P.O. BOX 824
 2323 FRANKLIN ROAD
 BLOOMFIELD HILLS, MICHIGAN 48313

SHEET NO.
 PS-5
 OF
 11
 DRAWER
 234

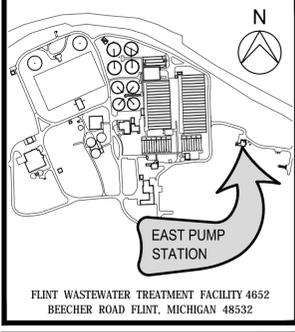
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HUBBELL, ROTH & CLARK, INC.
 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE
 BLOOMFIELD HILLS, MICH. 48303-0824
 PHONE: (248) 454-6300
 FAX (1st Floor): (248) 454-6312
 FAX (2nd Floor): (248) 338-2592
 WEB SITE: http://www.hrc-engr.com

5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	T.W.R.
DRAWN	T.W.R.
CHECKED	
APPROVED	



CITY OF FLINT
WPC FACILITY
EAST PUMP STATION
PUMP REPLACEMENT

EXISTING PUMP STATION
 PLAN @ ELEV. 701'-6"
 - FOR REFERENCE ONLY

DATE	SCALE
20151005	AS NOTED
MAY 2019	SHEET NO. REF-5



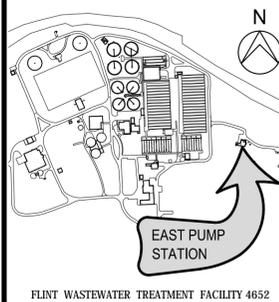
HRC HUBBELL, ROTH & CLARK, INC CONSULTING ENGINEERS SINCE 1915

555 HULET DRIVE BLOOMFIELD HILLS, MICH. 48303-0824

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Table with 2 columns: Description and Date. Includes 'ISSUED FOR BIDS' and 'PRELIMINARY PLAN REVIEW'.

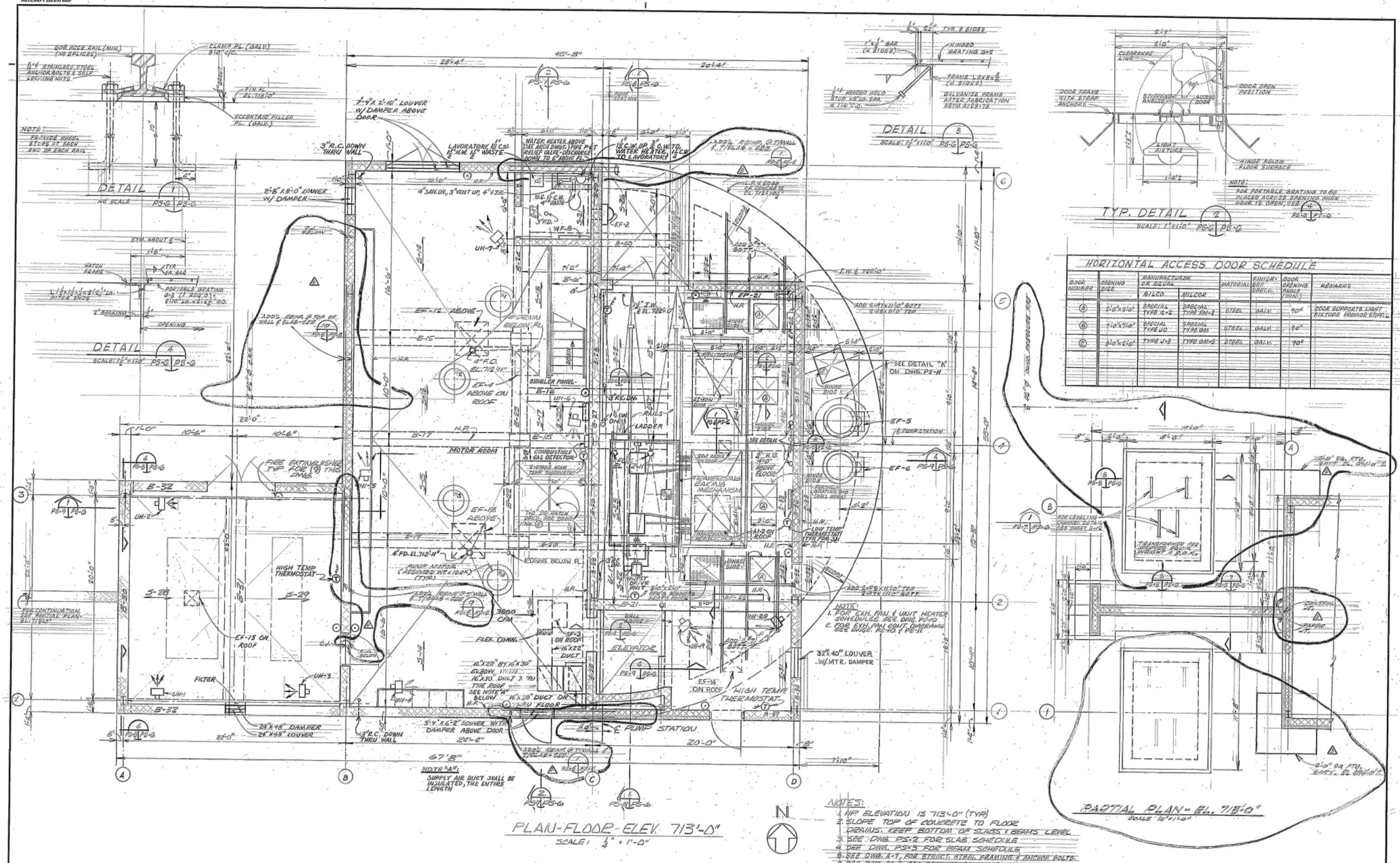


CITY OF FLINT WPC FACILITY EAST PUMP STATION PUMP REPLACEMENT

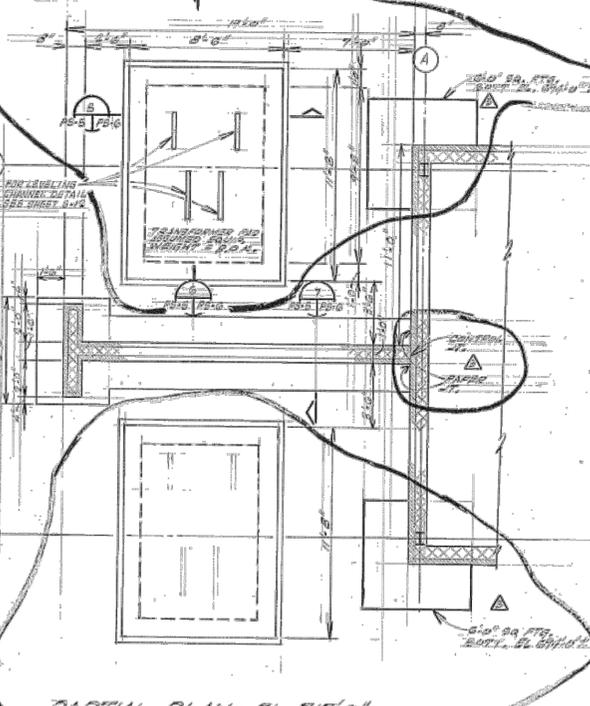
EXISTING PUMP STATION PLAN @ ELEV. 713'-0" - FOR REFERENCE ONLY

Table with 2 columns: HRC Job No. and Scale. Values: 20151005, AS NOTED.

Table with 2 columns: Date and Sheet No. Values: MAY 2019, REF-6 OF.



HORIZONTAL ACCESS DOOR SCHEDULE table with columns: Door Number, Opening Size, Manufacturer, Material, Finish, Door Opening Angle, and Remarks.

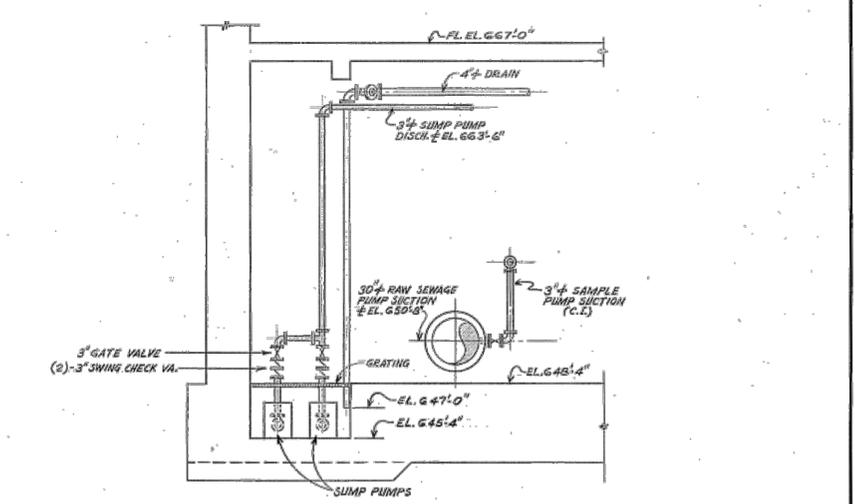
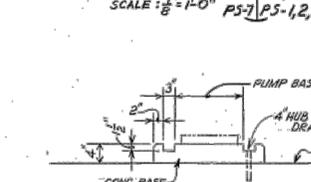
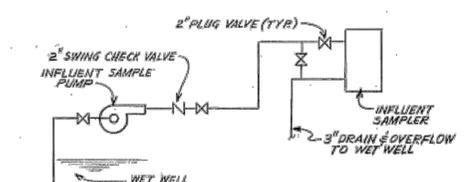
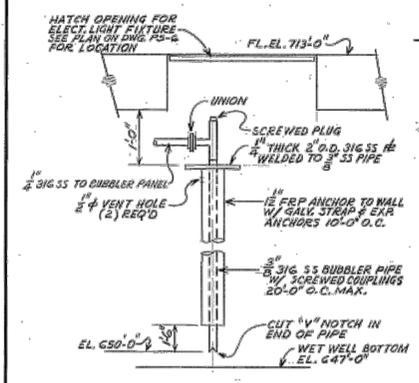
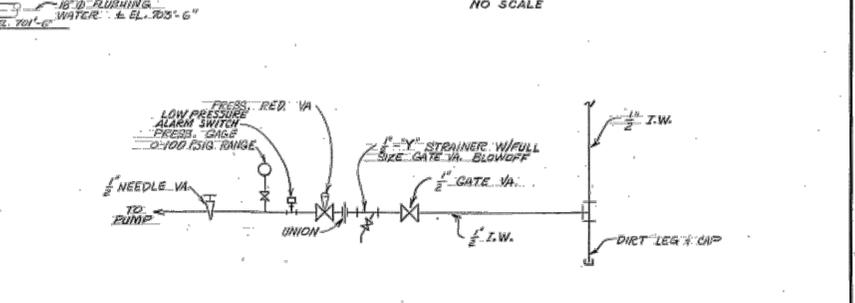
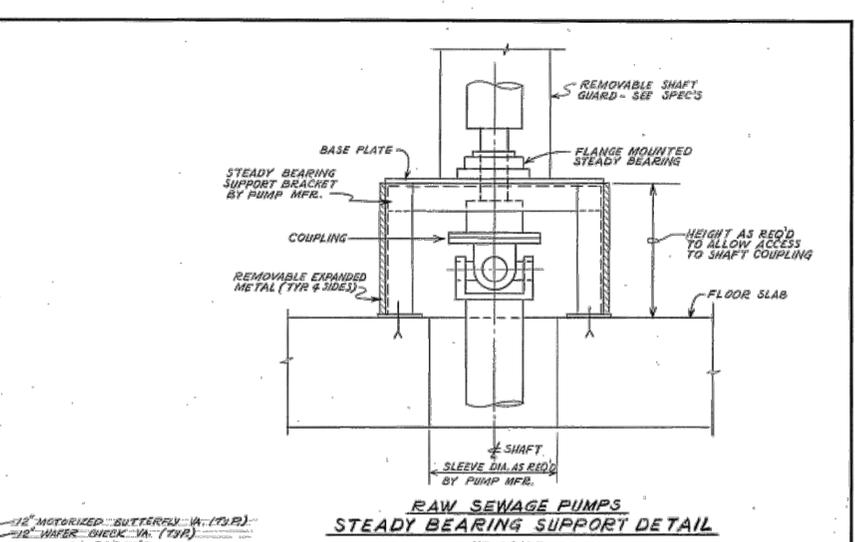
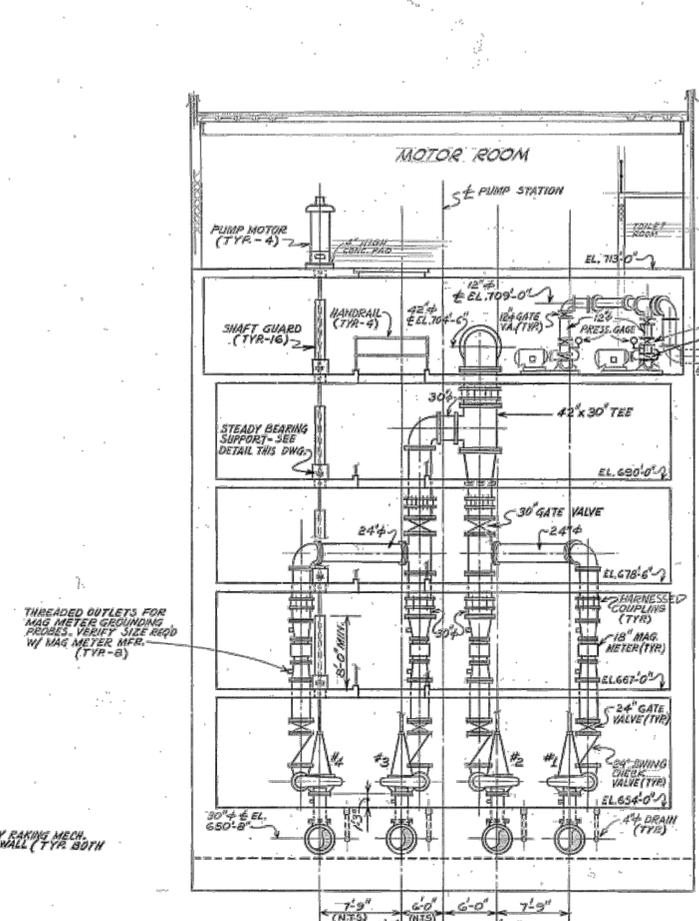
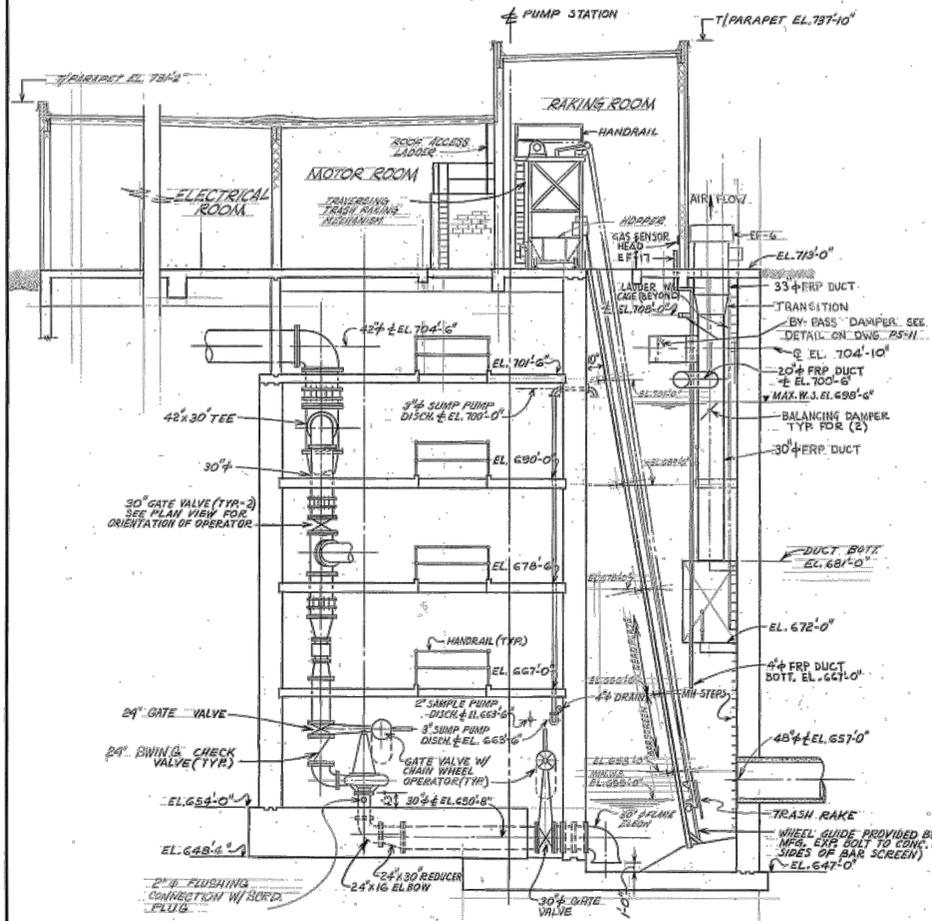


Project information table including title 'RETENTION-TREATMENT TANK AND PUMP STATION', date '7-30-77', and contractor 'HUBBELL, ROTH & CLARK, INC.'.

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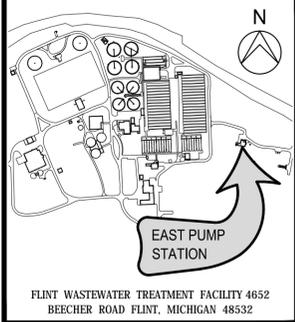
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ARCRAFT 03-37-100F



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 CONSULTING ENGINEERS SINCE 1915
 555 HULET DRIVE P.O. BOX 824
 BLOOMFIELD HILLS, MICH. 48303-0824
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5-1-19	ISSUED FOR BIDS
3-7-19	PRELIMINARY PLAN REVIEW
DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	
DRAWN	T.W.R.
CHECKED	
APPROVED	



CITY OF FLINT
**WPC FACILITY
 EAST PUMP STATION
 PUMP REPLACEMENT**
 SHEET NO. PS-7 OF 11
 DRAWER 234

EXISTING PUMP STATION SECTIONS - FOR REFERENCE ONLY

RETENTION-TREATMENT TANK AND PUMP STATION JOB NO: 77053		DATE: 7-30-77		CITY OF FLINT, MICHIGAN		HUBBELL, ROTH & CLARK, INC. CONSULTING ENGINEERS		SHEET NO. PS-7 OF 11	
SECTIONS		DR. C.P.		WASTEWATER SYSTEM IMPROVEMENTS		P.O. BOX 824 2323 FRANKLIN ROAD BLOOMFIELD HILLS, MICHIGAN 48013		DRAWER 234	
DATE		APP. DB		CONTRACT NO. 1					
ADDITIONS AND/OR REVISIONS		SCALE AS NOTED							
DATE		ADDITIONS AND/OR REVISIONS							

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HRC JOB NO. 20151005	SCALE AS NOTED
DATE MAY 2019	SHEET NO. REF-7 OF