

SPECIFICATIONS FOR
CITY OF ALPENA
WATER PRODUCTION PLANT
CLEARWELL REPLACEMENT
& INFRASTRUCTURE IMPROVEMENTS

ALPENA, MICHIGAN

ISSUED FOR BIDS

DATE: FEBRUARY 19, 2024

HRC JOB NO. 20220751



555 Hulet Drive
Bloomfield Hills MI. 48302



Douglas Urquhart

TABLE OF CONTENTS

<u>NUMBER</u>	<u>SECTION NAME</u>	<u>PAGE NUMBER</u>
BIDDING REQUIREMENTS - CONTRACT PROVISIONS		
00001	Title Page.....	1 only
00010	Table of Contents.....	1 and 3
00030	Advertisement for Bids.....	1 and 2
00120	Instructions to Bidders.....	1 thru 4
00300	Proposal and Legal Status of Bidder	1 thru 9
00460	Certification Regarding Debarment Suspension and Other Responsibility Matters	1 only
00500	Contract	1 and 2
00610	Performance Bond	1 and 2
00620	Labor and Material Bond.....	1 and 2
00630	Maintenance and Guarantee Bond.....	1 and 2
00700	General Conditions	1 thru 16
00702	Enrolled House Bill No. 5541 (Payment and Retainage)	1 thru 4
00704	Enrolled House Bill No. 1024 (Iran Economic Sanctions).....	1 thru 4
00800	General Supplementary Conditions.....	1 thru 16
DIVISION 1 - GENERAL REQUIREMENTS		
01000	General Specifications	1 thru 7
01005	Administrative Provisions	1 thru 4
01010	Summary of Work	1 thru 2
01039	Coordination and Meetings.....	1 thru 4
01300	Submittals	1 thru 6
01310	Progress Schedules	1 and 2
01400	Quality Control.....	1 thru 3
01500	Construction Facilities	1 thru 3
01590	Field Offices and Sheds.....	1 thru 3
01600	Material and Equipment	1 thru 6
01700	Contract Closeout	1 thru 5
01900	Soil Conditions and Boring Logs	1 only
01950	Special Project Requirements	1 thru 8
DIVISION 2 SITE WORK		
02140	Dewatering.....	1 thru 3
02200	Earthwork	1 thru 10
02201	Monitoring Vibrations	1 thru 3
02669	Buried Process Piping and Fittings.....	1 thru 10
02831	Chain Link Fences and Gates	1 thru 6

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<u>NUMBER</u>	<u>SECTION NAME</u>	<u>PAGE NUMBER</u>
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DIVISION 3 - CONCRETE

03050	Crystalline Waterproofing – Mix Additive	1 thru 6
03100	Concrete Forms and Accessories	1 thru 9
03200	Concrete Reinforcement	1 thru 5
03300	Cast-In-Place Concrete	1 thru 12
03390	Concrete Curing	1 thru 3
03400	Precast Concrete	1 thru 8

DIVISION 4 – MASONRY (Not Used)

DIVISION 5 – METALS (See Drawings)

DIVISION 6 - WOOD AND PLASTICS (Not Used)

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07110	Sheet Membrane Waterproofing	1 thru 5
-------	------------------------------------	----------

DIVISION 8 - DOORS AND WINDOWS (See Drawings)

DIVISION 9 – FINISHES

09900	Painting	1 thru 8
-------	----------------	----------

DIVISION 10 – SPECIALTIES (Not Used)

DIVISION 11 – EQUIPMENT

11282	Gates	1 thru 5
11390	Perimeter Drain Pump Station Equipment.....	1 thru 9

DIVISION 12 – FURNISHINGS(Not Used)

DIVISION 13 - SPECIAL CONSTRUCTION(Not Used)

DIVISION 14 - CONVEYING SYSTEMS (Not Used)

DIVISION 15 - MECHANICAL

15000	Equipment, General	1 thru 7
15010	Electrical Requirements for Mechanical Work.....	1 thru 5
15060	Pipe and Fittings	1 thru 14
15100	Valves and Actuators	1 thru 6

(Refer to the Process Drawings for additional specification items related to Mechanical trades)

<u>NUMBER</u>	<u>SECTION NAME</u>	<u>PAGE NUMBER</u>
	DIVISION 16 - ELECTRICAL	
16000	Electrical.....	1 thru 6

Appendix:

1. Soil Borings and Geotechnical Report
2. Tempest Enterprises LLC, Scope of Services
3. Soils & Structures, Scope of Services

END OF SECTION

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ADVERTISEMENT FOR BIDS
CITY OF ALPENA
WATER PRODUCTION PLANT
CLEARWELL REPLACEMENT
& INFRASTRUCTURE IMPROVEMENTS

Sealed proposals for the construction of the Water Production Plant (WPP) Clearwell Replacement & Infrastructure Improvements project will be received by the City of Alpena, City Clerk's Office until 2:00 p.m., Local Time on **March 18, 2024** at which time and place all bids will be publicly opened and read and then referred to City Council for action at a regular Council meeting.

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 Documents.

General Description of the Work:

Project Site Location: The Water Production Plant is located at 1300 S. State Ave., Alpena, MI. 49707.

Project consists of construction for poured in place concrete drinking water clearwell tank of approximately 1.0 MG capacity with precast concrete plank roof; concrete retaining walls, steel walkway platform and guardrails; associated excavation and sitework; gravel perimeter road, concrete access drive to lower level of Plant; underground piping; packaged groundwater pump station; chain link fence and gates; landscape restoration. Demolition of both existing concrete clearwells is included in the Work.

Copies of Plans , Specifications and the Proposal Form shall be available on **February 19, 2024**, via the City of Alpena's website at www.alpena.mi.us. Select the heading "Business" at the top of the web page, then scroll down to "Bids and Proposals."

Bidders shall obtain the official project documents through the City's website only. Project documents that may be posted on other sites are for reference and shall not be considered official bidding documents. Refer to the City's Engineering Department contact information under "Bids and Proposals" for additional information.

A Mandatory Pre-Bid Meeting will be held on February 23, 2024, at 1:00 pm, Local Time, at the WPP site. Attendance is required to receive any addenda and be on the plan holders list. Sign-in sheets will be provided at the meeting.

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.

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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 Alpena 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 Owner. No bid may be withdrawn after scheduled closing time for receiving bids for at least **sixty (60) days**.

The successful Bidder will be required to furnish satisfactory Performance, Labor and Material, and Maintenance and Guarantee Bonds.

The Owner reserves the right to reject all bids and to waive irregularities in bidding.

No Proposal will be received unless made on blanks furnished and delivered to the City of Alpena, City Clerk's Office located at 208 N. First Avenue, Alpena, Michigan, on or before date and time specified in this Advertisement. Please mark your envelope SEALED BID – WPP Clearwell Replacement & Infrastructure Improvements.

CLERK - CITY OF ALPENA

Published with:

- City of Alpena Website
- Builder's Exchange of Michigan
- Construction Association of Michigan (CAM)

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SECTION 00120

INSTRUCTIONS TO BIDDERS

SCOPE OF WORK

The work under this Contract shall consist of the furnishing of all labor, material, equipment, services, and all incidental items necessary to complete the project in accordance with the Contract Documents.

OBSERVATION OF SITE

Before submitting a Proposal, each Bidder shall personally inspect the site of the proposed work to arrive at a clear understanding of the conditions under which the work is to be done.

He shall be held to have compared the premises with the Drawings and Specifications and to have satisfied himself as to the conditions of the premises, existing constructions, and any other conditions affecting the carrying out of the work, before delivery of his Proposal.

No allowance or extra consideration on behalf of the Bidder will subsequently be allowed by reason of error or oversight on the part of the Bidder or on account of interferences by the Owner's or by other Bidder's activities.

ADVERTISEMENT

The published Advertisement for the proposed work contains information necessary to Bidders. A copy of the Advertisement shall be considered a part of the Instructions to Bidders as fully as if repeated herein.

PROPOSALS

Proposals will be received in accordance with the Advertisement for Bids, and shall be submitted only on forms provided by the Engineer.

Proposals shall be enclosed in sealed envelopes marked with the name of the project and Bidder and shall be delivered to the designated location on or before the bid time as specified in the Advertisement for Bids.

Proposals shall be made in full conformity with all the conditions set forth in the Drawings and in these specifications. Bids are firm and cannot be withdrawn for a period of **60 days after** opening of the bids, unless otherwise specified in the Advertisement for Bids.

NAME AND STATUS OF BIDDER

The name and legal status of the Bidder, either as a corporation, partnership, or individual, shall be stated in the Proposal.

Anyone signing a Proposal as an agent of another or others, must submit with the Proposal, legal evidence of his authority to do so.

The place of residence of each Bidder, or the office address and telephone number in the case of a firm or company, with County and State, must be given after his signature.

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BIDDER'S QUALIFICATIONS

It is the intention of the Owner to award this Contract to a Bidder fully capable, both financially and with regard to experience to perform and complete the work in a satisfactory manner. If required by the Owner, each Bidder under consideration may be required to furnish the Owner, within 48 hours at the Owner's request, the following information sworn to under oath by him:

1. Performance record.
2. The address and description of the Bidder's operations and place of business.
3. Itemized list of equipment available for use on the project.
4. A certified or authenticated financial statement dated within sixty days prior to the opening of bids. The Owner may require that any items of such statements be further verified.
5. A list of contracts on which the Bidder is currently engaged.
6. Such additional information as will satisfy the Owner that the Bidder is adequately prepared, in technical experience and otherwise, to fulfill the Contract.

BID DEPOSIT

Each Proposal must be accompanied by a bid deposit in the form described in the Advertisement for Bids, Specification Section 00030, as a guarantee on the part of the Bidder that he will, if called upon to do so, enter into contract in the attached form, to do the work covered by such proposal and at the price stated therein and to furnish acceptable surety for its faithful and entire fulfillment. Such certified check or bidder's bond shall be made out to the Owner and shall be subject to the conditions specified in the Proposal.

The bid deposits of all except the three lowest Bidders will be returned within three days after the opening of bids. The bid deposits of the three lowest Bidders will be returned within 48 hours after the Contract is awarded to the successful Bidder and the signed agreement has been delivered and the required bonds have been finally approved by the Owner, or after rejection of all bids.

Surety companies providing and executing Bid Bonds shall appear on the United States Treasury Department's most current list (Circular 570) as holding certificates of authority as acceptable sureties on federal bonds. The penal sum of such bonds shall not exceed a company's underwriting limitation as stated therein. A surety company shall be licensed in the State in which it provides a bond and in the State where the Contract work is to be performed.

Failure to provide a bid bond from a qualified company shall be a basis for rejection of a bid as non-responsive and non-responsible.

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EXPLANATION TO BIDDERS BY ADDENDUMS

Neither the Owner nor the Engineer will give verbal answers to inquiries, regarding the meaning of the Drawings or Specifications, or give verbal instructions, previous to the award of the Contract. Any verbal statements regarding same by any persons, previous to the award, shall be unauthoritative.

Explanations desired by Bidders shall be requested of the Engineer in writing and, if explanations are necessary, a reply will be made in the form of an addendum, a copy of which will be forwarded to each Bidder whose work is affected.

Addendums issued to Bidders prior to date of receipt of proposals shall become a part of the Specifications, and all proposals shall include the work described in the addendums.

The deadline for questions and inquiries is 5:00 PM, local time, March 8, 2024. No responses will be issued after this date. This allows time for Addenda, as may be necessary, to be prepared and posted to the City's website. All Bidder inquiries shall be issued, in writing via email, and directed to Hubbell, Roth & Clark, Inc., Jane Graham - Project Manager, email address: jgraham@hrcengr.com. Also copy the City of Alpena Engineering Department on the inquiry via email at engineer@alpena.mi.us.

Addenda materials will be posted to the City's website. Failure of the Bidder to receive any such interpretations shall not relieve the Bidder from obligation under his bid as submitted. Addenda shall be acknowledged on the Proposal form.

RIGHT TO ACCEPT, TO REJECT, AND TO WAIVE DEFECTS

The Owner reserves the right to accept any Proposal, to reject any or all Proposals, and to waive any defects or irregularity in the Proposal if it appears advantageous to the Owner to do so and/or in accordance with the Owner's "Award Process" and other bidding documents.

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.

TIME OF COMPLETION

The Bidder shall use sufficient labor and equipment to complete and place in service all of the work being constructed within this Contract within the time specified in the Proposal.

If the Bidder shall be unavoidably delayed in beginning or fulfilling this Contract by reason of excessive storms or floods, or by Acts of Providence, or by strikes, or by court injunction, or by stopping of the Work by the Owner because of any emergency or public necessity, or by reason of alterations ordered by the Owner, the Bidder shall have no valid claim for damages on account of any cause or delay; but he shall in such case be entitled to such an extension of the above time limit herein, as the Engineer shall adjudge to be just and reasonable; provided, however, that formal claim for such extension shall be made in writing by the Bidder within a week after the date upon which such alleged cause or delay shall have occurred.

FAIR EMPLOYMENT PRACTICES

Section 4 of the Fair Employment Practices Act PA 1955, No. 251, provides:

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Section 4. Every Contract to which the State or any of its political or civil subdivisions is a party shall contain a provision requiring the Bidder and his subcontractors not to discriminate against any employee or applicant for employment, to be employed in the performance of said contract, with respect to his hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of his race, color, religion, national origin or ancestry. Breach of this covenant may be regarded as a material breach of the Contract.

Section 4A of the Act provides:

Section 4A. Every contract which the State or any of its political or civil subdivisions is a party shall contain a provision requiring the Bidder and his subcontractors not to discriminate against any employee or applicant for employment to be employed in the performance of such contract with respect to his hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of his age or sex, except where based on a bona fide occupational qualification.

END OF SECTION

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PROPOSAL
FOR
CITY OF ALPENA - WATER PRODUCTION PLANT
CLEARWELL REPLACEMENT
& INFRASTRUCTURE IMPROVEMENTS

City of Alpena
Clerk's Office
208 N. First Ave.
Alpena, MI. 49707

Bids Due: March 18, 2024
On or Before: 2:00 pm, Local Time
HRC Job No. 20220751

To Prospective Bidders:

Name of Bidder: _____

Address: _____

Date: _____ Telephone: _____ Fax: _____

The above, as Bidder, hereby declares this bid is made in good faith without fraud or collusion with any persons bidding, and that the Drawings, Specifications, and all other information referenced in the Instructions to Bidders have been examined. Further, the Bidder is familiar with the location of the work described herein and is fully informed as to the nature of the work and the conditions relating to the performance of the Contract.

The Bidder acknowledges that no representations or warranties of any nature whatsoever have been received, or are relied upon from the City of Alpena, its agents or employees, as to any conditions to be encountered in accomplishing the work and that the bid is based solely upon the Bidder's own independent judgment.

The above, as Bidder, hereby certifies that the Drawings, Specifications, geotechnical data and other information provided by the Owner for bidding purposes have been examined. Further, the undersigned certifies that the proposed construction methods have been reviewed and found acceptable for the conditions which can be anticipated from the information provided for bidding.

The Bidder shall complete the Work under any job or field conditions which were present and/or ascertainable prior to bidding. The Bidder shall also complete the Work under whatever conditions they create by their own sequence of construction, construction methods, or other conditions they may create, at no additional cost to the Owner.

The Bidder hereby affirms that the site of work has been inspected and further declares that no charges in addition to the Lump Sum Price shall be made on account of any job circumstances or field conditions which were present and/or ascertainable prior to the bidding.

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The above, as Bidder, confirms knowledge of the location of the proposed Project and appurtenant construction and the conditions under which it must be constructed; and also declares to have carefully examined the Drawings, Specifications, and Contract Documents which the Bidder understands and accepts as sufficient for the purpose of constructing said Project, and appurtenant work, and agrees to contract with the Owner to furnish all labor, materials, tools, equipment, facilities and supervision necessary to do all the work specified in strict accordance with the full intent of the Drawings and Specifications, prepared by Hubbell, Roth & Clark, Consulting Engineers, and will accept in full payment therefore the Lump Sum of:

LUMP SUM (BASE BID – including the Allowances and Unit Costs listed herein)

_____ Dollars
(use words)

and _____ cents
(use words)

\$ _____
(figures)

ALLOWANCES

Bidders shall INCLUDE the following Allowances IN THE ABOVE LUMP SUM PRICE.

- 1. Building Permit Fees: \$ 65,000.00
- 2. Soil Erosion and Sedimentation Control (SESC) Permit Fee \$ 2,000.00
- 3. SCADA, Equipment Integration (Tempest Enterprises) \$ 60,000.00
- 4. Vibration Monitoring Consultant (Soils & Structures) \$120,000.00
- 5. Hazardous Material Testing and Abatement \$ 15,000.00

The Owner will reimburse the Contractor for City Building Department, Michigan Building Code permit fees, as well as SESC permit fees. Reimbursement will be for the exact amount of the fees, based upon the actual invoice with no Contractor mark-up. Refer to Section 01000 for permit information.

If additional inspections from the Building Department are necessary due to non-conforming work and additional fees are charged by the Building Department for those inspections, Contractor shall pay for the additional fees without reimbursement from the Owner.

Contractor shall maintain SESC measures in satisfactory condition for the duration of the Work. Allowance for SESC permit fee only.

SCADA, Equipment Integration shall be provided by Tempest Enterprises, as described in their proposal included in the Appendix. For the Tempest Allowance item, use amount listed above. Tempest Enterprises provides these types of services currently to the City of Alpena for their systems and equipment, including work at the Water Production Plant.

Vibration monitoring as specified in Section 02210 shall be provided by Soils & Structures, as described in their proposal scope included in the Appendix. The Contractor shall retain these services and be fully responsible for coordination of and compliance with the monitoring of vibrations, during the construction operations.

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UNIT COSTS

The following unit costs shall be provided by the Bidder and INCLUDED IN THE ABOVE LUMP SUM PRICE. The unit quantities for the work items shown below are estimated and will be field measured to determine actual quantity for payment.

Unit Price Bids:

A. Bidder will perform the following Work at the indicated unit prices:

Item No.	Description	Unit	Quantity	Bid Unit Price	Bid Amount
1	Rock removal and off-site disposal (see Section 02200 for requirements and measurement)	CY	900		\$
2	Pressure Injection for Crack Repairs in Filter Building Walls/Floors (misc crack repairs not related to item 3.)	LF	100		\$
3	Static crack repair per Sheet S-1 to keep exist. Clearwell #1 in service.)	LF	300		\$
4	Existing 16" FW Connection from Filter Pipe Gallery to Clearwell Cell 1: Unit price includes sawcutting of existing wall, demolition of existing 16" FW piping to existing flange, installation of new 16" FW wall pipe as shown on the Drawings, and all other required work to facilitate the connection of the new 16" FW WW between the former Clearwell Cell 2 to inside the Filter Pipe Gallery, complete.	LS	1		
5	Existing 16" FW Connection from Filter Pipe Gallery to Clearwell Cell 2: Unit price includes sawcutting of existing wall, demolition of existing 16" FW piping to existing flexible coupling, installation of new 16" FW wall pipe as shown on the Drawings, and all other required work to facilitate the connection of the new 16" FW WW between the former Clearwell Cell 2 to inside the Filter Pipe Gallery, complete.	LS	1		
6	Existing 16" WW Connection from Filter Pipe Gallery to Clearwell Cell 2: Unit price includes sawcutting of existing wall, demolition of existing 16" WW piping to existing flange, installation of new 16" WW wall pipe as shown on the Drawings, and all other required work to facilitate the connection of the new 16" WW between the former Clearwell Cell 2 to inside the Filter Pipe Gallery, complete.	LS	1		
TOTAL OF ALL UNIT PRICE BID ITEMS					\$

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B. Bidder acknowledges that:

1. Each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor’s overhead and profit for each separately identified item, and
2. Estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids. Final payment for all Unit Price Work will be based on actual quantities as measured in the field by the Engineer and reviewed mutually by the Engineer, Owner and Contractor.

PROPOSED SUBCONTRACTORS

Bidder proposes to utilize the services of the below listed major subcontractors for this work. This item must be filled in at the time of Proposal Submission.

NOTE: CHANGING OF SUBCONTRACTORS AFTER RECEIPT OF BIDS WILL NOT BE PERMITTED WITHOUT OWNER APPROVAL.

Concrete Subcontractor _____

Excavation Subcontractor _____

Mechanical Subcontractor _____

Electrical Subcontractor _____

SCADA/Integration Subcontractor - Tempest Enterprises, LLC

Vibration Monitoring Consultant - Soils and Structures

PLAN REVIEW SUBMITTAL AND BUILDING PERMIT APPLICATION, COSTS

On behalf of the Owner, HRC will submit the project for Plan Review to the City Building Department. This is NOT the Building Permit submittal. Once the project is awarded, the Contractor must go to the City and fill out the Building Permit Application, with their information and pay applicable building permit and inspections fees. Trades permits shall also be pulled for mechanical, electrical and plumbing work, as required by the City. (The fees for the Trades permits fall under the “Allowance” listed for Building Permit.)

The Contractor shall include the project demolition work under the Building Permit Application under “Type of Improvement” on the application form.

Building permit fees will be paid as specified under the Allowances work.

ALTERNATES

Voluntary Alternates proposed by the Bidder will not be considered. The Bidder shall submit a bid based on the information shown on the Drawings and Specifications.

The Owner, at its sole discretion, reserves the right to award to the Bidder who, in the sole determination of the Owner, will best serve the interest of the Owner. The Owner reserves the right to accept any bid, to reject any or all bids, to waive any and all informalities involving price, time, or changes in the work, and to

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negotiate contract terms with the successful Bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced or conditional bids. However, it is the intention of the Owner to award to the low total bid to one Bidder. Also, the Owner reserves the right to reject the bid of any Bidder if the Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the bid is not responsive or the Bidder is unqualified, of doubtful financial ability, or fails to meet any other pertinent standard or criteria established by the Owner.

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 Proposal must be accompanied by a bid deposit. See Instructions to Bidders – Bid Deposit for more information.

TAXES

The Bidder affirms that all applicable Federal, State and Local taxes of whatever character and description are included in all prices stated in this Form of Proposal.

ADDENDA

The Bidder acknowledges the following Addenda, covering revisions to the drawings or specifications and the cost, if any, of such revision has been included in the quoted proposal:

Addendum No. _____	Dated _____
Addendum No. _____	Dated _____
Addendum No. _____	Dated _____

FEES

The Bidder shall refer to the General Conditions for allowable Fees for additional work performed, upon Owner’s written authorization, by Bidder’s own forces and/or for additional work, upon Owner’s written authorization, by Bidder’s subcontractors.

TIME OF COMPLETION AND SUBSTANTIAL COMPLETION

Substantial Completion is defined that the new clearwell tank and piping are operational and ready to use for their intended purpose to put into service:

- If awarded the Contract for the Project, we agree to have all work substantially completed by **August 1, 2025.**

Final Completion with all demolition completed, site restoration and clean-up; and final punch-list items addressed; and closeout documents submitted, including Final Pay Request and Consent of Surety to Final Payment:

- Shall be no later than **December 31, 2025.**

The Bidder hereby agrees to furnish the required Bonds, Insurance Certificates, and Policies within ten (10) days after acceptance of this Proposal.

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See Section 01010 Summary of Work for key schedule dates. Any exceptions to this schedule shall be noted by the Bidder in his Proposal.

LIQUIDATED DAMAGES

Time is of the essence for completion of this project in order to have the Project ready for the OWNER. The Bidder guarantees that the work will be completed within the time limit stated herein before or within the time as extended as provided elsewhere in the Specifications. Inasmuch as the damage and loss to the Owner which will result from the failure of the Bidder to complete the work within the stipulated time, will be most difficult or impossible to accurately determine, it is mutually agreed that the damages to the Owner for such delay and failure on the part of the Bidder shall be liquidated in the amount of One Thousand Eight Hundred Dollars (\$1,800.00), for each and every calendar day by which the Bidder shall fail to complete the work or any part thereof within the provisions hereof, and such liquidated damages shall not be considered as a penalty.

The Owner will deduct and retain out of any money due or to become due hereunder the amount of the liquidated damages, and in case those amounts are less than the amount of actual liquidated damages, the Bidder shall pay the difference upon demand of the Owner.

We understand that liquidated damages may be assessed should we fail to meet the stipulated completion dates. Specifically, liquidated damages will be assessed daily **beginning August 2, 2025** until such a time that Substantial Completion is achieved and further if all work is not completed by the Final Completion Date specified.

BIDDER REFERENCES FOR SIMILAR PROJECTS

Bidder shall provide the following information for a minimum of three (3) similar water or waste treatment plant type projects with large, buried, cast-in-place concrete tank structures within the last five (5) years, where Bidder functioned as a General Contractor. (Provide additional sheets if necessary to present project information.)

	<u>Project Name</u>	<u>Owner</u>	<u>Date Completed</u>	<u>Const. \$\$ Value</u>
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BIDS TO REMAIN FIRM

The price stated in this Proposal shall be guaranteed for a period of not less than **60 days** from the bid due date and if authorized to proceed within that period, the Bidder agrees to complete the work covered by the Proposal at said price.

If this Proposal is accepted by the Owner and the undersigned shall fail to contract as aforesaid and to furnish the required surety bonds within fifteen (15) days after being notified of the acceptance of their bid, then the undersigned shall be considered to have abandoned the Contract, and the Certified Check, Cashier's Check or Bid Bond accompanying this Proposal shall be forfeited to the City of Alpena.

If the undersigned enters into the Contract in accordance with their proposal, or if their proposal is not accepted, then the accompanying bid guarantee shall be returned to the undersigned.

Company Name: _____

Signature: _____ Title: _____

Address: _____

County: _____ State: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

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LEGAL STATUS OF BIDDER

This Bid is submittal in the name of:

(Print) _____

The undersigned hereby designates below the business address to which all notices, directions or other communications may be served or mailed:

Street _____

City _____

State _____ Zip Code _____

The undersigned hereby declares the legal status checked below:

- INDIVIDUAL
- INDIVIDUAL DOING BUSINESS UNDER AN ASSUMED NAME
The Assumed Name of the Co-Partnership is registered in the County of _____, Michigan
- CORPORATION INCORPORATED UNDER THE LAWS OF THE STATE OF _____
_____. The Corporation is
- LICENSED TO DO BUSINESS IN MICHIGAN
- NOT NOW LICENSED TO DO BUSINESS IN MICHIGAN

The name, titles, and home addresses of all persons who are officers or partners in the organization are as follows:

A corporation duly organized and doing business under the laws of the State of _____

NAME AND TITLE	HOME ADDRESS
_____	_____
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Signed and Sealed this _____ day of _____, 20__.

By (Signature)

Printed Name of Signer

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BID BOND

We, the undersigned, _____

As Principal, hereinafter called the Principal, and _____

A corporation duly organized under the laws of the State of _____

As surety, hereinafter called the SURETY, are held and firmly bound unto:

The Owner: _____

in the sum of _____ Dollars (\$ _____),

For the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for _____

NOW, THEREFORE, if the OWNER shall accept the bid of the Principal and the Principal shall enter into a contract with the OWNER in accordance with the terms of such bid, and give such bond or bonds as may be specified in the CONTRACT DOCUMENTS with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the OWNER the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the OWNER may in good faith contract with another party to perform the work covered by said bid, then the obligation of the Principal shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, 20____

(Witness)

(Principal)

(Seal)

(Title)

(Witness)

(Surety)

(Title)

END OF SECTION

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SECTION 00460

CERTIFICATION REGARDING
DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

- a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal Department or Agency;
- b) Have not, within a three (3) year period preceding this Proposal, been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or Local) transaction or contract under a public transaction; violation of Federal or State Antitrust Statutes, or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or Local) with commission of any of the offenses enumerated in Paragraph (1)(b) of this Certification; and
- d) Have not within a three (3) year period preceding this Application/Proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default.
- e) I understand that a false statement on this Certification may be grounds for rejection of this Proposal or termination of the award. In addition, under 18 U.S.C. §1001, a false statement may result in a fine of up to \$10,000.00 or imprisonment for up to five (5) years, or both.

Name and Title of Authorized Representative

Signature of Authorized Representative

Dated

I am unable to certify to the above statements. Attached is my explanation.

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CONTRACT

ARTICLES OF AGREEMENT, Made and entered into this _____

day of _____, 2024, by and between

City of Alpena _____

Party of the first part, hereinafter called the Owner, and _____

in the City of Alpena _____, County of Alpena _____

and State of Michigan _____, Party of the second part, hereinafter called the Contractor, to wit:

Item 1) That all proposals, specifications, plans, bonds and other project documents hereto attached as Exhibit A or otherwise referenced herein, shall be and are made a part of this agreement and contract.

Item 2) That the Contractor, under penalty of bond attached, shall furnish all labor, materials, and equipment necessary, and do all the work as set forth in the below:

WPP Clearwell Replacement & Infrastructure Improvements - (plans and specifications dated 2/19/24), _____

including Addendums No. X, X, X (as indicated in the Proposal Form) _____

HRC Job No. 20220751 _____

according to the specifications, plans, and requirements and in a manner, time and place, as set forth in the documents attached as Exhibit A, the terms of which are incorporated herein, by reference.

IN CONSIDERATION WHEREOF, said Party of the First Part, for it and its successors, promises and agrees to pay to said Party of the Second Part, the sum of:

Dollars (\$ _____)

as provided in the documents attached as Exhibit A.

For the faithful performance of all and singular of the stipulations, terms and conditions of this Agreement, said parties respectfully bind themselves, their successors, heirs, executors, administrators and assigns.

IN WITNESS WHEREOF, Said Parties have signed this Contract, in duplicate, on the date first above written.

WITNESS:

City of Alpena
Party of the First Part

By: _____

WITNESS:

(A Michigan Corporation)
Party of the Second Part

By: _____

Approved as to form by Counsel for the City of Alpena

(Name) Dated: _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned _____

_____ as Principal,

and _____

of _____ as Sureties,

are hereby held and firmly bound unto the "Owner" _____

in the full and just sum of _____ Dollars

(\$ _____) for the payment of which well and truly to be made, we hereby jointly and severally

bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed and sealed this _____ day of _____ 20__.

The condition of the above obligation is such that if said _____

shall well and faithfully do and perform the things agreed by It
to be done and performed by the annexed contract, according to the terms thereof, then this obligation shall be
void; otherwise, the same shall remain in full force and effect.

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It is mutually understood and agreed that in cases where changes are required, either by order of the Engineer, or Owner, or by mutual agreement, such changes or changes shall not modify, discharge or release this bond.

(A Michigan Corporation)

(Seal)

Signed, Sealed
in the Presence of:

(Seal)

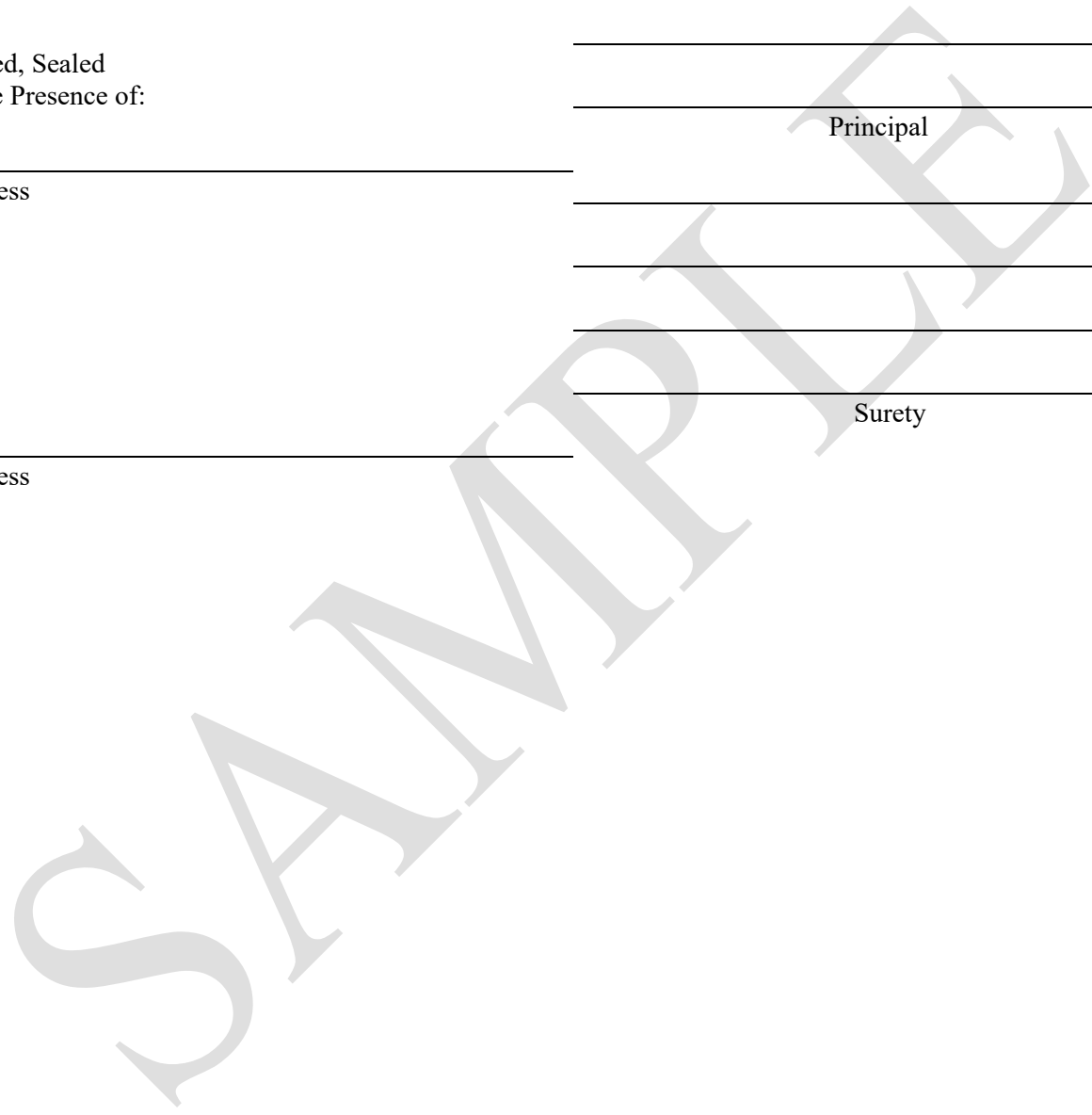
Principal

Witness

(Seal)

Surety

Witness



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LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____

of _____ hereinafter called the Principal,

and _____

hereinafter called the Surety, are held and firmly bound unto _____

in the sum of _____

_____ Dollars (\$ _____)

to the payment whereof, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, A.D., 20__.

WHEREAS, The above named Principal has entered into a contract with _____

dated the _____ day of _____, A.D., 20 __, wherein said Principal has covenanted and agreed as follows, to-wit:

To furnish all the labor and material _____

HRC Job No. 20220751

AND WHEREAS, This bond is given in compliance with and subject to the provisions of Act No. 213 of the Public Acts of Michigan, for the year 1963, and as may be amended by other Public Acts of Michigan.

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NOW, THEREFORE, The condition of this obligation is such that if payment shall be made by the Principal to any Subcontractor or by him or any Subcontractor as the same may become due and payable of all indebtedness which may arise from him to a Subcontractor or party performing labor or furnishing materials or supplies or any Subcontractor to any person, firm or corporation on account of any labor performed or materials or supplies furnished in the performance of said contract, then this obligation shall be void; otherwise, the same shall be in full force and effect.

AND PROVIDED, That any alterations which may be made in the terms of said contract, or in the work to be done under it, or the giving by the party of the first part to said contract, of any extension of time for the performance of said contract, or any other forbearance on the part of either party to the other, shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns from any liability hereunder, notice to the Surety of any alteration, extension, or forbearance being hereby waived.

(A Michigan Corporation)

By: _____

Signed, Sealed
in the Presence of:

Principal

Witness

Surety

Witness

MAINTENANCE AND GUARANTEE BOND

KNOW ALL MEN BY THESE PRESENTS, That we

as Principal, and _____

are held and firmly bound unto _____

in the sum of _____ Dollars (\$ _____)

good and lawful money of the United States of America, to be paid to the _____
its legal representatives and assigns, and we bind ourselves, our heirs, executors, administrators, successors
and assigns, and each and every one of them jointly and severally, firmly by these presents.

SEALED WITH OUR SEALS AND DATED THIS _____ DAY OF _____ A.D., 20____.

WHEREAS, the above named principal has entered into a certain written contract with the _____

dated this ___ day of _____ A.D., 20____, where in the said principal covenanted and agreed as follows, to wit:

for the: _____

HRC Job No. 20220751

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that by and under such
contract, the above named principal has agreed with the _____ that for a period of One
(1) year from the date of approval of the Final Estimate, to keep in good order and repair any defect in all
the work done under said contract, either by the principal, his subcontractors, or his material suppliers, that
may develop during said period due to improper materials, defective equipment, workmanship or
arrangements, and any other work affected in making good such imperfections, all to be made good without
expense to the Owner, (excepting only such part or parts of said work as may have been disturbed without the
consent or approval of the principal after the final acceptance of the work), and whenever directed so to do by
the Owner, by notice served in writing, either personally or by mail, on the principal at _____

or _____, its legal representatives, or successors, or on
the surety at _____

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to proceed at once to make such repairs as directed by the Owner and in case of failure to do so within one (1) week from the date of service of such notice, or within reasonable time not less than one (1) week, as shall be fixed in said notice, then the Owner shall have the right to purchase such materials and employ such labor and equipment as may be necessary for the purpose, and to undertake, do and make such repairs, and charge the expense thereof to, and be fully reimbursed for same from said principal or surety. If any repair is necessary to be made at once to protect life and property, the Owner may take immediate steps to repair or barricade such defects without notice to the contractor. In such case the Owner shall not be held to obtain the lowest figures for the doing of the work, or any part thereof, but all sums actually paid therefor shall be charged to the principal or surety. In this connection the judgment of the Owner is final and conclusive.

If the principal for a period of one (1) year from the date of approval of a Final Estimate, shall keep the work so constructed under the contract in good order and repair, excepting only such parts of said work which have been disturbed without the consent or approval of the principal after the final acceptance of same, and whenever notice is given as hereinbefore specified, at once proceed to make the repair as the notice directs, or reimburse the Owner for any expenses incurred by it in making such repairs should the principal or surety fail to do so, then the above obligation shall be void; otherwise, it will remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their respective authorized officers this _____ day of _____, 20_____.

Signed, Sealed
in the Presence of: _____
"Principal"

Witness _____ (L.S.)

Witness "Surety" _____ (L.S.)

_____ (L.S.)

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GENERAL CONDITIONS
TABLE OF CONTENTS

1. Contract Documents	2	21. Cleaning Up	9
2. Contract Drawings and Specifications	2	22. Use of Complete Portions of the Work	9
3. Engineer's Status	2	23. Payment Withheld	10
4. Construction Observer Status	3	24. Contractor's Right to Stop Work	10
5. Contractor's Responsibility	3	25. Fair Employment Practices Act	10
6. Permits and Regulations	3	26. Authority	11
7. Subcontracts	4	27. Starting Work	11
8. Information by the Contractor	4	28. Sanitary Regulations	11
9. General Requirements for Materials and Workmanship	4	29. Weekend and Night Work	11
10. Testing and Sampling	5	30. Progress of Work	11
11. Storage of Materials	5	31. Time of Completion	11
12. Relation to Other Contractors	5	32. Extension of Time	11
13. Contractor's Supervision and Origination	5	33. Time is Essence of Contract	12
14. Facilities for Inspection	6	34. Estimated Quantities	12
15. Shop Drawings	6	35. Forfeiture of Contract	12
16. Errors and Corrections in Drawings and Specifications	7	36. No Waiver of Contract	12
17. Changes in the Work	7	37. Payment Not to Be Stopped	12
18. Basis for Determining Cost of Changes in the Work	7	38. Guarantee	13
19. Patents	9	39. Estimates and Payments	13
20. "Or Equal" Clause	9	Contractor's Declaration	15
		Contractor's Affidavit	16

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GENERAL CONDITIONS

1. CONTRACT DOCUMENTS

The original and three copies of the Contract shall be signed by the Owner and the Contractor, unless otherwise required.

The work under this Contract shall consist of the items listed in the proposal, including all incidentals necessary to fully complete the project in accordance with the contract Documents. The Contract documents shall consist of the Advertisement, Instructions to Bidders, Proposal, Specifications, General Conditions, General Supplementary Conditions, Contract, Bonds and Contract Drawings.

2. CONTRACT DRAWINGS AND SPECIFICATIONS

The work to be done is shown on the accompanying set of original drawings prepared by Hubbell, Roth & Clark, Inc., Consulting Engineers, and are hereby made a part of this Contract, it being mutually understood and agreed that when taken together, the drawings and contract documents, including the specifications and the general conditions, are complementary, and what is called for by any one shall be binding as if called for by all. 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.

These original drawings may be supplemented by other drawings furnished by the Contractor and reviewed by the Engineer or supplied to the Contractor by the Engineer during the progress of the work as he may deem to be necessary or expedient. All such supplementary contract 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 contract 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.

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 a copy of all current drawings and specifications and shall at all times give the Engineer or Owner access thereto.

In case any inconsistency, omission or conflict shall be discovered in either specifications or drawings, or if in any place, the meaning of either or both shall be obscure, or uncertain, or in dispute, the Engineer shall decide as to the true intent and his decision shall be final and binding.

3. ENGINEER'S STATUS

The Engineer shall furnish consultation and advice to the Owner during construction. He may advise the Owner to stop the work whenever such stoppage may be necessary to insure that the finished work will be in accordance with the plans and specifications. He may advise the Owner to reject all work and material which do not conform to the drawings and specifications. The Engineer may stop work only under the written direction of the Owner.

4. CONSTRUCTION OBSERVER STATUS

The Owner may appoint on the job construction observer(s) who shall be under the direction of the Engineer. The construction observer on the work will inform the Engineer as to the progress of the Work, the manner in which it is being done, and the quality of the materials being used. The construction observer will call to the attention of the Contractor any failure to follow the drawings and specifications that he may observe. The construction observer shall advise the Engineer to reject materials suspend the work until any questions on the performance of the work can be referred to and decided by the Owner. The construction observer shall have no authority to determine the means and methods used to complete the work, direct the Contractor's work or workmen, to supervise the Contractor's operations, to stop work on the project or to change the Contract Drawings or Specifications.

In no instance shall any action or omission on the part of the construction observer release the Contractor of the responsibility of completing the work in accordance with the drawings, specifications and/or, municipal ordinances or established prior practices of the Owner, in the municipality in which the project resides.

5. CONTRACTOR'S RESPONSIBILITY

The Contractor shall assume full responsibility for the work, specifically including jobsite safety, and take all precautions for preventing injuries to persons and property on or about the Work; shall bear all losses resulting to him on account of the amount or character of the Work or because the conditions under which the work is done are different and he shall assume the defense and save harmless the Owner, the Engineer and their individual officers and agents from all claims relating to labor provided and materials furnished for the Work; to inventions, patents, and patent rights used in doing the Work; to injuries to any persons or property received or sustained by or from the Contractor, his agents or employees in doing the work or arising out of the work performed or to be performed; and to any act, or neglect of the Contractor, his agents or employees.

The mention of any specific duty or liability of the Contractor in this or in any part of the Contract documents shall not be construed as a limitation or restriction upon any general liability or duty imposed on the contractor by the Contract Documents.

6. PERMITS AND REGULATIONS

The Contractor shall secure and pay for all permits necessary for the prosecution of the Work. The Contractor shall keep himself fully informed of all laws, ordinances, and regulations in any manner affecting those engaged or employed in the Work, or the materials used in the Work, or in any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same.

He shall at all times observe and comply with, and shall cause all his agents and employees to observe and comply with all existing laws, ordinances, regulations, orders, and decrees. Provided that if the drawings and specifications are at variance therewith, the Contractor shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided in the Contract Documents.

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7. SUBCONTRACTS

The Contractor shall not sublet, assign, or transfer this Contract or any portion thereof or any payments due him thereunder, without the written consent of the Owner.

Assignment or subletting the whole or any portion of this Contract shall not operate to release the Contractor or his bondsmen hereunder from any of the contract obligations.

As part of the Proposal, the Contractor shall provide the names of the major subcontractors as indicated in Section 03000; as soon as practicable after the signing of the Contract, the Contractor notify the Owner in writing of the names of all other subcontractors (not named in the Proposal) proposed for the work and shall not employ any that the Owner may object to as incompetent or unfit.

If the Contractor shall cause any part of the work under this Contract to be performed by a subcontractor, the provisions of this Contract shall apply to such subcontractor and his officers and employees in all respects as if he and they were employees of the Contractor, and the Contractor shall not be in any manner thereby relieved from his obligation and liabilities; and the work and materials furnished by the subcontractor shall be subject to the same provisions as if furnished by the Contractor.

8. INFORMATION BY THE CONTRACTOR

The Contractor shall submit to the Engineer full information as to the materials, equipment, and arrangements which the Contractor proposes to furnish. This information shall be complete to the extent that the Engineer may intelligently judge if the proposed materials, equipment, and arrangements will meet the contract requirements.

Prior to the review of materials, equipment, and arrangements by the Engineer based on the information submitted by the Contractor, any work done by the Contractor shall be at his own risk.

The review of information covering materials, equipment, and arrangements by the Engineer shall in no way release the Contractor from his responsibility for the proper design, installation, and performance of any material, equipment, or arrangement, or from his liability to replace same should it prove defective.

9. GENERAL REQUIREMENTS FOR MATERIALS & WORKMANSHIP

In the specifications where a particular material or piece of equipment is specified by reference to some particular make or type, or equal, it is not the intent to limit competition but to set up by such reference a standard of quality most easily understood and defined. If materials or equipment of other make or type than that specified by name are offered by the Contractor, they will be given full consideration by the Engineer and the Engineer's decision will be final as to whether the materials or equipment offered are equal to those specified.

Unless otherwise stipulated in the specifications, all equipment, materials, and articles incorporated in the Work covered by this Contract are to be new and of the best grade of their respective kinds for the purpose. The Contractor shall, if required, furnish such evidence as to kinds and quality of materials as the Engineer may require.

The Contractor shall furnish suitable tools and building appliances and employ competent labor to perform the work to be done, and any labor or tools or appliances that shall not, in the judgment of the Engineer, be suitable or competent to produce this result may be ordered from the work by the Owner, at the advice of the Engineer, and such labor or tools or appliances shall be substituted therefor by the Contractor as will meet the acceptance by the Engineer/Owner.

If not otherwise provided, material or work called for in this Contract shall be furnished and performed in accordance with well known established practice and standards recognized by architects, engineers and the trade.

10. TESTING AND SAMPLING

Where called for in the specifications, samples of materials in the quantity named shall be submitted to the Engineer for review. Where tests are required they shall be made at the expense of the Contractor, except as otherwise called for in the specifications. (See Section 01400 for Construction Material Testing and Section 01950 for Special Project Requirements.) For materials covered by ASTM or Federal Specifications, unless otherwise stipulated, the required tests are to be made by the manufacturer and his certificate therefor submitted to the Engineer.

11. STORAGE OF MATERIALS

Materials and equipment distributed, stored and placed upon or near the site of the work shall at all times be so disposed as not to interfere with work being prosecuted by other contractors in the employ of the Owner, or with street drainage, or with fire hydrants or with access thereto, and not to hinder, any more than may be necessary, the ordinary traffic of the street.

It shall be expressly understood that this facility is a drinking water plant. The Contractor shall not bring onto the site materials or products that could contaminate the ground water supply without Owner's expressed permission. Any such materials brought on-site shall be controlled and properly disposed of to prevent contamination of groundwater.

12. RELATION TO OTHER CONTRACTORS

The Contractor shall so conduct his operations as not to interfere with or injure the work of other contractors or workmen employed on adjoining or related work and he shall promptly make good any injury or damage which may be done to such work by him or his employees or his agent. Should a contract for adjoining work be awarded to another contractor, and should the work of one of these contracts interfere with that of the other, the Owner shall decide which contractor shall cease work for the time being and which shall continue or whether the work in both contracts shall continue at the same time and in what manner.

13. CONTRACTOR'S SUPERVISION AND ORIGINATION

The work under this Contract shall be under the direct charge and direction of the Contractor. The Contractor shall give efficient superintendence to the work, using his best skill and attention. The Contractor shall at all times keep on the site of the work, during its progress, a competent superintendent and any and all necessary foremen and assistants. The superintendent shall represent and have full authority to act for the Contractor in the latter's absence, and all directions given to him shall be as binding as if given to the Contractor. On written request in each case, all such directions will be confirmed in writing to the Contractor.

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The Contractor shall employ only competent, efficient workers and shall not use on the work any unfit person or one not skilled in the work assigned to him, and he shall at all times enforce strict discipline and good order among his employees. Whenever the Owner shall notify the Contractor, in writing, that any person on the work is, in the opinion of the Owner, careless, incompetent, disorderly, or otherwise unsatisfactory, such person shall be discharged from work and shall not again be employed on it except with the written consent of the Owner.

The Contractor shall establish and maintain an office area on the site of the work or adjacent thereto, during the continuance of this Contract and shall have at all times during working hours, a representative authorized to receive and execute any and all orders, when given by the Engineer; and such order, when given out and received by said representative shall be deemed to have been given to and received by the Contractor. Copies of the drawings and specifications shall at all times be kept on file by the Contractor at readily accessible points near the work.

14. FACILITIES FOR INSPECTION

The Owner, the Engineer, and their employees shall at all times have the right to enter upon the premises upon which work is being done, or upon which material is stored for the work under this Contract, and to inspect the work under this Contract, and to inspect the work and materials, and to ascertain whether or not the construction is carried out in accordance with this Contract, and the Contractor shall furnish all reasonable facilities, and give ample time for such inspection. All materials shall be subject to mill and shop inspection, as provided in the specifications.

The Contractor shall promptly remove from the premises all materials rejected by the Engineer as failing to meet contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contractor and without expense to the Owner and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

If the Contractor does not remove such rejected work and materials promptly, after written notice, the Owner may remove them and store the material at the expense of the Contractor.

The Engineer has the right to have removed by the Contractor such portion of the work as he may deem necessary for the discovery of improper work or material, and the Contractor must restore such work at his own expense if improperly done and at the expense of the party of the first part if found to be in proper condition. Any work which, during its progress and before its final acceptance, may become damaged from any cause, shall be removed and replaced by good, satisfactory work at the Contractor's expense.

15. SHOP DRAWINGS

Where called for in the specifications, the Contractor shall submit to the Engineer for review copies of details, specifications, cuts, and drawings of such equipment and structural work as may be required. The Contractor shall make any changes or alterations required by the Engineer and re-submit same without delay. The review of the Engineer shall not relieve the Contractor of responsibility for errors in the drawings, as the Engineer's checking is intended to cover compliance with the drawings and specifications and not to enter into every detail of the shop work. No work shall be undertaken until the Engineer has reviewed the shop drawings.

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16. ERRORS AND CORRECTIONS IN DRAWINGS AND SPECIFICATIONS

The Contractor shall examine and check all drawings and specifications furnished by the Owner for dimensions, quantities, and coordination with other parts of the work on this or related contracts and shall notify, in writing, the Engineer of any and all errors, omissions, or discrepancies he may discover by examining and checking of same. The Contractor shall not be allowed to take advantage of any such error, omission, or discrepancy, as full instructions will be furnished by the Engineer, and the Contractor shall carry out such instructions as if originally specified. In no case shall be Contractor proceed with the work in uncertainty, and any work done by the Contractor after the discovery of any error, omission, or discrepancy, until authorized, will be at the Contractor's risk and responsibility. The work is to be made complete and to the satisfaction of the Engineer, notwithstanding any minor omissions in the specifications or drawings.

17. CHANGES IN THE WORK

The Owner shall have the right to require, by written order, changes in, additions to, or deductions from the work required by the contractor documents; provided that if changes, additions, or deductions are made, the general character of the work as a whole is not changed thereby. Adjustments in the contract price, if any, because of any change, addition, or deduction in the work shall be determined as hereinafter provided, and any claim for extension of time for completion shall be adjusted at the time of ordering the change, addition, or deduction. No claim for change, addition, or deduction, or adjustment of price, or extension of time for completion thereof, shall be made or allowed unless done in pursuance of a written order from the Owner specifically authorizing such change, addition, or deduction. Drawings without a written order shall not be considered such authority. Written notice of such claims shall be made to the Engineer before the commencement of work. Where the written notice of such claims shall be made to the Engineer before the commencement of work. Where the written order diminished the quantity of work to be done, this shall not constitute a basis for a claim for damages or anticipated profits on the work that may be deleted.

Under circumstances which, in the judgment of the Engineer, so necessitate, the Engineer shall have authority to require, by written order, changes in, additions to, or deductions from the work. Such written order by the Engineer shall be subject to later confirmation by the Owner when the extent and cost have been established.

It is understood and agreed that in case any change in, addition to, or deduction from the work is required, said change shall in no way invalidate the Contract and shall not affect or discharge the bonds furnished by the Contractor.

The Contractor, without extra charge, shall make such slight alternations as may be necessary to make adjustable parts fit to fixed parts, leaving all complete and in proper shape when done.

18. BASIS FOR DETERMINING COST OF CHANGES IN THE WORK

Adjustments, if any, in the contract price by reason of change in the work shall be limited to the amount specified in the written order authorizing the change in the work. Adjustments shall be determined by one or more of the following methods, the Owner reserving the right to select the method or methods at the time the written order is issued:

- A. An acceptable lump sum proposal: To facilitate checking and acceptance, the proposal shall be itemized with quantities and prices given for the various items.

- B. Unit Prices: The unit prices may be the "Unit Price" set in the Agreement, or fixed by subsequent agreement between the Owner and the Contractor.
- C. On a cost-plus-limited basis not to exceed a specified maximum limit of cost:
- D. "COST" as herein used shall be the actual and necessary cost incurred by the Contractor by reasons of the change in the work for:
1. Labor
 2. Materials
 3. Equipment Rental
 4. Insurance Premium
 5. Labor costs shall be the amount shown on the Contractor's payroll with payroll taxes added when such taxes can be shown to have been incurred. In no case shall be rates charged for labor exceed the rates paid by the Contractor for the same class of labor employed by him to perform work under the regular items of the Contract.
 6. Material costs shall be the net price paid for material delivered to the site of the work. If any material previously required is omitted by the written order of the Owner after it has been delivered to or partially worked on by the Contractor and consequently will not retain its full value for other uses, the Contractor shall be allowed the actual cost of the omitted material less a fair market value of the material as determined by the Owner.
 7. Equipment Rental shall be the actual additional costs incurred for necessary equipment. Costs shall not be allowed in excess of usual rental charged in the area for similar equipment of like size and condition, including the cost of necessary supplies and repairs for operating the equipment. No costs, however, shall be allowed for the use of equipment on the site in connection with other work unless its use incurs actual and additional costs to the Contractor. If equipment not on the site is required for the change in the work only, the cost of transporting such equipment to and from the site shall be allowed.
 8. Insurance Premium shall be limited to those based on labor payroll and to the types of insurance required by the Contract. The amount allowed shall be limited to the net costs incurred as determined from the labor payroll covering the work. The Contractor shall, upon request of the Owner, submit verification of the applicable insurance rates and premium computations.

"PLUS" as herein is defined as a percentage to be added to the items of "Cost" to cover superintendence, use of ordinary tools, bonds, overhead expense and profit. The percentage shall not exceed 15 percent on work done entirely by the Contractor and shall not exceed an aggregate total of 20 percent on work done by a subcontractor.

"SPECIFIED MAXIMUM LIMIT OF COST" is the amount stated in the written order of the Owner authorizing the change in the work. The amount to be allowed the Contractor shall be the "cost" and "plus" the percentage or the specified maximum, whichever is the lesser amount.

The Contractor shall keep complete, accurate, daily record of the net actual cost of changes in the work, and shall present such information in such form and at such times as the Owner may request.

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19. PATENTS

The Contractor shall pay all royalties and license fees and shall hold and save the Owner and his agent harmless from all liability of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the owner, unless otherwise specifically stipulated in the Contract Documents. In this respect, the Contractor shall defend all suits or claims for infringement of any patent or license right.

In the event that any claim, suit, or action at law or in equity of any kind, whatsoever, is brought against the Owner, involving any such patents or license rights, then the Owner shall have the right to, and may, retain from any money due or to become due to the Contractor, such sufficient sum as is considered necessary to protect said Owner, against loss, and such sum maybe retained by the Owner until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished the Owner.

20. "OR EQUAL" CLAUSE

Whenever, in any of the Contract Documents, material, or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal," if not inserted, shall be implied. The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in such a manner as to exclude manufacturers' products of comparable quality, design and efficiency. The Contractor shall comply with the requirements of the Contract Documents relative to the Owner's review of materials and equipment before they are incorporated in the work.

21. CLEANING UP

The Contractor shall remove at his own expense from the Owner's property all temporary structures, rubbish and waste materials resulting from his operations. This requirement shall not apply to property used for permanent disposal of rubbish or waste materials in accordance with permission of such disposal granted to the Contractor by the Owner thereof.

22. USE OF COMPLETE PORTIONS OF THE WORK

The Owner may, at any time during progress of the work, after written notice to the Contractor, take over and place in service any completed portions of the work which are ready for service, although the entire work of the Contract is not fully completed, and notwithstanding the time for completion of the entire work or such portion may not have expired. In such event, the Contractor will be relieved of further work on or maintenance of said portion, except as covered by his guarantee of same.

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23. PAYMENT WITHHELD

The Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate for progress payment to such extent as may be necessary to protect itself from loss on account of:

- A. Defective work not remedied.
- B. Claims filled or reasonable evidence indicating probable filing of claims.
- C. Failure of the contractor to make payments properly to subcontractors or for material or labor.
- D. A reasonable doubt that the Contract can be completed for the balance then unpaid.
- E. Damage to another contractor.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

24. CONTRACTOR'S RIGHT TO STOP WORK

If the work should be stopped under an order of any court, or other public authority for a period of three months, through no act or fault of the contractor or of anyone employed by him, or if the Owner should fail to pay to the Contractor within sixty days of its maturity and presentation any sum certified by the Engineer, provided no appeal is taken, the contractor may, upon seven days written notice to the Owner and the Engineer, stop work or terminate this Contract,, and shall receive from the Owner payment in full for all work executed, as determined from the prices contained in the detailed estimate as computed by the Engineer, but no claim for extra compensation or damages shall be made or allowed because of such termination of the Contract.

25. FAIR EMPLOYMENT PRACTICES ACT

The Contractor agrees that neither he nor his subcontractor will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to his hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of his race, color, religion, national origin or ancestry. Breach of this covenant may be regarded as a material breach of this Contract.

26. AUTHORITY

No agent of the Owner shall have power to revoke, alter, enlarge, or relax the stipulation or requirements of these specifications, except insofar as such authority may be specifically conferred by the specifications themselves, without the formal authorization to do so, conferred by the Contract of which the specifications are a part, or by ordinance, resolution, or other usual official action by the Owner.

27. STARTING WORK

Material shall be ordered and work shall begin on the ground within thirty (30) days after the Contract is signed, unless otherwise stated.

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28. SANITARY REGULATIONS

Necessary sanitary conveniences for the use of laborers on the work, properly secluded from public observation, shall be provided by the Contractor and maintained in sanitary condition by the Contractor, and their use shall be strictly enforced.

29. WEEKEND AND NIGHT WORK

The Contractor is required to prosecute work done under this Contract during the hours specified in Section 01010. Contractor is required to get Owner authorization for working outside of the specified hours. This provision is superseded if work is required to save property or life or as specifically authorized or directed by the Owner.

30. PROGRESS OF WORK

The work shall be prosecuted regularly and uninterruptedly, unless the Owner shall otherwise specifically direct, with such force and at such points as to insure its full completion within the time herein stated.

If, in the opinion of the Owner, it is necessary or advisable that certain portions of the work be done immediately, the Contractor, upon written order, shall proceed with such work without delay. Should he fail to so proceed, the Owner may do or cause to be done, such work, and the cost of the same will be deducted from any money due or to become due the Contractor under this Contract.

31. TIME OF COMPLETION

The time allowed for completion of the work contemplated in this Contract shall be as stated in the proposal or specifications.

32. EXTENSION OF TIME

All days in which work is suspended by order of the Owner, or in accordance with these specifications, shall automatically extend the time for completion an equal number of days.

33. TIME IS ESSENCE OF CONTRACT

It is distinctly understood and agreed to by the parties hereto that the time specified for the completion of the work is the essence of this Contract, and the Contractor shall not be entitled to claim performance of this agreement unless the work is satisfactorily completed, in every respect, within the time herein specified.

34. ESTIMATED QUANTITIES

The quantities of the various classes of work to be done and materials to be furnished under this Contract which have been estimated as stated elsewhere herein, are approximate and only for the purpose of comparing, on a uniform basis, the bids offered for the work under this Contract; and neither the Owner nor his agents is to be held responsible should any of the said estimated quantities be found incorrect during the construction of the work; and the Contractor shall make no claim for anticipated profit, nor for loss of profit, because of a difference between the quantities of the various classes of work actually done or materials actually delivered and the estimated quantities as herein stated.

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35. FORFEITURE OF CONTRACT

If the work to be done under the Contract shall be abandoned by the Contractor, or if any time in the judgment of the Owner, the Contractor shall fail to prosecute the work at a reasonable rate of progress, or to comply with all or any of the terms and requirements herein set forth, then the Owner shall have the right to take possession of the work, including Contractor's plant, supplies, and materials, at any time after having notified the Contractor in writing to discontinue the work under this Contract for said cause or causes, and such action shall not affect the right of the Owner to recover damages resulting from such failure. Upon receiving such notice, the Contractor shall and will, upon demand, immediately give the Owner to recover damages resulting from such failure. Upon receiving such notice, the Contractor shall and will, upon demand, immediately give the Owner safe and peaceable possession of the work, including the plant, and shall then cease to have control over any portion thereof or the persons employed thereon.

The Owner may then proceed to complete the work herein specified, by contract or otherwise; and the entire cost of the same shall be charged to the Contractor and deducted from any sum or sums due or to become due under the contract; the excess cost, if any, to be paid by the Contractor or his sureties, to said Owner.

36. NO WAIVER OF CONTRACT

Neither the acceptance of the whole or any part of the work by the Owner or his Engineer, or any of its agents, nor any order, measurements, or certificate by the Engineer, nor any order by the Owner for the payment of money, nor any payment for the whole or any part of the work by the Owner, nor any extension of time, nor any possession taken by the Owner or its agents, shall operate as a waiver for any portion of the Contract or any power therein provided; nor shall any waiver of any breach of the Contract by held to be a waiver of any other or subsequent breach.

37. PAYMENT NOT TO BE STOPPED

The Owner shall not, nor shall any officer thereof, be precluded or stopped by any return or certificate made or given by the Engineer, or other officer, agent or appointee, under the provisions of this agreement, at any time (either before or after the final completion and acceptance of the work and payment made therefor pursuant to any such return or certificates showing the true and correct amount of money due therefor, notwithstanding any such return or certificate, or any payment made in accordance therewith) from demanding and receiving from the Contractor or his sureties, separately or collectively, such sums as may have been improperly paid said Contractor by reason of any such return or certificate which has been untruly or incorrectly compiled.

38. GUARANTEE

The Contractor, as a condition precedent to final payment, shall execute a guarantee (in the form of a bond) to the Owner warranting for a period of one year from the date of final payment to keep in good order and repair any defect in all the work done under the contract, either by the Contractor or his subcontractors, or the material suppliers, that may develop during said period due to improper materials, defective equipment, workmanship, or arrangements, and any other work affected in making good such imperfections shall also be made good, all without expense to the Owner. The Contractor shall execute, in favor of the Owner, the attached Maintenance and Guarantee Bond.

When the specifications call for a guarantee period greater than one year, the Contractor shall provide such longer guarantee period.

39. ESTIMATES AND PAYMENTS

The Owner shall pay and the Contractor receive the prices bid in the proposal, or agreed upon, less any deduction for any uncompleted portion, based upon measurements made by the Engineer or as otherwise herein stipulated, and such measurements shall be final and conclusive.

As aid to the Owner in preparing estimates for progress payments, the Contractor may be required to submit to the Owner for review a breakdown of some or all contract unit prices into their essential component parts. The sum of the component parts shall not exceed the total contract price per unit and the breakdown shall not overrule the contract price per unit.

The Contractor shall submit to the Owner a written request for each payment and a Contractor's Declaration declaring that he has not performed any work, furnished any material, sustained any loss, damage or delay, for any reasons, including soil conditions encountered or created, or otherwise done anything for which he will ask, demand, sue for, or claim compensation from the Owner other than, as indicated on the Contractor's Declaration. When requested by the Owner, the Contractor shall submit receipts or other vouchers showing his payments for materials and labor, including payments to subcontractors.

Waivers for payments to subcontractors and a waiver for the progress payment made to the Contractor shall be provided monthly, for the prior months payment. Submit Sworn Statements monthly also.

Certified payrolls shall be provided with payment application requests.

Payments based on progress estimates will be made on a monthly basis for work completed during the preceding month or since the date of the last preceding progress payment. Payments will be in accordance with the provision of Act 524 of the Michigan Public Acts of 1980 and in accordance with the terms of this Contract. No allowance will be made for materials furnished which are not incorporated in the finished work, unless otherwise stated.

Partial Payment for materials and/or equipment stored on the jobsite may be allowed on the basis of 90% of the invoice cost of the material providing materials are properly stored. Partial Payment will be allowed on the basis of 90% of the invoice cost less the cost of delivery for materials and/or equipment stored off the jobsite providing the following conditions are met:

1. Materials can be inspected by the OWNER and are clearly identifiable for the project.
2. Items are properly stored in the opinion of the OWNER.
3. Evidence of clear title transfer to the OWNER upon such partial payment can be provided.
4. Insurance coverage against loss or damage is provided including certificates guaranteeing same.

Pursuant to Act 524, Michigan Public Acts of 1980, the Owner shall designate a person representing it to whom written requests for payments shall be submitted. The Contractor shall designate a person who shall submit written requests for payment to the Owner.

In the event a dispute arises over an avoidable or unacceptable delay in the performance of the work as described in Section 4(3) of Act 524 of Michigan Public Acts of 1980 [MCLA125.1564(3)], the

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dispute may, at the option of the Owner, be submitted for resolution in accordance with the provisions of Section 4 of Act 524 of the Michigan Public Acts of 1980 to an agent designated pursuant to Section 4(2) of the Act. The dispute resolution process described above shall be used only for the purpose of determining the rights of the parties to retained funds and interest earned on retained funds.

The Owner may withhold the payment of any estimate or portion of estimate until the Contractor shall have furnished satisfactory evidence that he has paid all claims of every nature.

No payment shall be considered as acceptance of the work or any portion thereof prior to the final completion of the work, and the payment of the final estimate.

Within thirty (30) days after the completion of the work under this Contract to the satisfaction of the Owner and the Engineer, in accordance with all and singular terms and stipulations herein contained, the Owner shall make final payment, from a final estimate made by the Engineer. Before final payment is made, the Contractor shall, as directed by the Owner, furnish a Contractor's Affidavit that he has paid or satisfactorily secured all claims of every nature. Also, the Contractor shall furnish a release from the surety or sureties and permit agencies as applicable, approving payment of final estimate by the Owner. The final payment, when made, shall be considered as final acceptance of the completed work herein specified.

The acceptance by the Contractor of the final payment aforesaid shall operate as, and shall be, a release to the Owner and his agents, from all claim and liability to the Contractor for anything done or furnished for, relating to the work, or for any act or neglect of the Owner or of any person relating to or affecting the work.

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period _____
to _____ A.D., 20____, performed any work, furnished any material, sustained any loss, damage or
delay for any reason, including soil conditions encountered or created, or otherwise done anything for which I
shall ask, demand, due for, or claim compensation from _____

the Owner, or his agents, in addition to the regular items set forth in the contract numbered ____ and dated ____

A.D., 20____, for _____

executed between myself and the Owner, and in the Change Orders for work issued by the Owner in writing as
provided thereunder, except as I hereby make claim for additional compensation and/or extension of time as
set forth on the itemized statement attached hereto.

There (is) (is not) an itemized statement attached.

Date: _____

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By: _____

Position: _____

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CONTRACTOR'S AFFIDAVIT

STATE OF MICHIGAN)
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County of)

The undersigned _____
hereby represents that on _____ he (it) was awarded a Contract by the East Lansing Meridian Water & Sewer Authority (ELMWSA), hereinafter called the Owner, to provide labor and materials for the Filter Backwash Recovery and Lagoon Decant Disposal project , in accordance with the terms and conditions of the Contract Documents; and the undersigned further represent that the subject work has now been accomplished and the said Contract has now been completed.

The undersigned hereby warrants and certifies that all of his (its) indebtedness arising by reason of the said contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the said contract, have been fully paid or satisfactorily settled. The undersigned further agrees that if any such claim should hereafter arise, he (it) shall assume responsibility for the same immediately upon request to do so by the Owner.

The undersigned, for a valuable consideration, the receipt of which is hereby acknowledged, does further hereby waive, release and relinquish any and all claims or right of lien which the undersigned now has or may hereafter acquire upon the subject premises for labor and material used in accomplishing said project owned by the Owner.

This affidavit is freely and voluntarily given with full knowledge of the facts, on this ___ day of _____, 20__.

Company: _____

By: _____

Title: _____

Subscribed and sworn to before me, a Notary Public in and for _____ County, Michigan, on this ___ day of _____, 20__.

_____ Notary Public

My Commission Expires _____

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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.

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“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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Act No. 517
Public Acts of 2012
Approved by the Governor
December 28, 2012
Filed with the Secretary of State
December 28, 2012
EFFECTIVE DATE: April 1, 2013

**STATE OF MICHIGAN
96TH LEGISLATURE
REGULAR SESSION OF 2012**

Introduced by Senators Kahn, Marleau, Brandenburg, Anderson, Green and Booher

ENROLLED SENATE BILL No. 1024

AN ACT to prohibit persons who have certain economic relationships with Iran from submitting bids on requests for proposals with this state, political subdivisions of this state, and other public entities; to require bidders for certain public contracts to submit certification of eligibility with the bid; to require reports; and to provide for sanctions for false certification.

The People of the State of Michigan enact:

Sec. 1. This act shall be known and may be cited as the "Iran economic sanctions act".

Sec. 2. As used in this act:

- (a) "Energy sector of Iran" means activities to develop petroleum or natural gas resources or nuclear power in Iran.
- (b) "Investment" means 1 or more of the following:
 - (i) A commitment or contribution of funds or property.
 - (ii) A loan or other extension of credit.
 - (iii) The entry into or renewal of a contract for goods or services.
- (c) "Investment activity" means 1 or more of the following:
 - (i) A person who has an investment of \$20,000,000.00 or more in the energy sector of Iran.
 - (ii) A financial institution that extends \$20,000,000.00 or more in credit to another person, for 45 days or more, if that person will use the credit for investment in the energy sector of Iran.
- (d) "Iran" means any agency or instrumentality of Iran.
- (e) "Iran linked business" means either of the following:
 - (i) A person engaging in investment activities in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers or products used to construct or maintain pipelines used to transport oil or liquefied natural gas for the energy sector of Iran.
 - (ii) A financial institution that extends credit to another person, if that person will use the credit to engage in investment activities in the energy sector of Iran.
- (f) "Person" means any of the following:
 - (i) An individual, corporation, company, limited liability company, business association, partnership, society, trust, or any other nongovernmental entity, organization, or group.
 - (ii) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in section 1701(c)(3) of the international financial institutional act, 22 USC 262r(c)(3).

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(iii) Any successor, subunit, parent company, or subsidiary of, or company under common ownership or control with, any entity described in subparagraph (i) or (ii).

(g) "Public entity" means this state or an agency or authority of this state, school district, community college district, intermediate school district, city, village, township, county, public authority, or public airport authority.

Sec. 3. (1) Beginning April 1, 2013, an Iran linked business is not eligible to submit a bid on a request for proposal with a public entity.

(2) Beginning April 1, 2013, a public entity shall require a person that submits a bid on a request for proposal with the public entity to certify that it is not an Iran linked business.

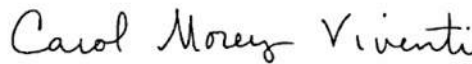
Sec. 4. If a public entity determines, using credible information available to the public, that a person has submitted a false certification under section 3(2), the public entity shall provide the person with written notice of its determination and of the intent not to enter into or renew a contract with the person. The notice shall include information on how to contest the determination and specify that the person may become eligible for a future contract with the public entity if the person ceases the activities that cause it to be an Iran linked business. The person shall have 90 days following receipt of the notice to respond in writing and to demonstrate that the determination of false certification was made in error. If a person does not make that demonstration within 90 days after receipt of the notice, the public entity may terminate any existing contract and shall report the name of the person to the attorney general together with information supporting the determination.

Sec. 5. The attorney general may bring a civil action against any person reported under section 4. If a civil action results in a finding that the person submitted a false certification, the person is responsible for a civil penalty of not more than \$250,000.00 or 2 times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the public entity's investigation, and reasonable attorney fees, in addition to the fine. A person who submitted a false certification shall be ineligible to bid on a request for proposal for 3 years from the date the public entity determines that the person has submitted the false certification.

Sec. 6. The provisions of this act are effective only if Iran is a state sponsor of terror as defined under section 2 of the divestment from terror act, 2008 PA 234, MCL 129.292.

Enacting section 1. This act takes effect April 1, 2013.

This act is ordered to take immediate effect.



Secretary of the Senate



Clerk of the House of Representatives

Approved

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Governor

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Statewide Prohibition Against Iran-Linked Businesses

The Michigan State legislature passed legislation to prohibit entities that have certain economic relationships with Iran from submitting a bid on a request for proposals (RFP) from state public entities, to require bidders for certain public contracts to submit certification of eligibility with a bid, and to respond to and report a false certification.

The "Iran Economic Sanctions Act" (P.A. 517 of 2012) makes an Iran-linked business ineligible to submit a bid on a RFP with a public entity. School districts, community college districts, and intermediate school districts must require each entity submitting a bid on an RFP to certify it is not an Iran-linked business. This requirement applies to all RFPs and not just to construction projects. Applicants for MDE grants will be required to assure compliance with this condition.

The Iran Economic Sanctions Act defines Iran-linked business as either of the following:

- A person engaging in investment activities in the energy sector of Iran, including a person who provides oil or liquefied natural gas tankers or products used to construct or maintain pipelines used to transport oil or liquefied natural gas for the energy sector of Iran.
- A financial institution that extends credit to another person, if that person will use the credit to engage in investment activities in the energy sector of Iran.

There are additional requirements to respond to and report an entity that has submitted a false certification. These requirements are described in the Iran Economic Sanction Act at:

<http://www.legislature.mi.gov/documents/2011-2012/publicact/pdf/2012-PA-0517.pdf>

Provisions of the Iran Economic Sanction Act remain in effect as long as Iran is defined by the U.S. Secretary of State as a state sponsor of terror, a country determined to have repeatedly provided support for acts of international terrorism. Information about federal sanctions is available at: <http://www.state.gov/j/ct/list/c14151.htm>

Questions regarding the requirements of the Iran Economic Sanction Act may be directed to the Attorney General's office.

**VENDOR CERTIFICATION
THAT IT IS NOT AN
“IRAN LINKED BUSINESS”**

Pursuant to Michigan law, (*the Iran Economic Sanctions Act, 2012 PA 517, MCL 129.311 et seq.*), before accepting any bid or proposal, or entering into any contract for goods or services with any prospective Vendor, the Vendor must first certify that it is not an “IRAN LINKED BUSINESS, as defined by law.

Vendor	
Legal Name	
Street Address	
City	
State, Zip	
Corporate I.D. Number / State	
Taxpayer I.D. #	

The undersigned, with: 1) full knowledge of all of Vendors business activities, 2) full knowledge of the requirements and possible penalties under the law MCL 129.311 et seq. and 3) the full and complete authority to make this certification on behalf of the Vendor, by his/her signature below, certifies that: the Vendor is NOT an “IRAN LINKED BUSINESS” as required by MCL 129.311 et seq., and as such that Vendor is legally eligible to submit a bid and be considered for a possible contract to supply goods and/ or services to the Owner.

Signature of Vendor's
Authorized Agent: _____

Printed Name of Vendor's
Authorized Agent: _____

Witness Signature: _____

Printed Name of Witness: _____

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SECTION 00800

GENERAL SUPPLEMENTARY CONDITIONS

PART 1 INSURANCE

1.1 Insurance Required of the Contractor

- A. Prior to commencement of the work, the Contractor shall purchase and maintain during the term of the project such insurance as will protect him, the Owner, and the Engineer from claims arising out of the work described in this contract and performed by the Contractor, Subcontractor(s) or Sub-Subcontractor(s) consisting of the below listed policies.

1.2 Worker's Compensation Insurance

- A. Worker's Compensation insurance including Employer's Liability to cover employee injuries or disease compensable under the Workers' Compensation Statutes of the states in which work is conducted under this contract; disability benefit laws, if any; or Federal compensation acts such as U. S. Longshoremen or harbor Workers', maritime Employment, or Railroad Compensation Act(s), if applicable.
- B. Self-insurance plans approved by the regulatory authorities in the state in which work on this project is performed are acceptable.

1.3 Comprehensive General Liability

- A. A Comprehensive General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, including the following exposures:
 - 1. All premises and operations.
 - 2. Explosion, collapse and underground damage.
 - 3. Contractor's Protective coverage for independent contractors or subcontractors employed by him.
 - 4. Contractual Liability for the obligation assumed in the Indemnification or Hold Harmless agreement found hereinafter.
 - 5. The usual Personal Injury Liability endorsement with no exclusions pertaining to employment.
 - 6. Products and Completed Operations coverage. This coverage shall extend through the contract guarantee period.
- B. Additional Insured Requirements:
 - 1. Coverage shall be Primary and Non-contributory
 - 2. 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.

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Bloomfield Hills, Michigan
Their owners, directors, officers, consultants, agents, and employees

1.4 Comprehensive Automobile Liability

- A. A Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance or use of any motor vehicle, including owned, non-owned and hired vehicles and including Michigan “No Fault” coverage.
- B. In light of standard policy provisions concerning (a) loading and unloading and (b) definitions pertaining to motor vehicles licensed for road use vs. unlicensed or self-propelled construction equipment, it is strongly recommended that the Comprehensive General Liability and the Comprehensive Auto Liability be written by the same insurance carrier, though not necessarily in one policy.
- C. Additional Insured Requirements:
 - 1. Coverage shall be Primary and Non-contributory
 - 2. 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

1.5 Owner's & Contractors Protective Liability Policy

- A. The Contractor shall purchase for the Owner, a separate Owner's Protective Liability policy to protect the Owner, the Engineer, their consultants, agents, employees and such public corporations in whose jurisdiction the work is located, for their contingent liability for work performed by the Contractor, the Subcontractor(s) or the Sub-Subcontractor(s) under this contract.
- B. Purchase the Owner's Protective Liability policy in the Owner’s name.
- C. Additional Insured Requirements:
 - 1. The policy shall include an endorsement which includes the following as additional insured’s:
 - a. The “Engineer”
Hubbell, Roth & Clark, Inc.
Bloomfield Hills, Michigan
Their owners, directors, officers, consultants, agents, and employees

1.6 Builder's Risk-Installation Floater

- A. The Contractor shall purchase a Builder's Risk-Installation Floater in a form acceptable to the Owner covering property of the project for the full cost of replacement as of the time of any loss which shall include, as named insured, (a) the Contractor, (b) all Subcontractors, (c) all Sub-Subcontractors, (d) the Owner, and the Engineer, as their respective interests may prove to

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be at the time of loss, covering insurable property which is the subject of this contract, whether in place, stored at the job site, stored elsewhere, or in transit at the risk of the insured(s).

- B. Coverage shall be effected on an "All Risk" form including, but not limited to, the Perils of fire, wind, flood, vandalism, collapse, theft and earthquake, with exclusions normal to the cover.
- C. The Contractor may arrange for such deductibles as he deems to be within his ability to self-assume, but he will be held solely responsible for the amount of such deductible and for any coinsurance penalties.
- D. Any insured loss shall be adjusted with the Owner and the Contractor and paid to the Owner and Contractor as trustee for the other insured.
- E. Additional Insured Requirements:
 - 1. Coverage shall be Primary and Non-contributory
 - 2. 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

1.7 Umbrella or Excess Liability

- A. The Contractor is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested.
- B. Umbrella or Excess policy wording shall be at least as broad as the primary or underlying policy(ies) and shall apply both to the Contractor's general liability and to his automobile liability insurance.
- C. Additional Insured Requirements:
 - 1. Coverage shall be Primary and Non-contributory
 - 2. 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

1.8 Railroad Protective Liability

- A. Where such an exposure exists, as determined by the Owner, the Contractor will provide coverage in the name of each railroad company having jurisdiction over rights-of-way across which work under the contract is to be performed.

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- B. Additional Insured Requirements:
 - 1. Coverage shall be Primary and Non-contributory
 - 2. 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

1.9 Limits of Liability

- A. The required limits of liability for insurance coverage shall be **not less than** the following:
 - 1. Workers' Compensation
Coverage A - Compensation Statutory
Coverage B - Employer's Liability \$500,000
 - 2. Comprehensive General Liability
Bodily Injury and Property Damage \$1,000,000 Each Occurrence
Combined Single Limit \$2,000,000 Per Job Aggregate
..... \$1,000,000 Completed Operations Aggregate
 - 3. Comprehensive Automobile Liability
Bodily Injury and Property Damage \$1,000,000 Each Accident
Combined Single Limit
 - 4. Owner's Protective
Bodily Injury and Property Damage \$1,000,000 Per Occurrence
Combined Single Limit \$1,000,000 Aggregate
 - 5. Builder's Risk & Installation Floater Cost to replace at time of loss
 - 6. Umbrella or Excess Liability \$2,000,000 Per Occurrence
..... \$2,000,000 Aggregate
 - 7. Insurance - Other Requirements
 - a. Notice of Cancellation or Intent Not to Renew: Policies will be endorsed to provide that at least 30 days written notice shall be given to the Owner and to the Engineer, of cancellation of, material change, or intent not to renew (see sample endorsements which follow this Section).

1.10 Evidence of Coverage

- A. Prior to commencement of the work, the Contractor shall furnish to the Owner, Certificates of Insurance in force on the Owner's Form of Certificate provided.
- B. Other forms of Certificate are acceptable only if (1) they include all of the items prescribed in the Owner's Form of Certificate, including agreement to cancellation provisions outlined herein, (2) the Engineer's Project Identification Number, and (3) they have written review and acceptance of the Owner and the Engineer.
- C. The Owner reserves the right to request complete copies of policies if deemed necessary to ascertain details of coverage not provided by certificates.
- D. Such policy copies shall be "Originally Signed Copies," and so designated.

1. Insurance Required for the Contractor
 - a. Workers' Compensation and Employers' Liability
 - b. Comprehensive General Liability-including:
 - 1) All premises and operations.
 - 2) Explosion, collapse and underground damage.
 - 3) Contractor's Protective.
 - 4) Contractual Liability for obligations assumed in the Indemnification-Hold Harmless Agreement of this Contract.
 - 5) Personal Injury Liability.
 - 6) Products and Completed Operations
 - c. Comprehensive Automobile Liability - including owned, non-owned and hired vehicles and Michigan "No Fault" coverage.
 - d. Umbrella or Excess Liability.
 - e. Builders Risk Installation Floater
 - f. Railroad Protective Liability
2. Insurance Required for the Owner
 - a. Owners' and Contractor's Protective Liability Policy which names as additionally insured the Engineer, their consultants, agents, employees and such public corporations in whose jurisdiction the work is located.
 - b. Refer to sample endorsements which follow this Section.

1.11 Qualification of Insurers

- A. In order to determine financial strength and reputation of insurance carriers, all companies providing the coverages required shall be licensed or approved by the Insurance Bureau of the State of Michigan and shall have a financial rating no lower than XI and a policyholder's service rating no lower than A as listed in A. M. Best's Key Rating Guide, current edition.
- B. Companies with ratings lower than A;XI will be acceptable only upon written consent of the Owner.

1.12 Contract Security

- A. If the Owner is a public entity, the Contractor shall furnish a surety bond (form attached) in an amount at least equal to 100 percent of the contract price as security for the faithful performance of this contract. The Contractor shall furnish, also, a separate surety bond (form attached) in an amount at least equal to 100 percent of the contract price as security for the payment of all persons performing labor on the project under this contract, and furnishing materials in connection with this contract. The surety on each such bond shall be a duly authorized surety company satisfactory to the Owner.
- B. Regardless of whether the Owner is or is not a public entity, the Contractor shall furnish a Maintenance and Guarantee Bond (form attached) covering all work under this contract. The guarantee is to cover a period of one year subsequent to the date of the final pay estimate, unless otherwise specified.
- C. Surety Companies providing and executing Surety and Guarantee Bonds shall appear on the United States Treasury Departments most current list, Circular 570, as holding certificates of authority as acceptable sureties on federal bonds. The penal sum of such bonds shall not exceed

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the company's limitation as stated therein. A surety company shall be licensed in the State in which it provides a bond, and in the State where the contract work is to be performed.

1.13 Indemnification

- A. The contractor agrees to indemnify, defend, and save harmless the Owner and the Engineer, their consultants, agents, and employees, from and against all loss or expense (including costs and attorney's fees) by reason of liability imposed by law upon the Owner and the Engineer, their consultants, agents, and employees for damages because of bodily injury, including death at any time resulting there from, sustained by any person or persons or on account of damage to property, including loss of use thereof, arising out of or in consequence of the performance of this work, whether such injuries to persons or damage to property is due, or claimed to be due, to the negligence of the contractor, his subcontractors, the Owner, the Engineer, and their consultants, agents, and employees, except only such injury or damage as shall have been occasioned by the sole negligence of the Owner, the Engineer, or their agents, employees or consultants.

- B. The Contractor also agrees to indemnify, defend and save harmless the Owner and the Engineer, their owners, directors, Board members, officers, directors, officials, and council members, consultants, agents and employees, from and against any and all loss or expense (including costs and attorney's fees) for any and all claims or allegations of supervision, inspection or observation activities or services which may arise out of, or in consequence of, the performance of this work.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

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Client#: 7782 PAVCOR

ACORD™ CERTIFICATE OF LIABILITY INSURANCE DATE (MM/DD/YYYY)
04/02/2015

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Insurance Agency 24724 Any Street (248) 666-6666 P.O. Box 2067 SomeCity, MI 48037-2067	CONTACT NAME: Insurance Agent name PHONE (A/C, No, Ext): 248 555-5555 FAX (A/C, No): 248 111-1111 E-MAIL ADDRESS: InsuranceAgent@InsuranceGroup.com PRODUCER CUSTOMER ID #:														
INSURED Company ABC 2654 Street Name AnyCity, MI 48183	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">INSURER(S) AFFORDING COVERAGE</th> <th style="text-align: left;">NAIC #</th> </tr> <tr> <td>INSURER A : Insurance Company 1</td> <td></td> </tr> <tr> <td>INSURER B : Insurance Company 2</td> <td></td> </tr> <tr> <td>INSURER C :</td> <td></td> </tr> <tr> <td>INSURER D :</td> <td></td> </tr> <tr> <td>INSURER E :</td> <td></td> </tr> <tr> <td>INSURER F :</td> <td></td> </tr> </table>	INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A : Insurance Company 1		INSURER B : Insurance Company 2		INSURER C :		INSURER D :		INSURER E :		INSURER F :	
INSURER(S) AFFORDING COVERAGE	NAIC #														
INSURER A : Insurance Company 1															
INSURER B : Insurance Company 2															
INSURER C :															
INSURER D :															
INSURER E :															
INSURER F :															

COVERAGES	CERTIFICATE NUMBER:	REVISION NUMBER:				
THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.						
INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> X,C,U <input checked="" type="checkbox"/> Contractual GEN'L AGGREGATE LIMIT APPLIES PER: POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC	X X	MPA00000042433S	11/17/2014	11/17/2015	EACH OCCURRENCE \$1,000,000 DAMAGE TO REITIED PREMISES (Ea occurrence) \$100,000 MED EXP (Any one person) \$5,000 PERSONAL & ADV INJURY \$1,000,000 GENERAL AGGREGATE \$2,000,000 PRODUCTS - COMPIOP AGG \$2,000,000
A	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS <input checked="" type="checkbox"/> Drive Other Car	X X	BA00000042434S	11/17/2014	11/17/2015	COMBINED SINGLE LIMIT (Ea accident) \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$ \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DEDUCTIBLE RETENTION \$	X X	CMB00000042435S	11/17/2014	11/17/2015	EACH OCCURRENCE \$2,000,000 AGGREGATE \$2,000,000 \$ \$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y / N N / N/A	WC0001100555	05/01/2014	04/30/2015	<input checked="" type="checkbox"/> WC STATU-TORY LIMITS <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$500,000 E.L. DISEASE - EA EMPLOYEE \$500,000 E.L. DISEASE - POLICY LIMIT \$500,000
A	Installation Floater	X	MPA00000042433S	11/17/2014	11/17/2015	\$150,000 \$1,000 deductible
DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required) Municipality Name, their counsel, members, board members, public officials, consultants, agents and (See Attached Endorsements evidencing the change of policy)						

CERTIFICATE HOLDER Municipality Name 18500 Street Name AnyCity, MI 48025	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE <div style="text-align: right;">SIGNATURE</div>
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DESCRIPTIONS (Continued from Page 1)

employees, as well as the engineer; Hubbell Roth & Clark, their owners, directors, officers, consultants, agents, and employees are included as Additional Insured per written contract with respect to the general, auto and umbrella liability coverages for the work performed by the named insured for the certificate holder. Insurance is considered primary and non contributing and a waiver of subrogation applies. Should any of the above described policies be cancelled before the expiration date thereof, the issuing Company will mail 30 days prior written notice to the Certificate holder. Endorsements evidencing the change of Policy are attached.

Example only

POLICY NUMBER: TRA 4820287

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**EARLIER NOTICE OF CANCELLATION
PROVIDED BY US**

This endorsement modifies insurance provided under the following:

- BUSINESS AUTO COVERAGE PART
- CRIME AND FIDELITY COVERAGE PART
- EQUIPMENT BREAKDOWN COVERAGE PART
- FARM COVERAGE PART
- COMMERCIAL PROPERTY COVERAGE PART
- COMMERCIAL INLAND MARINE COVERAGE PART
- COMMERCIAL LIABILITY UMBRELLA COVERAGE PART
- OWNERS AND CONTRACTORS PROTECTIVE LIABILITY COVERAGE PART
- COMMERCIAL GENERAL LIABILITY COVERAGE PART
- LIQUOR LIABILITY COVERAGE PART
- PROFESSIONAL LIABILITY COVERAGE

SCHEDULE

Number of Days' Notice 30

<u>Name Of Additional Insured Person(s) Or Organization(s)</u>	<u>Location(s) Of Covered Operations</u>

(If no entry appears above, information required to complete this Schedule will be shown in the Declarations as applicable to this endorsement.)

For any statutorily permitted reason other than nonpayment of premium, the number of days required for notice of cancellation, as provided in paragraph 2. of either the CANCELLATION Common Policy Condition or as amended by an applicable state cancellation endorsement, is increased to the number of days shown in the Schedule above.

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POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 37 04 13

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED – OWNERS, LESSEES OR
CONTRACTORS – COMPLETED OPERATIONS**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location And Description Of Completed Operations

Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

A. Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the Schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

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COMMERCIAL GENERAL LIABILITY
CG 20 33 04 13

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED – OWNERS, LESSEES OR
CONTRACTORS – AUTOMATIC STATUS WHEN
REQUIRED IN CONSTRUCTION AGREEMENT WITH YOU**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. Section II – Who Is An Insured is amended to include as an additional insured any person or organization for whom you are performing operations when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured on your policy. Such person or organization is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured.

However, the insurance afforded to such additional insured:

1. Only applies to the extent permitted by law; and
2. Will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

A person's or organization's status as an additional insured under this endorsement ends when your operations for that additional insured are completed.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to:

1. "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:
 - a. The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
 - b. Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of or the failure to render any professional architectural, engineering or surveying services.

2. "Bodily injury" or "property damage" occurring after:

- a. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
- b. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to

Section III – Limits Of Insurance:

The most we will pay on behalf of the additional insured is the amount of insurance:

- 1. Required by the contract or agreement you have entered into with the additional insured; or
 - 2. Available under the applicable Limits of Insurance shown in the Declarations;
- whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

Example only

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ACORD™ INSURANCE BINDER		DATE 06/18/14	
THIS BINDER IS A TEMPORARY INSURANCE CONTRACT, SUBJECT TO THE CONDITIONS SHOWN ON THE REVERSE SIDE OF THIS FORM.			
PRODUCER Insurance Company Name Any Street City, State Zip	PHONE (A/C, No, Ext): 248-555-5555 FAX (A/C, No): 248-333-3333	COMPANY Selective Insurance Company of Amer	BINDER # BINDER83730
CODE: 38-3112729	SUB CODE:	DATE EFFECTIVE 06/18/14	TIME 12:01
AGENCY CUSTOMER ID: 7430	INSURED Owner's Name Any Street SomeCity, MI 48001	EXPIRATION DATE 08/18/14	TIME 12:01 AM NOON
THIS BINDER IS ISSUED TO EXTEND COVERAGE IN THE ABOVE NAMED COMPANY PER EXPIRING POLICY #:		DESCRIPTION OF OPERATIONS/VEHICLES/PROPERTY (Including Location) Project Description	

COVERAGES		LIMITS		
TYPE OF INSURANCE	COVERAGE/FORMS	DEDUCTIBLE	COINS %	AMOUNT
PROPERTY CAUSES OF LOSS <input type="checkbox"/> BASIC <input type="checkbox"/> BROAD <input type="checkbox"/> SPEC				
GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> OCP	Owners & Contractors Protective Liability RETRO DATE FOR CLAIMS MADE:	EACH OCCURRENCE		\$ 1,000,000
		DAMAGE TO RENTED PREMISES		\$
		MED EXP (Any one person)		\$
		PERSONAL & ADV INJURY		\$
		GENERAL AGGREGATE		\$ 1,000,000
		PRODUCTS - COMPI/OP AGG		\$
AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS		COMBINED SINGLE LIMIT		\$
		BODILY INJURY (Per person)		\$
		BODILY INJURY (Per accident)		\$
		PROPERTY DAMAGE		\$
		MEDICAL PAYMENTS		\$
		PERSONAL INJURY PROT		\$
		UNINSURED MOTORIST		\$
AUTO PHYSICAL DAMAGE DEDUCTIBLE <input type="checkbox"/> COLLISION: <input type="checkbox"/> OTHER THAN COL: <input type="checkbox"/>	<input type="checkbox"/> ALL VEHICLES <input type="checkbox"/> SCHEDULED VEHICLES	ACTUAL CASH VALUE		\$
		STATED AMOUNT		\$
		OTHER		\$
GARAGE LIABILITY <input type="checkbox"/> ANY AUTO		AUTO ONLY - EA ACCIDENT		\$
		OTHER THAN AUTO ONLY:		\$
		EACH ACCIDENT		\$
		AGGREGATE		\$
EXCESS LIABILITY <input type="checkbox"/> UMBRELLA FORM <input type="checkbox"/> OTHER THAN UMBRELLA FORM	RETRO DATE FOR CLAIMS MADE:	EACH OCCURRENCE		\$
		AGGREGATE		\$
		SELF-INSURED RETENTION		\$
WORKER'S COMPENSATION AND EMPLOYER'S LIABILITY		WC STATUTORY LIMITS		\$
		E.L. EACH ACCIDENT		\$
		E.L. DISEASE - EA EMPLOYEE		\$
		E.L. DISEASE - POLICY LIMIT		\$
SPECIAL CONDITIONS/OTHER COVERAGES Named Insured to include: Owners Name & the Engineer, their (See attached Spec Conditions/Other Covs page.)		FEES		\$
		TAXES		\$
		ESTIMATED TOTAL PREMIUM		\$

NAME & ADDRESS		MORTGAGEE	ADDITIONAL INSURED
Contractors Name SomeStreet AnyCity State Zip		LOSS PAYEE	<input checked="" type="checkbox"/> Contractor
		LOAN #	
		AUTHORIZED REPRESENTATIVE <i>Michael G. Zerwas</i>	

ACORD 75 (2001/01) 1 of 3 #5069 NOTE: IMPORTANT STATE INFORMATION ON REVERSE SIDE MSB © ACORD CORPORATION 1993

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CONDITIONS

This Company binds the kind(s) of insurance stipulated on the reverse side. The Insurance is subject to the terms, conditions and limitations of the policy(ies) in current use by the Company.

This binder may be cancelled by the Insured by surrender of this binder or by written notice to the Company stating when cancellation will be effective. This binder may be cancelled by the Company by notice to the Insured in accordance with the policy conditions. This binder is cancelled when replaced by a policy. If this binder is not replaced by a policy, the Company is entitled to charge a premium for the binder according to the Rules and Rates in use by the Company.

Applicable in California

When this form is used to provide insurance in the amount of one million dollars (\$1,000,000) or more, the title of the form is changed from "Insurance Binder" to "Cover Note".

Applicable in Delaware

The mortgagee or Obligee of any mortgage or other instrument given for the purpose of creating a lien on real property shall accept as evidence of insurance a written binder issued by an authorized insurer or its agent if the binder includes or is accompanied by: the name and address of the borrower; the name and address of the lender as loss payee; a description of the insured real property; a provision that the binder may not be canceled within the term of the binder unless the lender and the insured borrower receive written notice of the cancellation at least ten (10) days prior to the cancellation; except in the case of a renewal of a policy subsequent to the closing of the loan, a paid receipt of the full amount of the applicable premium, and the amount of insurance coverage.

Chapter 21 Title 25 Paragraph 2119

Applicable in Florida

Except for Auto Insurance coverage, no notice of cancellation or nonrenewal of a binder is required unless the duration of the binder exceeds 60 days. For auto insurance, the insurer must give 5 days prior notice, unless the binder is replaced by a policy or another binder in the same company.

Applicable in Nevada

Any person who refuses to accept a binder which provides coverage of less than \$1,000,000.00 when proof is required: (A) Shall be fined not more than \$500.00, and (B) is liable to the party presenting the binder as proof of insurance for actual damages sustained therefrom.

SPECIAL CONDITIONS/OTHER COVERAGES (Cont. from page 1)

consultants, agents, employees,
& such public corporations in whose jurisdiction the work is located.

** Continued From Additional Interests Section **

Hubbell, Roth & Clark, Inc.
555 Hulet Drive; P.O. Box 824
Bloomfield Hills, MI 48303-0824
Type: Additional Insured

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COMMERCIAL GENERAL LIABILITY
CG 20 31 04 13

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED – ENGINEERS,
ARCHITECTS OR SURVEYORS**

This endorsement modifies insurance provided under the following:

OWNERS AND CONTRACTORS PROTECTIVE LIABILITY COVERAGE PART

A. Section II – Who Is An Insured is amended to include as an additional insured any architect, engineer or surveyor engaged by you, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by your acts or omissions or the acts or omissions of those acting on your behalf:

1. In connection with your premises; or
2. In the performance of your ongoing operations.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusion applies:

This insurance does not apply to "bodily injury" or "property damage" arising out of the rendering of or the failure to render any professional services by or for you, including:

1. The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

2. Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage" involved the rendering of or the failure to render any professional services by or for you.

C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

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SECTION 01000

GENERAL SPECIFICATIONS

1.1	WORKING SPACE	1
1.2	LOCATING WORK AND SURVEY CONTROL	1
1.3	SOIL CONDITIONS	1
1.4	SURVEY MONUMENTS.....	2
1.5	CONSTRUCTION PERMITS.....	2
1.6	ROAD DETOURS	2
1.7	PROTECTION OF THE PUBLIC	3
1.8	BARRICADES AND PROTECTION.....	3
1.9	MAINTENANCE OF TRAFFIC	3
1.10	FINAL CLEANUP, GRADING, SITE AND SLOPE RESTORATION, INCLUDING OFF-SITE AREAS.....	4
1.11	EXISTING STRUCTURES AND UTILITIES.....	4
1.12	PUBLIC AND PRIVATE UTILITIES.....	4
1.13	PUMPING, BAILING AND DRAINING.....	5
1.14	SHEETING, SHORING AND BRACING	6
1.15	TESTING AND DISPOSAL OF EXCAVATED MATERIAL	6
1.16	DISPOSAL OF WASTE MATERIALS.....	6
1.17	INSPECTION OF PREMISES	6
1.18	SCHEDULE OF OPERATIONS	6
1.19	ORDINANCES AND CODES.....	7
1.20	TRAFFIC CONTROL	7
1.21	DUST CONTROL	7

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.

1.2 LOCATING WORK AND SURVEY CONTROL

- A. The Contractor shall accurately locate and layout the the work from survey control points established by the Owner along the surface of the ground and the line of work. Reference points shall be protected and preserved by the Contractor.

1.3 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.

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- C. Contractor shall review geotechnical data provided within the documents before providing Bid for the work.

1.4 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.

1.5 CONSTRUCTION PERMITS

- A. Soil Erosion and Sedimentation Control (SESC) Permit – The Contractor shall apply for and obtain permit through Alpena County.
- B. The Contractor shall apply for and obtain any necessary road construction permits required of Contractors for work within public streets. The scope of this project extends out into Mason Street on the south side of the Water Production Plant. Mason Street is a City road – coordinate permit requirements directly with City Engineering Department.
- C. The Contractor shall apply for and obtain applicable Building Permits as required under the Michigan Building Code and per the City Building Department. (This requirement includes sub-trade permits for mechanical, electrical, plumbing, etc.)
- D. Demolition Permit – The City will allow the demolition of the existing Clearwells to be included on the Building Permit; however, the City requires that a Demolition or Moving of Structures Specifications & Affidavit be completed for the work. Contractor to work with Owner to provide this paperwork for the project.
- E. Construction permits shall be applied for immediately following receipt of the Notice to Proceed from the City. Construction shall not begin until applicable permits have been obtained.
- F. The cost of construction permits, including, but not limited to, inspection fees, application fees, and/or review fees that may be required in connection with such permits, shall be at the Contractor’s expense but reimbursable to the project as described in the Proposal Form. Construction operations shall be conducted in accordance with provisions of required permits. The Owner will not pay for re-inspection fees for work that fails to pass inspection.
- G. City or County required bonds related to Construction Permits - The cost of any required bonds shall be included in the cost of the work, Lump Sum Bid price. The Owner will not pay construction bond fees as part of the Permit Allowances.

1.6 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.

1.7 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.

1.8 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.

1.9 MAINTENANCE OF TRAFFIC

- A. During the progress of the work, the Contractor shall accommodate both vehicular 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.

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1.10 FINAL CLEANUP, GRADING, SITE AND SLOPE RESTORATION, INCLUDING OFF-SITE AREAS

- A. It shall be understood that site restoration requirements are performance based as specified on the Civil Drawings under Slope Restoration. The MDOT specifications and requirements for this work, as called for on Sheet C-1 shall be included in the Lump Sum Bid Price for the project. This work is not unit price based nor will the Owner pay additional costs for re-doing slope restoration areas that do not develop minimum growth standards as required for acceptance.
 - 1. Materials used for slope restoration and turf establishment requirements shall be as specified in MDOT sections 816 and 917, and as modified on Sheet C-1.
 - 2. "On-site" and "off-site" areas shall be restored.
- B. Upon completion of construction and before final payment is made, the Contractor shall restore the working areas, including off-site storage locations, project Contractor parking areas, etc. that have been disturbed the Contractor operations, to as clean a condition as existed before construction operations started.
- C. 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.
 - 1. Grading and filling shall include graveled areas and other unpaved areas affected by the Contractor's operations. Re-gravel areas to pre-construction conditions.
 - 2. Pavement areas that were damaged by Contractor operations, that were not called for to be replaced under the project shall be repaired to meet City approval.
 - 3. Restore unpaved areas on Mason Street with crushed stone to match existing conditions prior to Construction. Restore paved areas with like materials.
 - 4. Lawn areas disturbed, including "off-site" Park location that may have been used for Contractor storage, staging, trailers, parking etc. shall be restored as specified under Slope Restoration.

1.11 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.

1.12 PUBLIC AND PRIVATE UTILITIES

- A. Utilities
 - 1. The Contractor must provide adequate protection for water, sewer, gas, telephone, fiber, 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 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.
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.

1.13 PUMPING, BAILING AND DRAINING

- A. The Contractor shall provide and maintain adequate pumping and drainage facilities for removal and disposal of water from trenches and other excavations. See Section 02140 DEWATERING for additional requirements.
- 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 acceptable to the Owner.
- C. Drainage or discharge lines shall be connected to adjacent storm water drains or extended to an acceptable discharge point. In any event, all pumping and drainage shall be done without damage to any other property, public or private, and without interference with the rights of the public or private property Owners and in accordance with the EGLE 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.

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1.14 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. See additional notes on the Structural Drawings.

1.15 TESTING AND DISPOSAL OF EXCAVATED MATERIAL

- A. With the exception of suitable excavated materials to be stockpiled and re-used, sufficient for backfilling and construction of fills, all broken concrete, stone, and excess excavated materials shall be disposed of , off site, by the Contractor. The Contractor will be required to obtain his own disposal ground, and will receive no extra compensation for disposing of any of the excess materials.
- B. Contractor shall include in the Lump Sum Bid price, cost for testing and disposal of excavated materials, except presumed hazardous/contaminated as outlined in Section 02200. Note that the existing concrete clearwells have a form of bituminous waterproof coating on them that was applied during a prior tank rehabilitation process and disposal of this material shall be addressed accordingly in the project, by the Contactor. See Section 02200 for additional information.

1.16 DISPOSAL OF WASTE MATERIALS

- A. Unless otherwise directed by the Owner, all waste materials and debris 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.

1.17 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.

1.18 SCHEDULE OF OPERATIONS

- A. The Contractor shall submit, for the Owner's review and acceptance, 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. Refer to Section 01950 for additional requirements.

1.19 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.

1.20 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.

1.21 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 acceptable to and directed by the Owner. See Section -01950 SPECIAL PROJECT REQUIREMENTS for additional requirements.

END OF SECTION

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SECTION 01005

ADMINISTRATIVE PROVISIONS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Related Requirements
- B. Work sequence.
- C. Alternatives.
- D. Coordination.
- E. Cleanliness of the work.
- F. Regulatory requirements.
- G. Satisfaction of Claims
- H. Fire protection.
- I. Chemicals.
- J. Abbreviations.
- K. References.

1.2 RELATED REQUIREMENTS

- A. Section 00120 - Instructions to Bidders.
- B. Section 00500 - Contract.
- C. Section 00700 - General Conditions.
- D. Section 00800 - General Supplementary Conditions.
- E. Section 01010 – Summary of Work.
- F. Section 01310 - Progress Schedules.
- G. Section 01700 - Contract Closeout.

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1.3 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 review, a complete detailed working schedule setting forth the sequencing of operations he proposes to follow.

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

1.5 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 Owner shall review all scheduling of all such activities for acceptance.

1.6 CLEANLINESS OF THE WORK

- A. The work itself, and all property used therewith, shall be kept in a neat orderly condition at all times. Excess waste and rejected materials, rubbish, and debris shall not be allowed to accumulate.

1.7 REGULATORY REQUIREMENTS

- A. The requirements of this Article shall be made a part of any subcontracts entered into.
- B. 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.
- C. All costs including fees, inspection charges and permits shall be included in the Contract Price.

1.8 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.

1.9 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.

1.10 CHEMICALS

- A. All chemicals used during construction or furnished for project operation, whether 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.

1.11 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
 - A.W.G. - American Wire Gauge
 - A.W.S. - American Welding Society
 - A.W.W.A. - American Water Works Association
 - E.G.L.E.- -Michigan Department of Environment, Great Lakes and Energy (formerly called M.D.E.Q.)
 - Fed. Spec. - Federal Specification, Federal (of F.S.) Supply Service, General Services Administration, U.S. Government

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- I.E.E.E. - Institute of Electrical and Electronics Engineers
- I.P.C.E.A. - Insulated Power Cable Engineers Association
- M.D.E.Q. -Michigan Department of Environmental Quality (former name, see E.G.L.E.)
- 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

1.12 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

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General work summary covered by Contract Documents.
- B. Project Schedule.
- C. Contractor Use of Premises and Work Hours.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Location: City of Alpena, Water Production Plant, 1300 S. State Ave., Alpena, MI. 49707.
- B. The Contract Documents were prepared by Hubbell, Roth & Clark, Inc. (HRC) Job Number 20220751.
- C. Work Summary: In general, the work consists of the following items. Refer to the Drawings and these Specifications for additional details:
 - Construction for poured in place concrete drinking water clearwell tank of approximately 1.0 MG capacity with precast concrete plank roof; concrete retaining walls, steel walkway platform and guardrails; associated excavation and sitework; gravel perimeter road, concrete access drive to lower level of Plant; underground piping; packaged groundwater pump station; chain link fence and gates; landscape restoration. Demolition of both existing concrete clearwells is included in the Work.
- D. The project will be constructed under a Single Prime Contract.

1.3 PROJECT SCHEDULE

- A. The following is the anticipated, tentative schedule for the work, to be used for Bidding purposes:
 - 1. Bids Due: March 18, 2024.
 - 2. Execute Contract with Owner: late April, early May, 2024.
 - 3. Mobilization: mid-to-late May, 2024.
 - 4. Substantial Completion: On or before August 1, 2025. (Substantial Completion shall be as defined within the Proposal form.)
 - 5. Project Completion: On or before December 31, 2025.

1.4 CONTRACTOR USE OF PREMISES AND WORK HOURS

- A. This facility is a Drinking Water Plant. Access into the facility site is strictly limited to the Contractor and project support personnel associated with this project.

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1. Contractor shall provide Owner with a list of all personnel to be on site.
- B. Contractor activities around the water production plant building and access to site buildings is strictly limited to the areas necessary for tie-in of the new work. Contractor personnel shall not have access to non-work related areas of the site or facilities.
- C. The Contractor, Owner and Owner's representative shall have a meeting to go over scheduling of the work as one of the first items after the Award to make sure all aspects of the work are coordinated with the facility operations. See Section 01950 for project planning and requirements.
- D. Any grass, landscaped areas, sidewalks, etc. that are damaged by the Contractor's operations shall be restored to their pre-contract condition at the end of the project.
- E. The staging and stockpile area(s) on site shall as agree to by the Owner so that Plant operations are not impacted.
- F. Work Hours: General site working hours shall be arranged with the Plant; construction work is intended to be performed Monday through Friday. Work hours shall conform to local ordinances for such activities.

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. Pre-Award Meeting.
- E. Preconstruction Meeting.
- F. Progress Meetings.
- G. Pre-Installation Meetings.

1.2 RELATED SECTIONS

- A. Section 00120 – Instructions to Bidders.
- B. Section 00700 - General Conditions.
- C. Section 00800 - General Supplementary Conditions.
- D. Section 01005 - Administration Provisions.
- E. Section 01300 - Submittals.
- F. Section 01310 - Progress Schedules.
- G. Section 01950 – Special Project Requirements.

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.

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- 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.
- 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.

1.4 PRE-BID MEETING

- A. Engineer will schedule a meeting as noted in the Information to Bidders.
- B. Attendance: Owner, Engineer, and Bidders.
- C. 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. Utilities provided by Contractor and by Owner.
 - 9. Security and housekeeping procedures.
- D. Engineer will record minutes and distribute after the meeting, via email, to participants.

1.5 PRE-AWARD MEETING

- A. Engineer may elect to schedule a meeting prior to issuing Notice of Award.
- B. Attendance Required: Owner, Engineer, and Contractor.
- C. Agenda:
 - 1. Review of Owner-Contractor Agreement.
 - 2. Review of Submission of bonds and insurance certificates.
 - 3. Regulatory requirements affecting the project.
 - 4. Review of Federal, State and Local contract requirements.
 - 5. Review of list of Subcontractors, list of Products, and schedule of values.
 - 6. Designation of personnel representing the parties in Contract, and the Engineer.
 - 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
- D. Engineer will record minutes and distribute after the meeting, via email, to participants.

1.6 PRECONSTRUCTION MEETING

- A. Engineer will schedule meeting.
- B. Attendance Required: Owner, Engineer, major subcontractors and Contractor.
- C. Agenda:
 - 1. Review of Regulatory requirements affecting the project.
 - 2. Submission of progress construction schedule.
 - 3. Designation of personnel representing the parties in Contract, and the Engineer.
 - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 5. Critical work sequencing.
 - 6. Use of premises by Owner and Contractor
 - 7. Construction facilities and controls provided by Owner.
 - 8. Mobilization
 - 9. Project Coordination
 - 10. Utilities provided by Contractor and Owner.
 - 11. Security and housekeeping procedures.
 - 12. Procedures for maintaining record documents.
- D. Engineer will record minutes and distribute after the meeting, via email, to participants.

1.7 PROGRESS MEETINGS

- A. The Engineer will schedule and administer meetings throughout progress of the work. Meetings shall be held, at a minimum, once per month, on-site, unless deemed otherwise by the Engineer/Owner, while the work is underway. Engineer will make arrangements for meetings, prepare agenda as necessary, and preside at meetings.
- B. Attendance Required: Job superintendent, major Subcontractors and Suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- C. 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. Effect of proposed changes on progress schedule and coordination.
- D. Engineer will record minutes and distribute after the meeting, via email, to participants.

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1.8 PRE-INSTALLATION MEETING

- A. When required in individual specification sections, convene a Pre-Installation meeting at the site prior to commencing work of the section. Some topics may be discussed and coincide with the monthly project meetings, where the specific Pre-Installation meeting may not be required, as determined by the Owner and Engineer.
- 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 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

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. Section 00700 - General Conditions
- B. Section 01400 - Quality Control
- C. Section 01600 – Material and Equipment – Substitution criteria; “Or-Equal” clause.
- D. 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 ten (10) 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. Submittals NOT conforming to the requirements of these SUBMITTAL PROCEDURES may be rejected by the Engineer and returned NOT REVIEWED with re-submittal required.
- B. All submittals shall be electronic:
 - 1. Electronic submittal procedures are only applicable to Shop Drawings and product data submittals.
 - 2. Electronic submittals shall be made in JPEG, TIF, or PDF format.
 - 3. Reviewed submittals shall be returned in JPEG, TIF, or PDF format for the Contractor's distribution.
- C. Transmit each submittal with Contractor's transmittal form.
- D. Submittal Numbering:
 - 1. Sequentially number the transmittal forms, starting with #001 for the initial submittal of the first shop drawing sent for Engineer's review.
 - 2. The second product submittal will be #002, third is #003, etc.
 - 3. Re-submittals shall have original number and a "Revision Number" such as "REV1", for example 001 REV1 for the first resubmittal of the initial product, 001 REV2 if another resubmittal of the initial product is necessary, etc.
- E. Identify Project, Contractor, Subcontractor and supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- F. 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.
- G. 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.
- H. All drawings, information and documentation shall be prepared and submitted with all words in the English language and dimensions in Imperial units. No foreign language or metric units will be permitted.
- I. Identify variations from Contract Documents and Products and system limitations which may be detrimental to successful performance of the completed work.
- J. Provide space for Contractor and Engineer review stamps.
- K. Revise and resubmit submittals as required. Contractor shall identify all changes made since previous submission whether changes are due to Engineer's prior comments or revisions made by supplier, vendor etc.
- L. Distribute copies of reviewed submittals to all concerned and related parties. Instruct parties to promptly report any inability to comply with provisions.

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 to measurements, sizes of members, materials, 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. Contractor shall then provide the submittals to the Engineer, electronically, for review.
- C. The Engineer will review the Contractor's, subcontractors' and manufacturers' drawings within 10 business days after receipt thereof and will return electronically, endeavoring to indicate, by notation thereon or written instructions, any correction which may be necessary to meet the Contract requirements.
 - 1. 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.
 - 2. 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.
 - 3. The Engineer's review will be limited to a maximum of two (2) re-submittals (beyond the original submittal.) Contractor shall pay for Engineer's review time beyond two (2) re-submittals, where submittal continues to be non-compliant with Project requirements.
- D. 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 10 days after date of Owner-Contractor Agreement submit list of all major products proposed for use, including those previously that may have been 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: Refer to Section 01600 - MATERIALS AND EQUIPMENT for Substitutions for a Cause and Substitutions for Convenience requirements.

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, material 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

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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 acceptance of 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
 1. Submit in electronic format as outlined in Section 1.4.
 2. After review, Contractor shall distribute in accordance with the SUBMITTAL PROCEDURES article herein and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- P. Product Data
 1. Submit in electronic format as outlined in Section 1.4
 2. Mark each submittal to identify applicable products, models, options, and other data. Supplement manufacturers standard data to provide information unique to this Project.
 3. After review, Contractor shall distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.
- Q. 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.

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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

SECTION 01310
PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- A. Section 00700 - General Conditions
- B. Section 01950 – Special Project Requirements

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 work of separate stages and other logically grouped activities.
- C. Provide sub-schedules to define critical portions of the entire schedule.
- D. Show accumulated percentage of completion of each item, and total percentage of work completed, as of the last day of each month.
- E. 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.

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1.5 REVISIONS TO SCHEDULE

- 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 SCHEDULE SUBMITTAL

- A. Submit initial schedule within 14 calendar days after date established in Notice to Proceed. Owner and Engineer to review and provide comments. If revisions are required, resubmit revised data within 5 calendar days.
- B. Submit schedule in PDF format.
- C. Schedule Updates and Schedule Submittal Frequency – Submit an updated schedule to all parties every time an update/change is made. Clearly indicate date of issue on the schedule.

1.7 DISTRIBUTION

- A. Distribute copies of reviewed/revised 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

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Construction Material Testing and Special Inspection Services.
- C. Tolerances.
- D. References.
- E. Manufacturers' field services and reports; training.

1.2 RELATED SECTIONS

- A. Section 01000 – General Specifications – Testing of materials for disposal.
- B. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
- C. Section 01600 - Material and Equipment: Requirements for material and product quality.
- D. Section 01950 – Special Project Requirements: Construction Material Testing and Special Inspections.

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.

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1.4 CONSTRUCTION MATERIAL TESTING AND SPECIAL INSPECTION SERVICES

- A. Construction material testing and Special Inspection as required under the Michigan Building Code are required for this project. Refer to Section 01000 Contractor testing of materials for excavation and disposal and 01950 for additional information.

1.5 TOLERANCES

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

1.6 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.

1.7 MANUFACTURERS' FIELD SERVICES AND REPORTS; TRAINING

- A. When specified in individual specification sections and/or on the Drawings, 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. Contractor shall provide equipment and controls training and support as specified on the Drawings.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. 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, water supply, and sanitary facilities.
- B. Temporary Controls: Fire Protection, barriers, protection of the work.
- C. Construction Facilities: First Aid, Traffic Access Roadways; Parking; cleaning.

1.2 RELATED SECTIONS

- A. Section 00700 - General Conditions
- B. Section 01000 – General Specifications – Site Restoration.
- C. Section 01005 - Administrative Provisions
- D. Section 01700 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY AND LIGHTING

- A. Contractor shall contact local utility and obtain temporary power from overhead in the Park, as shown on Sheet G-1, for the staging area. Contractor shall pay for power installation. All circuits shall be insulated, weatherproof, equipped with an equipment grounding conductor. All enclosures and devices shall be weatherproof.

1.4 TEMPORARY HEAT AND VENTILATION

- A. The Contractor shall provide ventilation of enclosed areas to cure materials; to disperse humidity; and to prevent accumulations of dust, fumes, vapors, or gases. Provide temporary heat is necessary during times that interior of Filter Building, including Pipe Gallery may be open to cold weather conditions.

1.5 TEMPORARY WATER SERVICE

- A. Municipal water shall be made available for the Contractor's use, at the Park, with the staging area. The discriminate use of the Municipal water for normal purposes of construction shall be at no cost to the Contractor. Excessive or indiscriminate use of water will be cause for the Owner to require the Contractor to pay for the water used.
- B. If connections are made to the hydrants, the Contractor shall obtain authorization from the appropriate Fire Department. The Fire Department standard wrench shall be used for opening and closing the fire hydrants.

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1.6 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain adequate and required facilities and enclosures during the entire duration of the project. Portable toilets shall be used. Locate near Office Trailer, in location approved by the Owner, and locate additional temporary facility on-site at the Plant, at the construction location. Contractor personnel shall not use Plant restrooms nor the Park restrooms at the Pavilion.

1.7 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 Plant and accessory buildings/structures and distribute the liquids directly from the containers. Storage of flammable liquids shall not be allowed inside the Plant. Refer to avoidance of bringing groundwater contaminants on-site in the General Conditions.

1.8 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 and existing facilities.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- C. Where off-site areas adjacent to the Plant are used for parking, material storage, staging etc., Contractor shall protect and erect barriers to secure these areas from the public. Contractor staging area shall be fenced as specified in Section 02831.

1.9 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.

1.10 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 readily available in the work area(s) and posted in the office trailer.

1.11 PARKING

- A. Paved parking areas are limited at the Plant and the existing open spaces shall be maintained for Plant staff and Plant visitors. Coordinate acceptable construction employee parking areas with Plant staff and City Engineering Department (when using off-site parking areas.)

1.12 TRAFFIC REGULATION AND ROADWAY ACCESS

- 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.

1.13 PROTECTION OF PROPERTY AND SURVEY MONUMENTS

- A. 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.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Provide dumpster for construction materials and related debris. Collect and remove waste materials, debris, and rubbish from site and dispose off-site.

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, at completion of project. Pay for removal fees as incurred by the removal of these items.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original pre-construction condition. Restore Park areas and Mason Street as specified under site restoration in Section 01000.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

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SECTION 01590

FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary field offices and sheds.
- B. Maintenance and cleaning.
- C. Removal.

1.2 RELATED SECTIONS

- A. Section 01500 - Construction Facilities
- B. Section 01600 - Material and Equipment

1.3 USE OF EXISTING FACILITIES

- A. Existing facilities shall not be used for field offices or for storage.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION FIELD OFFICE

- A. Portable or mobile building with floor raised above ground with steps and landing at entrance door.
- B. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove at completion of Work.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
- D. Exterior Materials: Weather resistant, finished materials.
- E. Interior Materials in Office: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
- F. Lighting for Offices: 50 ft-C at desk top height, exterior lighting at all doors.

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- G. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.
- H. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

2.3 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain 68 degrees F heating and 76 degrees F cooling.
- B. Storage Spaces: Heating and ventilation as needed to maintain Products in accordance with Contract Documents; adequate lighting for maintenance and inspection of Products.

2.4 CONTRACTOR FIELD OFFICE

- A. Contractor to provide field office for Contractor use.
- B. Size: For Contractor's needs and to provide space for routine meetings.
- C. Furnishings: As required by Contractor.
- D. Miscellaneous Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer.

2.5 FIELD ENGINEER OFFICE

- A. Contractor to provide field office for the Engineer's use. Engineer's office may be within Contractor's field office but Engineer to have separate space within and separate key lock on door to Engineer's space
- B. Area: Minimum 100 sq ft .
- C. Windows: Minimum one operable sash.
- D. Receptacles – Minimum (2) two duplex 120V.
- E. Furnishings: Temporary furniture may be used, but in good condition. Furnishings shall be as follows:
 - 1. One desk 30 x 60 inch with three drawers.
 - 2. One drafting table or similar surface area for plan set – min. 36 x 72 inch.
 - 3. One standard four-drawer letter - size metal filling cabinet with locks and two keys per lock.
 - 4. One swivel arm chair.
 - 5. One tackboard 36 x 30 inch.
 - 6. One waste basket.

2.6 STORAGE AREAS AND SHEDS

- A. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01600.

PART 3 EXECUTION

3.1 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

- A. Install office space, ready for occupancy, within 15 days after date fixed in Notice to Proceed but prior to start of any work.

3.3 MAINTENANCE AND CLEANING

- A. Provide weekly cleaning and maintenance for office and storage areas.
- B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

- A. When no longer required, remove all buildings, foundations, utility services, and debris.
- B. Restore the area of its original condition or as required by the Contract Documents.

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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. Section 01300 - Submittals
- 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 review and acceptance of the Engineer.
- B. If requested, 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 of the 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 the Painting 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.

- 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 and Owner at least two (2) working 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. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. 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.

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.

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- 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. 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.
- D. Substitutions of "or equal" products are subject to review and acceptance of the Engineer. Engineer will determine if "or equal" product is acceptable for use.

1.8 SUBSTITUTIONS

- A. Definitions:
 - 1. **Substitutions for Cause:** Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms; impacts to project schedule that adversely affect completion of the Work.
 - 2. **Substitutions for Convenience:** Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to Contractor. Requests for Substitution for Convenience shall be made only during Bidding.
- B. **Substitutions for Convenience will not be considered after the Award of the Contract.**
- C. Should the need arise after the Award of the Contract, Engineer will consider requests for Substitutions for Cause as outlined below.
 - 1. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
 - 2. State why the product specified cannot be provided.
 - 3. A request constitutes a representation that the Contractor:
 - a. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - b. Will provide the same warranty for the Substitution as for the specified Product.
 - c. 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.
 - d. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 4. 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.
 - 5. Substitution Submittal Procedure:
 - a. Submit request for Substitution for consideration. Limit each request to one proposed Substitution.
 - b. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - c. 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.

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

1.9 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 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.
- 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 concurrence of the Engineer.

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.

3. On-site training shall be provided for equipment as specified in Section 01700 – CONTRACT CLOSEOUT.

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. Operations manuals for equipment.
- H. Warranties.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.

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 all surfaces on which dust and dirt has collected.
- C. Clean equipment with cleaning materials appropriate to the surface and material being cleaned.

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- D. Remove construction related waste, surplus materials and rubbish, from the site.
- E. 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.
- F. 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 full-size prints of the Drawings effected or in the specifications which shall be kept at the job site for review 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. As-Built Drawings 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 review 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 transfer all as-built revisions and changes to a clean set of Construction Drawings and deliver them to the Engineer. These drawings shall be dated and marked "As-Built".
- I. All documents made by the Contractor, equipment manufacturers, and/or material suppliers shall be corrected to show the work as actually completed or installed with a copy of these drawings turned over to the Engineer.
- J. Submit all documents to Engineer for review prior to submittal of final Application for Payment.

1.7 SPARE PARTS AND SPECIAL TOOLS

- A. Spare Parts
 - 1. As soon as practicable after review and acceptance 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. The Contractor shall deliver all special tools required by this contract to the Owner.

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.
 - 1. Equipment start-up pertains to the groundwater pump station.
- 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 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. Provide a minimum of one (1) training session for the Owner's personnel, for each required system.
- 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.
- 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 OPERATIONS MANUALS FOR EQUIPMENT

- A. Contractor shall provide, in three D side ring binder with durable plastic cover, printed copies of all Owner's Manuals and operation instructions for equipment provided.
 1. Multiple pieces of equipment may be included in one binder but include an index and tabbed separation pages between products.
 2. Provide 2 copies of binder for Owner.
 - a. Submit a "draft copy" to Engineer for review and comments, prior to final submission for closeout.
- B. Provide final binder information from item A above also in PDF format on a USB drive for Owner.

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.
- 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 01900

SOIL CONDITIONS AND BORING LOGS

PART 1 GENERAL

1.1 SOIL CONDITIONS

- A. The Contractor is specifically referred to in the following items in the Contract Documents regarding soils information:
 - 1. The location of the soil borings is indicated on the drawings. The Geotechnical Investigation Report is included in Appendix of these Specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01950

SPECIAL PROJECT REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL

- A. Contractor shall comply with the following as included in the specifications and submit with the Proposal Form:
 - a. Iran Sanction Form - Vendor Certification (Section 00704)
 - b. Debarment Certification Form (Section 00460)
- B. The Contractor shall schedule and arrange his work so that the Water Production Plant (WPP) functions will remain in service, without interruption, until the improvements have been completely constructed, installed, and tested.
- C. In general, work on the new facilities may proceed on a schedule established by the Contractor to meet the completion date agreed to in the Proposal Form. However, all scheduling shall be subject to the Owner's review and acceptance.
- D. Contractor shall apply for and obtain all required permits prior to the start of on-site construction. See Section 01000 for permit requirements.
- E. The Contractor shall be entirely 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 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.
- F. It shall be understood that the project Bid Price is a Lump Sum. There will be no unit price measurements, quantities, or payment breakdown beyond how cost items are listed in 00300, Proposal form.
- G. The Contractor shall note the construction site area limitations as they impact on storage of excavated and construction materials.
 - 1. The Contractor shall make all necessary provisions for off-site storage as required for his operations. All costs for this work shall be included in his Lump Sum Bid price.
 - 2. Prior to commencement of site excavation, the Contractor shall provide the names and locations of the offsite disposal to be used for excess excavated materials. Excess materials that are not suitable for use as backfill or able to be used in the final grading and landscaping around the excavation area, shall be disposed of off-site.

1.02 RELATED SECTIONS

- A. Section 01000 – General Specifications
- B. Section 01300 – Submittals
- C. Section 01310 – Progress Schedule
- D. Section 02201 – Monitoring Vibrations

- E. Section 02669 - Buried Process Pipe and Fittings
- F. Section 03300 – Cast In Place Concrete

1.03 COORDINATION

- A. The provisions contained herein, particularly the suggested Sequence of Construction, shall be coordinated and incorporated into the Construction Schedule.
- B. The Owner shall be notified at least 15 days in advance of any planned process equipment, or electrical shutdowns, switchovers or lockouts.
- C. Prior to commencing any work, temporary construction fencing (8-foot chain link fence) shall be installed to protect any planned work areas. All temporary fencing shall be removed when final grading and site restoration begins. See Section 02831 for temporary fencing requirements.
- D. Contractor shall meet with Owner, Engineer and Vibration Monitoring Consultant to review vibration monitoring plan, see Section 02201. Vibration monitoring equipment shall be in place before site preparation begins.
- E. Prepare the site for construction as described in Section 02200 – Earthwork; provide soil erosion control measures as specified on the Civil Drawings.
- F. Restoration of the site, including any off-site areas used for parking, material storage, material staging, etc. shall be done strictly according to the requirements of these Plans and Specifications.
- G. All equipment and facilities shall be tested with finished water prior to being accepted by the Owner. Testing shall be conducted in the presence of the Owner's representative. All equipment and facilities shall then be cleaned and turned over to the Owner in good working order so that they may be made operational and a part of the Owner's facilities.

1.04 SPECIAL PROJECT REQUIREMENTS

- A. Construction Material Storage
 - 1. Contractor shall not park vehicles outside of the designated areas on the property as identified by the Owner or where they may inhibit the normal operations of the facility. All construction related equipment and materials shall be stored in the designated staging areas or at Owner approved locations. Staging area(s) will be determined between Owner and Contractor, at the site, after award of the contract. Refer to Sheet G-1 for additional information.
- B. Construction Material Testing and Special Inspections
 - 1. Construction Material Testing for Quality Control - The Owner shall arrange for construction material testing services for quality control, for verifying compliance with the Drawings and Specifications. The Contractor shall coordinate and schedule

- construction material testing with the testing agency and provide at least 48 hours notice for scheduling testing.
2. Special Inspections as required under the Michigan Building Code Section 1701 will be performed for the work. The content of statement of Special Inspections is listed on Structural Drawing, Sheet S-0. The Owner will arrange and pay for these services. Special Inspection reports will be provided to the Building Department per their requirements.
 3. Where a material test is specified to be provided by the Contractor, materials or tests results that are not compliant with Project Requirements shall be brought to the attention of the Owner and Engineer immediately upon knowledge of the results.
- C. Monitoring Vibrations – See Section 02201 for these requirements. Monitoring shall be set up before site work begins.
- D. Dust Control – The project site is located adjacent to public park areas to the north and south and commercial/residential areas to the west. The Contractor shall:
1. Maintain and employ dust control measures on-site at all times during the construction operations or weather conditions that generate airborne material are present.
 2. Use potable water to bind soils by spraying.
 3. Erect wind barriers as needed to reduce the velocity and erosivity of the wind. Barriers may include” solid board fences, burlap fencing, hay bales, etc.
 4. Cover stockpiles with solid materials as necessary.
 5. Provide street and driveway sweeping maintenance as needed.
 6. Where tarps or similar covers are used, maintain and anchor in-place.
- E. Use of Existing Reference Drawings
1. Several sheets of Reference Drawings, as noted under the Sheet Index on the Drawing set Cover Sheet, have been provided for the Contractor’s information. It shall be understood that these reference drawings are not considered As-Built drawings nor have the conditions they represent been field verified. These documents are provided as information only to assist in understanding what the general conditions and construction encountered may be. The Contractor shall field verify actual field conditions as needed.
- F. Progress Payments – Payments for the work shall be as specified in the General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor is responsible for the Schedule, including any Demolition, Staging, Sequencing, etc. required to complete the work in the time specified.

- B. Where necessary, as identified herein, limitations imposed on the Contractor are specified. The Contractor shall incorporate these limitations into the Sequence of Construction.
- C. This section includes a suggested general sequence of construction operations. This sequence shall not be construed as mandatory, nor shall the Contractor rely on it solely for the basis of determining his or her operations or costs as required to accomplish all of the work as shown on the Drawings or described in the project Specifications. All work shall be performed at no additional cost to the Owner , regardless of alternate construction sequences proposed by the Contractor or determined necessary to complete construction in accordance with the contract Drawings and Specifications.
- D. The Contractor shall assume full responsibility for scheduling and performing the work with partial and temporary shutdowns when absolutely necessary. Any work affecting Owner operations shall be included in the schedule and shall be submitted to the Owner for review and acceptance. Provide contingency plans for work items affecting operations for Owner review and acceptance.
- E. Contractor shall be responsible for maintaining WPP operations during all construction operations.
- F. Other sequences may be proposed by the Contractor and will be reviewed for acceptance by the Owner and Engineer.
- G. Submit a detailed Sequence of Operations Work Plan to the Owner and Engineer for review, minimum 2 weeks prior to starting the work. A review meeting will be scheduled by the Engineer for discussion, after initial review of the submitted document. Work will not proceed until Work Plan has been reviewed and accepted.

3.02 SUGGESTED GENERAL SEQUENCE OF OPERATIONS

The suggested sequence as outlined below is intended as a minimum guideline for setting a schedule. As specific details of the project develop or in the course of Bidding the project, the Contractor may suggest modifications to this sequence however, any suggested modification shall be subject to review and input from the Owner and Engineer, and as such, adequate review time shall be allowed. Any such modifications to the Suggested Sequence shall be reviewed by the Owner and Engineer prior to acceptance.

The existing WPP must remain in service at all times except that any outages required for switchovers shall be scheduled in advance with WPP personnel. **AT NO TIME SHALL ANY OF THE WPP CONTROL PANELS, PUMPS, OR CRITICAL PERTINENT SUPPORT EQUIPMENT BE ALLOWED TO BE OFFLINE OR OTHERWISE UNAVAILABLE FOR AUTOMATIC OPERATION AT THE END OF A WORKING DAY OR ON WEEKENDS.** During normal daytime shift work times and when the Contractor's staff are available to assist the Owner with operations, the Contractor may schedule times when the pumps and equipment may be removed or disconnected from automatic operation in order to provide for a switchover in power source or for changes to controls. Prior to initiation of any such switchover in power or controls, the Contractor shall review in advance with the Owner and Engineer's personnel the method of switchover, the duration of down time as well as any

other details associated with the procedure so that the Owner may assess the risk associated with the specific procedure. No switchovers shall be performed without the Owner's acceptance.

The suggested general sequence is as follows.

1. Complete permit requirements per Section 01000.
2. Mobilize to the site. Secure the area necessary for the work with temporary fencing.
3. Contractor shall proceed with submittals and equipment acquisition of all critical piping and equipment based on reviewed submittals.
4. Perform site condition assessment and photo documentation for vibration monitoring condition report; install vibration monitoring system devices.
5. Provide **Temporary Bypass** of Cell 2 for field verification.
 - i. Drain Clearwell Cell 2 so that interior can be inspected and documented for cracks along the common walls between Clearwell Cell 1 and Cell 2. Contractor shall inspect common walls, video document and photo document condition findings. Also document location and size of the overflow holes in these walls because these holes will be covered as part of the work to keep Cell 1 in operation while the new tank is being constructed.
 - ii. Field verify the centerline and pipe joints for the 16" FW, 16" WW and 16" HS and the 16" FW pipe outlet and 16" WW and 16" HS inlet elevations. Provide field verification data to the Engineer.
 - iii. Field verify the location and size of the openings between the existing Clearwell Cell 1 and Cell 2
6. Proceed with the removal of the Skate Park area and excavation for the Clearwell.
7. Excavate site to elevation 584.0 and Proceed with installation of Low Permeability Barrier Wall per the Drawings.
8. Construction of Perimeter Drain, Perimeter Drain Pump Station (PS-1), and force mains to existing manhole as shown. (The new pump station shall not be used for construction operations dewatering.)
9. Begin construction of the Clearwell, Filtered Water (FW), Washwater (WW), High Service (HS) and Overflow (OF) piping outside of the existing Clearwells, Retaining Walls A and B, and all related appurtenances.
 - a. Develop a groundwater management plan for the installation of structures.
 - b. This groundwater management plan shall incorporate the installation of the Clearwell and the Retaining Walls.
 - c. Proceed with initial groundwater management to enable excavation for the Clearwell and Retaining Walls.
 - d. Maintain the groundwater elevation within the entire excavation at an elevation that will not allow boiling or uplift of the structural concrete slab pour. Closely monitor site conditions and vibration monitoring; any movement shall be considered unacceptable.
 - e. Pour the structural floor slabs and proceed upward with the structural walls.

- f. Install the Filtered Water piping from the Clearwell to outside of the existing Clearwell Cell 2. Install the above grade FW, WW, HS and OF piping and valves within the valve vault.
 10. Replace the existing Clearwell Cell 1 Isolation Gate Valve.
 - a. Install the 16" gate valve that isolates the Existing Clearwell Cell 1 (FW-101). This will require a **Temporary Shutdown** of the WPP and draining of this header and must be coordinated with the WPP personnel (up to 8 hours if completed during period of low demand). The Contractor should be prepared to complete the work during the shutdown overnight, at no additional cost to the Owner.
 11. **Phase I Demolition** - Complete Existing Clearwell Cell 2 Demolition and Piping Interconnection. See Structural Drawings for specific requirements pertaining to demolition of Cell 2 area.
 - a. The Contractor shall notify the WPP prior to the installation of the new 16" FW piping and 16" WW piping and connection to the existing 16" FW and 16" WW within Cell 2. This will require a **Temporary Bypass** of Cell 2 in which the WPP isolates the existing 16" FW to Cell 1 and opens the Washwater Pump suction to this same pipe.
 - b. Once the WPP has successfully isolated Cell 2 for demolition and demonstrated this operation, Cell 2 can be taken offline. Install the watertight seals/coverings on the overflow wall openings between the Cells 1 and 2. Install the new 16" and 24" FW and 16" WW to the existing piping per the Contract Drawings by connecting to the existing 16" FW and 16" WW piping. Construct the Chlorine Feed Chamber.
 - c. Complete the relocation of the existing Cell 2 water treatment sensors at the location of the Cell 2 wall to the inside of the Chlorine Feed Chamber.
 - d. Complete the demolition of the 4" bubbler pipe.
 - e. Complete wall cut for the access opening to the Chlorine Feed Chamber installation of the new wall on the east side of the filter gallery between the building and the former Clearwell Cell 2.
 - f. Complete the demolition of Existing Clearwell Cell 2 per the Contract Drawings.
 12. Complete the Clearwell Hydrostatic Testing and Construction of proposed Clearwell.
 - a. Complete the hydrostatic testing of the Clearwell and piping per the Contract documents; see Section 02669 for pipe testing and Section 03300 for testing of the concrete tank.
 - b. Following successful testing, complete the initial backfill of the Clearwell and bedding of the FW piping.
 - c. Install the WW piping and bedding and complete the final backfill of the Clearwell.
 - d. Complete the above grade installation of Clearwell accessories and other process components.
 - e. Connect OF pipe to the headwall as per the Drawings.
 13. Complete the installation of the new HS piping from the Clearwell to the High Service Pump Station (20" north connection). A **Temporary WPP Shutdown is required to complete this interconnection.**
 14. Complete the Clearwell Disinfection as outlined below.
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15. **Phase II Demolition** – Complete the Existing Clearwell Cell 1 Demolition and Piping Interconnection. See Structural Drawings for requirements pertaining to Cell 1 area demolition and filling old clearwell area under the building.
 - a. The Contractor shall notify the WPP prior to the demolition of Cell 1.
 - b. Complete the connection of the new 24” and 16” FW to the existing 16” FW within Cell 1 per the Contract Drawings.
 - c. Complete the installation of the new closure wall for the 16” FW opening between Cell 1 and the filter gallery lower level per the Contract Drawings.
 - d. Complete the backfilling and demolition of Existing Clearwell Cell 1 per the Contract Drawings.
 - e. **A Temporary Shutdown is required for the 24” FW interconnection with the new 24” FW from the Chlorine Feed Chamber.**
16. Complete the installation of the new 20” HS piping to the High Service Pump Station (20” south connections)
17. Complete the construction of the access drive to the building following the relocation of the process components on the south wall of the filter gallery; sawcut wall and install new door.
18. Complete the remaining civil, architectural, structural, plumbing, mechanical, process, and electrical work.
19. Complete all exterior site restoration including seeding, landscaping, and finish all administrative tasks of the Contract.

3.03 CLEARWELL DISINFECTION

- A. The Contractor shall complete disinfection of the new Clearwell in accordance with AWWA C-652 (Method 2 or 3) and submit a work plan for Owner review and acceptance.
- B. The Clearwell disinfection shall comply with the requirements of Michigan R 325.11117, provided as follows:
 1. Proper techniques shall be followed during construction to keep storage tanks clean and dry.
 2. A finished water storage tank shall be disinfected before initial use and after any internal maintenance or repair activity.
 3. Bacteriological Testing - Before placing a storage tank into service all of the following shall occur; also see Section 02669, Buried Process Pipe and Fittings, item 3.9 for testing:
 - a. Before collection of each bacteriologic sample, heavily chlorinated water shall be flushed from the tank, drain piping, riser and all other appurtenances until the chlorine measurements in the water leaving the tank is absent or no higher than that normally maintained in the storage tank.
 - b. Not fewer than 2 consecutive water samples for bacteriological analysis shall be collected 24 hours apart unless an alternate interval is approved by EGLE.
 - c. An analysis shall not indicate the presence of coliform. Analyses for other contaminants may be required if EGLE has reason to believe that these contaminants are present.

3.04 ELECTRICAL, INSTRUMENTATION, AND PROCESS CONNECTIONS

- A. Power must remain in service at all times. Work related to any shutdowns of power, if necessary, shall be coordinated and planned ahead of time with the Plant.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.1 GENERAL

- A. All dewatering, well pointing, pumping, bailing and cleaning shall be performed that is necessary to complete the work as specified.
- B. The Contractor will be held to have compared the conditions of the site where work is to be performed with the Drawings and Specifications and to have satisfied himself as to the conditions of the site, existing conditions, and any other conditions affecting the carrying out of the work, before delivery of his proposal.
- C. The Contractor shall draw his own conclusions as to soil and groundwater conditions to be encountered and he shall complete the work under any job or field condition which was present and/or ascertainable prior to bidding.
- D. Contractor shall review the geotechnical data including water level information observed during boring operations.
- E. He shall also complete the work under whatever conditions he may create by his own sequence of construction, construction methods, or other condition he may create at no additional cost to the Owner.
- F. No allowance or extra consideration on behalf of the Contractor will subsequently be allowed by reason of error or oversight on the part of the Contractor.
- G. All work shall be done in a thorough and workmanlike manner and in conformance with accepted good practices and all requirements of local, state, and federal authorities having jurisdiction.
- H. The requirements of the Soil Erosion Control Permit shall be adhered to at all times.

1.2 SUBMITTALS

- A. Submit Dewater Plan to Owner and Engineer for review, minimum 2 weeks prior to starting dewatering systems installation. Identify pumping discharge point, pump equipment, power/fuel measures, hose size, pump capacity.

1.3 RELATED SECTIONS

- A. Section 01000 - General Specifications
- B. Section 01900 - Soil Conditions and Boring Logs

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PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 REMOVAL OF WATER

- A. Ample means and devices shall be provided and maintained at all times during the life of this Contract to remove and properly dispose of all ground water and drainage water within, around, and entering the excavated area. The excavation and the structures within shall be kept dry until the work is completed, or as approved by the Owner.
- B. The water level within and below work areas shall be so maintained that there is no unbalanced upward pressure on the bottom of structures, sewers, or open excavations during the construction period.
- C. In addition, water that may occur during excavation for base slabs, pipe trenches, etc., shall be channeled to accumulate in certain low points and disposed of through a filtering device before entering into the approved discharge sewer in accordance with the Soil Erosion Control Permit measures.
- D. Discharge Location – Dewatering discharge shall be to the grass area upland of the Lake or to Owner acceptable stormwater structure location, as permissible.
 - 1. There are no stormwater structures on-site, within the WPP fence line. The closest stormwater structure is the catch basin shown on the Civil Sheets, west end of Mason Street.
 - 2. All stormwater discharge shall flow through filter bags and filtration shall be maintained by Contractor for the duration of the construction dewatering activities.
 - 3. Dewatering hoses that cross the bike path or sidewalk around the Plant perimeter shall be provided with ADA compliant ramps constructed over them. Contractor shall be responsible for ramp construction from non-slip durable materials designed for pedestrian and bike traffic over, and shall maintain the ramp(s) for the duration of the dewatering activities.
 - 4. The new Pump Station shall not be used for construction dewatering activities.
- E. The Contractor shall determine the extent of dewatering required to complete the work, and shall include all dewatering costs as incidental to the work, as bid in the lump sum cost in the Proposal. The Owner will not review claims from the Contractor trying to justify additional or extra dewatering measures deemed by the Contractor to be outside of the scope of work or bid cost.
- F. All excavation dewatering shall be routed as necessary so as not to impede construction. In any event, all pumping and drainage shall be done without damage to any other property, public or private, and without interference with the rights of the public or private property owners.

- G. The Contractor shall review soil information provided under Section 01900 - Soil Conditions and Boring Logs. This information may be used as an aid to the Contractor in determining the screen material necessary for well points or relief wells to prevent the removal of soil fines with the water removed. All pumping and drainage shall comply with Soil Erosion Control measures and with the requirements of the Soil Erosion Control Permit
- H. The Contractor shall receive no extra compensation for providing, maintaining or operating any dewatering or drainage facilities.
- I. On completion of this project the Contractor shall fill all dewatering depressions and withdraw all dewatering facilities and drainage devices and restore the area to an acceptable condition, as approved by the Owner.

END OF SECTION

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General
 - 1. Site Conditions
 - 2. Hazardous/Contaminated Materials excavation and disposal.
- B. Backfill
- C. Flowable Fill
- D. Expansive Demolition Grout
- E. Excavation and disposal of materials
- F. Unauthorized Excavation
- G. Subgrade
- H. Slopes, Sheeting and Bracing
- I. Backfill and Compaction
- J. Finish Grading
- K. Perimeter Drains
- L. Measurement and Payment for Earthwork and Rock Excavation

1.2 RELATED SECTIONS

- A. Section 00700 - General Conditions
- B. Section 01000 – General Specifications
- C. Section 01400 - Quality Control
- D. Section 01500 - Construction Facilities
- E. Section 01900 - Soil Conditions and Boring Logs
- F. Section 02140 – Dewatering
- G. Section 02201 Monitoring Vibrations

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1.3 SUBMITTALS

- A. Section 01300 – Submittal Procedures: Requirement for submittals.
- B. Product Data: Submit data on expansive demolition grout.
- C. Contractor and manufacturer’s installation Instructions: Submit installation procedures for use of expansive demolition grout.
- D. Shop Drawings: Submit for review the following:
 - 1. Submit flowable fill mix design and documentation
 - 2. Flowable fill mix design submittal shall include, but not be limited to:
 - a. Sources of cement and aggregate.
 - b. Product data on all admixtures used.
 - c. Sieve analysis, mechanical properties, and deleterious substance content for coarse and fine aggregate in accordance with ASTM C33.
 - d. Chemical analysis and physical test of cement.
 - e. Certification that admixture used in the same concrete mix are compatible with each other and the aggregates.
 - f. Test data Alkali Silica Reactivity of Cementitious materials and aggregates.
 - g. Historical test records of concrete strength for mixes provided or three-point curve strength data for new mixes proposed.
- E. Delivery Tickets
 - 1. Furnish to Engineer copies of all delivery tickets for each load of flowable fill delivered to the site. Provide the following items of information on the deliver tickets:
 - a. Contract/Job Name
 - b. Amount of flowable fill being delivered.
 - c. Time that water was added to the dry ingredients.
- F. Resubmissions: Indicate on resubmissions all revisions made to previous submittals.

1.4 GENERAL

- A. All excavation and backfilling shall be performed that is necessary to complete the work under this Contract. Excavation shall include the loosening, loading, removing, transporting, stockpiling, and disposing of all materials of every sort, necessary to be removed for purposes of construction; the furnishing, placing, and maintaining of all sheeting, bracing, and timbering; the care of existing roads, existing structures, utilities; and all incidental and collateral work necessary to complete the entire work as specified and as shown on the Drawings.
- B. Disposal costs shall be paid by the Contractor and included in the Lump Sum Price for the work. Contractor shall estimate the material quantities for disposal, as part of the Bid process. For the purpose of Bidding, it shall be assumed that excavated materials are non-hazardous for off-site disposal.
- C. Backfilling shall include the filling of the excavated and void spaces around and over the outside of completed structures and pipes. It is also the intention of these specifications to provide that backfill shall be so compacted that no appreciable subsequent settlement will

occur, and so that sidewalks, driveways, etc. may be placed (or replaced) shortly after completion of backfilling.

- D. The Contractor will be held to have compared the conditions of the site where work is to be performed with the Drawings and Specifications and to have satisfied himself as to the conditions of the site, existing conditions, and any other conditions affecting the carrying out of the work, before delivery of his proposal. It is expressly understood that he will obtain first hand information concerning the available facilities for receiving, transporting, handling and storing construction equipment and materials and concerning other local conditions that may affect his work.
- E. The Contractor shall draw his own conclusions as to soil and/or rock conditions to be encountered, and he shall complete the work under any job or field condition which was present and/or ascertainable prior to bidding.
- F. He shall also complete the work under whatever conditions he may create by his own sequence of construction, construction methods, or other condition he may create at no additional cost to the Owner.
- G. The Contractor shall be responsible for evaluating the compatibility of his construction methods with the Drawings, Specifications and Soil Information provided by the Owner for bidding purposes.
- H. No allowance or extra consideration on behalf of the Contractor will subsequently be allowed by reason of error or oversight on the part of the Contractor.
- I. This Contractor shall grade all areas within his work area and provide slopes and level surfaces defined according to existing and established grades.
- J. All work shall be done in a thorough and workmanlike manner and in conformance with accepted good practices and all requirements of local, state, and federal authorities having jurisdiction.

1.5 REGULATORY REQUIREMENTS

- A. Excavated materials not used for backfill and site restoration shall be properly disposed of, off-site, at the Contractor's expense.
- B. Obtain disposal permit from Local Enforcing Agency.

1.6 QUALITY ASSURANCE

- A. Comply with all code, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.
- B. Backfill materials shall be compacted to not less that specified percentage of optimum dry density as determined by ASTM D 698 and as specified elsewhere in these Specifications.
- C. Testing of backfill material will be done in accordance with ASTM D 2922, ASTM D 1556, and ASTM D 3017.

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- D. Unsuitably compacted backfill materials shall be removed and recompacted.

1.7 SITE CONDITIONS

- A. Provide and maintain barricades, warning lights, warning signs, and other protection required by applicable laws for safety of persons and property.
- B. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent earth movement.
- C. Notify Owner of unexpected subsurface conditions and discontinue affected work area until notified to resume work.

1.8 HAZARDOUS/CONTAMINATED MATERIAL

- A. There is no known buried hazardous or contaminated soil materials on-site, in the area of the new work. Contractor to pay for excavated soils testing for disposal – this is not part of the Hazardous Materials Testing and Abatement Allowance.
- B. The existing concrete clearwell top slab and a portion of the exterior tank sidewalls are covered with what appears to be a bituminous waterproof coating applied in 2014 during tank repair operations (see photos on Sheet A-3.) Contractor shall provide off-site proper disposal in the Lump Sum Bid price and assume this portion of the mastic covered concrete materials cannot be crushed and used as recycled concrete.
- C. Assume that tank sidewall protection board material shown on Sheet A-3, photo “Northeast Corner of Clearwell #2” will be tested under the Hazardous Material Testing and Abatement Allowance. (There is no record of what this protection board material is and it maybe be original to the 1935 Clearwell #2 construction.) Use testing allowance for this item, for abatement also, if necessary. Removal and disposal of the concrete itself shall be included in Contractor’s Lump Sum Bid price.
- D. Prior tank inspection data from 2014 indicates that Vandex was used as an interior waterproofing coating inside the clearwells; Vandex is an applied crystalline coating that is NSF approved. Coating may be tested, if required for confirmation, for disposal/recycling of concrete interior tank walls. Use testing allowance for this item. Removal and disposal of the concrete itself shall be included in Contractor’s Lump Sum Bid price.
- E. The following information, subsequent to items A through D above, is provided, should a concern regarding excavated soil or exposed materials arise:
- F. The following indicators shall be used by Owner’s on-site observer during excavation to identify materials suspected of being hazardous or contaminated and requiring disposal in a Type I or Type II landfill.
 - 1. Materials other than general construction debris of a color not consistent with the natural soils observed in the area.
 - 2. Materials other than general construction debris of a consistency that is not consistent with the natural soils observed in the area.
 - 3. Man-made containers, vessels, tanks, or barrels.
 - 4. Insulation or fibrous material that may contain asbestos.
 - 5. Material that emits a chemical or petroleum odor.

Based on these observations, materials in question shall be stockpiled separately, inspected, and representative samples should be collected and screened in the field. Materials should be stored on plastic sheeting at the predesignated, secure location on the parcel or an adjacent parcel and covered with plastic sheeting until disposal is determined.

- G. 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. It is assumed that the presence of VOCs should provide a general indicator of the presence of other potentially hazardous chemicals.

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 excavation.

- H. Based on the field screening and laboratory analysis, the test results will determine Contractor method of disposal.
- I. The Contractor shall have presumed hazardous/contaminated materials tested, using the testing allowance. If materials test positive, Owner will pay the difference between non-hazardous/contaminated disposal cost that Contractor is paying for, for off-site disposal and cost for disposal of these materials, unless agreed otherwise with the Contractor.

PART 2 PRODUCTS

2.1 BACKFILL

- A. All material necessary to complete the backfill as specified on the Drawings or to replace excavated unsuitable material shall be furnished by the Contractor. See Structural and Process Drawings for backfill and pipe bedding materials. Backfill at structures, backfill to replace unsuitable material and backfill under gravel or stone and paved roads, shall all be granular material conforming to Michigan Department of Transportation (MDOT) Granular Materials Class II, unless specified otherwise. If suitable material for backfilling is not available on site then suitable material shall be brought in from an off-site borrow pit by the Contractor at no additional cost to the Owner. (Refer to the soil borings for existing soils on-site.)
- B. The Owner shall have the right to reject any backfill material which when used in the work, does not accomplish the required compaction.
- C. All backfill material shall be free from large or frozen lumps, concrete rubble, blue clay, sod, wood, debris, and other extraneous material.

2.2 FLOWABLE FILL

- A. Where called for on the Drawings certain areas of the excavation and areas of existing structures shall be backfilled with flowable fill.
- B. Flowable fill shall consist of a mixture of Portland cement, granular material or fine aggregate, fly ash, and water. Mix design, strength requirements and trial batching shall be in accordance with the Michigan Department of Transportation Special Provisions; for Non-Structural Flowable Fill, 12RC205 (A020) and for Flowable Fill, 12RC205 (A025).

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- C. Cement shall be Portland Cement conforming to A.S.T.M. C 150 Type II. Air entrained cement, pozzolan, and other types of cement shall not be used. Fly ash shall conform to the requirements of A.S.T.M. C618, Class F. Water shall be potable.
- D. The stabilized fly ash mixture shall contain 10% Portland cement based on the dry weight of the fly ash. The mixture shall have a slump of 10 to 12 inches at the point of placement. The mix temperature shall not be lower than 50°. The mixture shall have a compressive strength of 100 psi minimum at 28 days.
- E. The method used to measure fly ash and cement shall be submitted for acceptance. The contractor's proposed method shall be one that compliments the type of mixing plant being used and provides assurance that the percentage of cement is being satisfactorily controlled. Cement content shall be based on the dry weight of the fly ash in the mix. The batched weight of fly ash shall be corrected for its moisture content. Water shall be measured, although its control will be a function of consistency (slump and workability) of the mix.
- F. The flowable fill may be mixed by a pug mill, central concrete mixer, turbine mixer or other acceptable equipment or method. Provisions shall be made to maintain the mix temperatures and slump as stated.
- G. The material shall be placed by end or side dumping, tremie, pump, conveyors, or other suitable method. Lines and grades shall be as shown on the Drawings. Stabilized fly ash shall be protected from freezing temperatures for the initial 24 hours after placement. Protection may consist of earth cover, straw, or a sacrificial layer of the stabilized fly ash mix.

2.3 EXPANSIVE DEMOLITION GROUT

- A. Dexpan Demolition Grouts, www.dexpan-canada.com
- B. Buster Expanding Grout, 800-282-4384.

PART 3 EXECUTION

3.1 EXCAVATIONS

- A. The Contractor shall make all excavation necessary for the construction of all work called for by the Drawings or specified herein.
- B. Excavations shall be made to the line and grade shown on the Drawings including removal of unsuitable soils from under structures or roads, or as required to meet MIOSHA regulations. Side slopes of unbraced excavations shall be such as to prevent slides which might injure the work. The Contractor shall conduct his excavation and other operations in such a manner as to ensure that the bed for footings and foundations remains free from rutting, trampling, or other undue disturbance. The beds for footings and foundations shall be true to grade and free of all loose material before any concrete is put in place. All unauthorized excavation below grade of any structure shall be backfilled with concrete to the proper grade at the Contractor's expense. The Contractor shall make all necessary fills to bring grade to finished grade shown on the Drawings. Fills and cuts shall be graded to a uniform, smooth, and even grade to grades as shown on the Drawings to meet Owner's approval. Existing underground utilities

that are to remain in place shall be protected and any damage caused by excavating shall be made good.

C. Excavation classification shall be defined as follows:

1. Common excavation: This shall include the removal and disposal of all materials not classified as rock excavation.
2. Rock excavation: This shall include the removal and disposal of all hard or cemented materials. For this classification, rock shall be defined as solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses, or conglomerate deposits, neither of which can be removed without systemic drilling and blasting, drilling and expansive demolition grouting, backhoe mounted rock breaker or large track type tractors with single tooth ripping equipment having a power rating of at least 300 flywheel horsepower.

D. Blasting will not be permitted.

E. Submit notification of encountering rock in the project. If at anytime during construction the Contractor encounters material that is classified as rock excavation, uncover such material and notify the Owner's Representative. Do not proceed with the excavation of this material until the Owner's Representative has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Owner's Representative, and allow ample time for classification and cross sectioning of undisturbed surface of such material will cause the forfeiture of the Contractor's right to claim to any classification or volume of material to be paid for other than that allowed by the Owner's Representative for the areas of work in which such deposits occur.

F. Control the grading in the vicinity of excavated areas so that the surface of the ground will be properly sloped to prevent water from running into the excavated areas. Such areas shall be kept reasonably dry at all times. Accumulated water in the excavated areas shall be removed by pumping.

G. Broken concrete or rubbish unsuitable for backfill shall be disposed of by the Contractor. Borrow material shall be graded in such a way that surface water will continue to drain in a manner similar to the drainage patterns present before filling occurred. Broken concrete and rubbish shall be disposed of off-site.

3.2 UNAUTHORIZED EXCAVATIONS

- A. Whenever the excavation is carried beyond the lines and grades established by the Drawings or as accepted by the Owner, the Contractor shall, at his own expense, fill all such excavated space with an approved material and in such a manner as to meet the acceptance of the Owner.
- B. Unauthorized excavation beneath structures shall be filled with plain concrete, or flowable fill as determined by the Owner.

3.3 SUBGRADE

- A. The subgrade for all structures shall be prepared so as to have as near as practicable a uniform density throughout the entire area. The subgrade shall be compacted to 95% maximum

density at optimum moisture content as specified in AASHTO-180 or by Michigan Cone density, whichever is greater, by rolling or by other acceptable methods. After being prepared, the subgrade shall be maintained until concrete has been placed thereon.

- B. If, through neglect or delay on the part of the Contractor, the earth at subgrade elevation becomes unsuitable for the support of the work to be constructed thereon, the Contractor shall excavate down to solid earth, and shall backfill to the required subgrade elevation with plain concrete, compacted sand, or other suitable material as required to meet the Owner's approval. Unstable subgrade soil under all concrete foundations shall be replaced with plain concrete.
- C. All subgrades shall be reviewed and accepted by the Engineer before proceeding with backfilling and compaction, landscaping, or other construction work.
- D. Subgrades shall be level and clean of all loose rock, dirt, and debris and free of standing water prior to placing concrete.

3.4 SLOPES, SHEETING, AND BRACING

- A. All slopes shall be cut and maintained to the proper degree required for stability. Sheeting and bracing shall be placed and maintained as indicated and/or whenever required for safety to men and the work. The degree of slope for all excavations shall be fixed by the Contractor, and shall comply with all State and Federal safety requirements.
- B. The Contractor shall provide, install, and maintain all shoring, sheet piling, and bracing required to maintain banks of excavations and other construction, and assume full responsibility for same. The design of all shoring systems shall be performed by an Engineer registered in the State of Michigan, retained and paid for by the Contractor. The shoring system design computations shall be sealed by the Engineer who prepared them and forwarded to the Owner prior to implementation of the work.

3.5 BACKFILL AND COMPACTION

- A. It is the intent of these Specifications that backfill shall be so placed and consolidated that no appreciable subsequent settlement will occur.
- B. Backfill shall be placed in uniform layers not exceeding 12 inches in depth when measured loose and each layer shall be thoroughly compacted by tamping, sheepsfoot-roller, mechanical vibrators, or by other effective means acceptable to the Engineer. All backfill in all areas shall be compacted to at least 95% of maximum density, at optimum moisture content as specified in MDOT Standard Specifications for Construction Controlled Density Method. Compaction by flooding will not be permitted.

The Owner shall have the right to reject any backfill material which when used in the work, does not accomplish the required compaction.

- C. No backfill material shall be placed on areas where free water is standing or on frozen subsoil areas.
 - 1. Clean areas and excavations to be backfilled of all trash and debris before placement of backfill. In placing backfill, take special care to prevent any wedge action,

eccentric loading, damage, or overloading of any adjacent structures, piping, and equipment by equipment used in compacting backfill material.

- D. Heavy equipment for spreading and compacting fill and backfill shall not be operated closer to a wall than a distance equal to the height of the fill or backfill to be placed. Power-driven hand operated equipment shall be used against walls and where space limits the use of heavy equipment.
- E. All excavations around the walls and other foundations, etc., shall be backfilled to meet Owner acceptance after all work has been reviewed and accepted. Backfill shall not be placed against walls until all supporting slabs are in place and have attained their design strength or as indicated on the Structural Drawings.
- F. If compaction tests indicate work does not meet specified requirements, remove work, replace and retest.

3.6 FINISH GRADING

- A. The Contractor shall grade the entire site as indicated on the Drawings to a smooth and even grade, meeting existing grades and/or the grades indicated on the Drawings.
- B. Excavated material suitable for backfilling shall be stored in areas designated by the Owner. Reusable topsoil that is displaced shall also be stored in a separate area from the backfill.
- C. Finish grade under gravel road areas and under paved areas shall be limited to 1/2 inch in 10 feet from true profile, and shall be maintained until succeeding layer or surface course is placed.
- D. Finish grading shall slope uniformly to contour lines shown on the Drawings, and to meet existing adjacent levels. The Contractor shall grade all areas within his work site and provide slopes, shoulders, berms, and level surfaces defined according to existing and established grades. The work shall also include all adjacent areas disturbed by construction and as required by new pavement installation.
- E. The subgrade for all slabs and pavements shall be prepared so as to have as near as practicable a uniform density throughout the entire area. The subgrade shall be compacted to 95% maximum density at optimum moisture content, as specified under BACKFILL AND COMPACTION herein, by rolling or by other acceptable methods. After being prepared, the subgrade shall be maintained until concrete, or pavement has been placed thereon.
- F. If, through neglect or delay on the part of the Contractor, the earth at subgrade elevation becomes unsuitable for the support of the work to be constructed thereon, the Contractor shall excavate down to solid earth, and shall backfill to the required subgrade elevation with plain concrete, or other suitable material as required to meet the Owner's acceptance.
- G. Soil found to be unstable in the subgrade shall, when required to meet the Owner's approval, be excavated to firm soil and replaced with MDOT Granular Material, Class II, as specified above thoroughly compacted. Subgrade area supporting structures shall have unstable material replaced with acceptable concrete.

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3.7 INSTALLATION OF PERIMETER DRAINS

- A. Install at locations where drains are shown or called to be installed on the Drawings.
 - 1. Install aggregate and filter cloth as shown on details on Drawings.
 - 2. Compact aggregate as specified and complete filter cloth installation prior to completion of backfill.

3.8 MEASUREMENT AND PAYMENT FOR EARTHWORK AND ROCK EXCAVATION

- A. Earthwork volumes shall be calculated by the Contractor as specified herein. Earthwork costs shall be included in the Proposal Lump Sum Price amount submitted by the Contractor.
- B. Rock Excavation – The Proposal Lump Sum Price shall also include the cost for the Estimated Quantity of rock excavation identified on the Proposal form. Rock excavation volume above or below the amount indicated on the Proposal form, shall be added or deducted from the Contract Price by the Unit Price Per Cubic Yard submitted by the Contractor on the Proposal form. This will occur via a Change Order during construction.
- C. Measurement and payment for rock excavation will be by the number of cubic yards of acceptably excavated rock material. Rock shall be measured in place with the volume based on the following criteria:
 - 1. A maximum width of 30 inches for pipes 12 inches in diameter or less.
 - 2. A maximum width of 18 inches greater than the outside diameter of the pipe for pipes over 12 inches in diameter.
 - 3. For manholes and pump stations, 12 inches outside of wall line of the structure.
 - 4. For wall footings and tank mat, 18 inches parallel to the footing or mat edge.
 - 5. For underdrains, 12 each side of pipe centerline and 12 inches below pipe centerline.
- D. Measurement in place will be by the Owner’s Engineer/Surveyor and quantities shall be reviewed between Owner and Contractor prior to submitting for payment of this item. Payment will be by measured in-place volume only, not weight or truckload.

END OF SECTION

SECTION 02201

MONITORING VIBRATIONS

a. Description

This work shall consist of furnishing all the necessary labor, materials, and equipment to monitor vibrations at the Water Production Plant (WPP) facility during the construction of the new clearwell tank to assure that vibrations are within tolerances set forth in this Specification. The structures adjacent to and in the immediate area of the new clearwell tank, including the Filter Building, High Service Pump Station and underground piping, fresh water intake from Lake Huron, the Low Lift Pump Station and underground piping and Existing Clearwell 1 shall not be damaged throughout the construction of the new Work. These structures and piping systems must remain in service.

The Contractor shall understand that vibration monitoring, as required by this Section, shall be 24/7 for the duration of construction, through the demolition and backfilling operations for the final grading of the site. Monitoring shall not be stopped unless agreed to by the Owner and the Engineer.

(2) two monitoring devices are required and shall be installed 14 days prior to construction to establish baseline conditions, as specified.

The Contractor is referred to AASHTO Designation: R 8-96 "Standard Recommended Practice for Evaluation of Transportation-Related Earthborne Vibrations" for guidance in addition to this Specification.

See the Allowances section of the Proposal Form for these Vibration Consultant (referred to herein as the Consultant) services.

b. Vibration Monitoring

The Contractor shall retain the services of the Vibration Consulting Firm as specified in the Proposal Form. The Consultant shall provide the following vibration monitoring services:

1. Submitting of monitoring plans and daily reports, overseeing installation of the vibration monitoring equipment and interpretation of vibration monitoring data shall be performed by personnel with the following qualifications:
 - A. Must be a Professional Engineer currently registered in the State of Michigan.
 - B. Must have a minimum of five years' experience in the vibration consulting field.
 - C. Must have successfully completed at least five projects that involved monitoring vibrations and evaluating effects of vibrations on structures.
2. Installation and monitoring of the vibration monitoring equipment, and collection of the vibration monitoring data shall be performed by personnel with the following qualifications.
 - A. Must have at least three years of experience in the operation of the proposed monitoring equipment and interpretation of data produced by such equipment.

- B. Must have installed, operated, monitored, and interpreted vibration monitoring equipment and data on at least five projects that involved monitoring vibrations and evaluating the effects on structures.

The qualifications shall be submitted to the Engineer for review and approval at least one week prior to the start of monitoring.

c. Site Survey and Existing Conditions Documentation

Huron Engineering and Surveying, Inc. will work with the Consultant to survey adjacent existing buildings and structures to establish exact elevations at fixed points to act as benchmarks. Consultant shall clearly identify benchmarks and record existing elevations. Consultant shall:

1. During construction, dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in any adjacent structures.
2. Develop pre-condition survey as described below.

d. Planning and Construction

The Consultant shall develop a detailed vibration monitoring program and meet with the Owner, Engineer and Contractor for review. Draft of program shall be submitted minimum of one week prior to the review meeting. Edit plan as needed per review comments.

The Contractor shall note that the Program must be reviewed and be in-place prior to the start of any sitework.

Once the program is acceptable to the Owner and Engineer, Consultant shall perform existing conditions survey, install all the necessary vibration monitoring equipment, establish baseline vibrations; monitor vibrations during vibration-inducing construction operations, and interpret vibration monitoring data throughout construction of the new work.

The following items must be met:

1. The Consultant's monitoring plan shall be developed in accordance with AASHTO R8-96. The instrumentation locations, monitoring procedures, and a description of the monitoring devices and/or the manufacturer's brochures shall be included in the submitted plan.
2. The Consultant shall perform a pre-condition survey and video/photo document exposed structure conditions.
 - A. Photograph cracks on building walls and measure cracks for documentation. Provide temporary identification (ID) designations for the cracks on surfaces and in survey report.
 - B. Install plastic concrete crack monitoring devices on cracks 1/8 inch and wider in brick and concrete wall surfaces. Device shall measure in 1 mm increments in both the vertical and horizontal direction. Secure devices to surface with screws or adhesive as suitable for substrate.
 - C. Provide color video documentation of site area and structures being monitored.
1. Install vibration monitoring devices to establish the baseline vibration conditions from the day-to-day activities in the local area. This must be done minimum two (2) weeks – 14 days, prior to the start of construction. Install two devices – one near the north end of the Filter Building and one near the

south end of the Filter Building. Specific locations will be as recommended by the Consultant and agree to by the Owner and the Engineer.

2. The record peak particle velocity at the ground surface within right-of-ways and along a direct line to the adjacent structures should not exceed 0.05 inch/sec with a hammer energy rated at 32,500 ft-lbs.

Any records in excess of this particle velocity shall require immediate cessation of the construction activities that are responsible for the excess ground vibration and:

- A. The Engineer and Contractor shall be notified immediately.
 - B. The Contractor is responsible for using different methods and/or different equipment to stay within vibration tolerances at no additional cost to the Contract. Provide recommendations for vibration-limiting methods to meet the specified peak particle velocity limitations.
3. Provide daily reports to the Engineer within 24 hours when vibration-inducing operations are taking place. The following shall be included:
 - A. The source of the vibration readings.
 - B. A plot of the ten highest readings (occurrences) on a graph of Particle Velocity (in/sec) vs. Frequency (Hz). Include the U.S. Bureau of Mines (USBM) RI 8507 curve on the same graph.
 - C. Instances, dates, and times when recordings exceeded the threshold limits.
 - D. Produce a Log PPV vs. Log Distance Plot based upon same event monitoring at different distances from the source.

Working with the Consultant, the Contractor shall have complete responsibility for the control of vibrations (due to his construction operations), prevention of consequent settlement and/or damage to the existing structures adjacent to the project site and for repair of any damage whatsoever resulting from his construction operations. Repairs due to damage shall be at the Contractor's expense.

e. Measurement and Payment

The completed work shall consist of furnishing all the necessary labor, material, and equipment necessary for the preparation and monitoring ground vibrations and survey work throughout the construction of the new clearwell tank project, including underground piping installations. The cost for this work shall be included in the Contractor's Lump Sum base bid price in Section 00300 – Proposal.

END OF SECTION

SECTION 02669

BURIED PROCESS PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY OF WORK

- A. Covers all pipe, fittings and appurtenances installed in buried conditions and used for process services and perforated foundation drain piping.
- B. Furnish all labor, materials, tools, equipment, and supervision required to complete all piping systems, as indicated on the Drawings and specified herein, and all other work incidental thereto, except as otherwise noted.
- C. In the event that provisions of this specification conflict with information on a pipe schedule provided in the contract Drawings, the information in the pipe schedule shall take precedence.
- D. Pipe pressure testing.
- E. Bacteriological testing for new Clearwell tanks.

1.2 RELATED WORK

- 1. Section 01300 – Submittals
- 2. Section 01950 Special Project Requirements
- 3. Section 15060 – Exposed Pipe and Pipe Fittings
- 4. Section 15100 – Valves

1.3 REFERENCES

- A. All materials and workmanship shall be in conformance with the following:
 - 1. Standards and Standard Methods published by the American Water Works Association (AWWA).
 - 2. Any and all Federal, State, and/or local codes, ordinances, or regulations.

1.4 SUBMITTALS

- A. Shop Drawings are required for each item in this section of the specifications, including, but not limited to piping, couplings, gaskets, fittings, layouts, dimensions, etc. in accordance with Division 1.
- B. Manufacturer's Certificate: The manufacturer shall furnish a sworn statement that the inspection and all specified tests have been made, and that the results comply with the requirements of the listed standards.
- C. Contractor's Field Reports: Certify that installed products meet or exceed specified requirements.

1.5 DELIVERY STORAGE AND PROTECTION

- A. Properly store and protect all pipe per manufacturer recommendations.

1.6 REGULATORY REQUIREMENTS

- A. All piping materials, layout, and installation shall meet the requirements of governing local, state, and national codes. Referenced codes and standards herein shall be the current code or standard in effect at the time proposals are received.

1.7 REFERENCE STANDARDS

- A. NSF International (NSF)
1. NSF 61: Drinking Water System Components
- B. American Water Works Association (AWWA)
1. Various references as noted

PART 2 PRODUCTS

2.1 GENERAL

- A. For drinking water service provide NSF 61 certified pipe fittings and valves

2.2 DUCTILE IRON PIPE

- A. Pipe
1. The ductile iron pipe to be furnished, delivered and installed under this specification shall conform in all respects with the requirements of the current edition American National Standards Institute and American Waterworks Association for “Ductile-Iron-Pipe, Centrifugally Cast in Metal or Sand-Lined Molds for Water or Other Liquids,”(ANSI/AWWA C151/A21.51) except as may otherwise be specified herein.
2. Dimensions and thickness of ductile-iron pipe will be based on the Special Thickness Class as listed in ANSI/AWWA C150 and shall conform to the pipe schedule on the Contract Drawings.
- B. Joints
1. All joints in which bolts are used shall be protected from corrosion by coating with Bitumastic #50 or cement mortar to a minimum thickness of one inch after the joint is completed.
2. All buried pipe shall have mechanical joint type joints, unless specified otherwise on the Contract Drawings.
3. Mechanical Joints
a. Mechanical type joints shall be in accordance with the current standard for “Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings” ANSI/AWWA C111/A21.11. Bolts for mechanical joints shall be of low alloy steel conforming with the characteristics listed in this standard.
b. Manufactured in accordance with Section 10-5.1 of “Gray Iron and Ductile Iron Fittings, 3” through 48” for Water and Other Liquids.” (ANSI/AWWA C110/A21.10).
4. Restrained Joints
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- a. Retrain joints on all fittings and valves.
 - b. Provide thrust restraints on all couplings within the specified distance from valves and fittings.
 - c. Provide thrust restraint using the following:
 - 1) Mechanical restraint joint couplings: EBAA Series 1100 Mega-Lug or reviewed equal
 - 2) Locking gaskets: Fast-Grip by American Cast Iron Pipe Company, Field-Lok by US Pipe, or reviewed equal
- C. Gaskets
- 1. Supplied by the pipe manufacturer,
 - 2. Conform to all requirements of AWWA C111.
 - 3. Styrene Butadiene Rubber (SBR)
- D. Fittings
- 1. Gray-iron and/or ductile-iron conforming with AWWA C110
 - 2. For compact fittings, conform to AWWA C153
 - 3. Cast the manufacturer's mark, nominal diameter of openings, type of fitting, and pressure rating on the fitting.
- E. The pressure rating of pipe joints shall meet the minimum requirements as listed in ANSI/AWWA C111.
- F. Hardware
- 1. Low alloy steel compliant with AWWA C111
 - 2. Coated with a minimum two (2) coats of fluoropolymer epoxy coating and heat cured.
 - 3. Manufacturers:
 - a. Cor-Blue by Birmingham Fasteners
 - b. R-Blue by Romac Industries
 - c. Owner reviewed equal.
- G. Lining
- 1. The pipe shall be lined with a cement mortar lining in accordance with the requirements of the current standard for "Cement Mortar Lining for Cast-Iron Pipe and Fittings for Water" ANSI/AWWA C104/A21.4.
 - 2. Required for all pipe and fittings.
 - 3. Provide double thickness lining.
- H. Polyethylene Encasement
- 1. Required for all pipe and fittings
 - 2. Polyethylene encasement in accordance with AWWA C105
 - 3. Install following Method "A"

2.3 FOUNDATION PERIMETER DRAIN PIPE

- A. Perforated HDPE corrugated plastic pipe for foundation drain as shown on the Drawings.
- B. An adapter is required to the 6-inch perforated foundation drain to pipe at the pump station. Provide and install per manufacturer's recommendation.

PART 3 EXECUTION

3.1 GENERAL

- A. All pipe and fittings delivered to the Project shall be accompanied by documentation that the pipe and fittings meet the applicable specifications.
- B. Provide the necessary material and labor to make connections to existing piping when called for on the Drawings. Provide all necessary gaskets, bolts and fittings for this purpose.
- C. Pipe shall be kept clean. During construction, openings in pipe shall be fitted with temporary plugs except where the pipe is actually being worked on. Piping must be clean at time of final acceptance of the work.
- D. Where necessary to cut pipe, cutting shall be done with reviewed tools and cut ends of pipe shall be square and regular. Cutting shall be done in a manner to avoid damage to lining and coating.
- E. To prevent trench water from entering the pipe, joints which for any reason may not be completed as the pipe is laid shall be thoroughly packed with reviewed material, in a manner to make them watertight. Open ends of fittings shall be tightly closed with reviewed plugs and well packed as shall the end of the last pipe laid whenever work is not in progress.
- F. Tools or other objects shall not be stored or left in the pipe.

3.2 EXCAVATION

- A. The Contractor shall do all the excavation required for the construction of the pipes and appurtenances, including clearing of the site of the work and the removal and disposal of all materials necessary to be removed in the construction of all work under this contract.
- B. Excavation shall be of sufficient widths and depths to provide adequate room for the construction and installation of the work to the lines, grades, and dimensions called for on the Drawings and to allow the backfill to be placed and compacted properly. Excavation shall be to depths which will provide a minimum cover of five (5) feet over the top of pipe to plan grade, unless otherwise noted on the Drawings.

<u>Pipe Size</u>	<u>Trench Width</u>
6-8"	32"
24"	46"
36"	68"
42"	75"

- C. Excavated materials may be temporarily stored along the trench, unless otherwise noted, in a manner that will not cause damage to trees, shrubs, fences, or other property, nor that will endanger the bank of the trench by imposing too great a load thereon.
- D. Excavations shall be adequately braced and/ or sheeted to prevent caving or squeezing of the soil, or disturbing existing utilities or pavement and shall be completely dewatered prior to construction of the piping system or other structures.

- E. Where, through the Contractor's construction procedure, or because of poor existing ground conditions, it is impossible to maintain alignment and grade properly, or provide suitable support for the pipe, the Contractor shall, at his own expense, excavate below grade and replace with suitable reviewed material in order to insure that the pipe, when laid, will maintain correct alignment and grade.
- F. The subgrade shall be accurately prepared to line and grade so that the pipe, when laid, shall have uniform bearing upon the reviewed backfill, throughout its length.
- G. Pavement cutting, maintenance and restoration shall be done in a manner satisfactory to the Owner, and in accordance with other requirements of these Specifications.

3.3 PREPARATION OF TRENCH BOTTOM

- A. The bottom of trench shall be excavated neatly to the required grade prior to filling with minimum of four (4) inches of MDOT Class II sand thoroughly compacted by tamping before the pipe is laid. Blocking under pipe is strictly prohibited.

3.4 BACKFILLING

- A. After the pipe is laid, MDOT Class II sand backfill shall be thoroughly compacted in place to a level a minimum of four (4) inches above the top of the pipe. Particular care shall be taken to assure filling all spaces under, around and above the top of the pipe.
- B. The balance of the backfill shall be completed as shown on the Drawings for each specific area of work. If not indicated, MDOT Class II backfill shall be used near structures, replacing unsuitable material, or under gravel or stone and paved roads and sidewalks,
- C. All backfill material shall be free from large or frozen lumps, concrete rubble, blue clay, sod, wood, debris, and other extraneous material. The Owner shall have the right to reject any backfill material which when used in the work, does not accomplish the required compaction.

3.5 DUCTILE IRON PIPE

- A. Pipe shall be installed in accordance with the current AWWA C600, "Standard for Installation of Ductile Iron Water Mains and their Appurtenances."
- B. Before lowering into the trench, and while suspended, each pipe and fitting shall be inspected for defects and rung with a light hammer to detect cracks. Defective, damaged or unsound pipe shall immediately be removed from the construction site. The interior of each pipe shall be inspected for cleanness and cleared of all dirt and foreign matter before being lowered into the trench.
- C. Unless otherwise acceptable to Engineer, pipe shall be laid with bell ends facing in the direction of laying. After a length of pipe is placed in the trench, the spigot shall be centered in the bell of the adjacent pipe, the pipe shoved into position and brought to true alignment and there secured with sand tamped under and on each side of the pipe, excepting at bell holes. No earth or other foreign matter shall be allowed to enter the joint space.
- D. When the temperature is above 60 degrees F., the spigot of each pipe laid shall be brought tightly home in the bell of the preceding pipe. When the temperature is below 60 degrees F.,

the pipe shall be laid with the spigot end approximately 1/16" from the face of the bell to allow for expansion.

- E. Whenever deflections at joints are required by changes in grade or alignment, or to plumb valve stems, the deflection at any bell and spigot joint shall not exceed that which will cause the spigot end of pipe to be away from home in the bell of the adjacent pipe a distance of ¼ inch at the point of greatest opening. The deflection at any mechanical joint shall not exceed three-quarters of the maximum deflection recommended by the manufacturer of the joint used.

F. Jointing Pipe

1. Mechanical Joint

- a. Bells and spigots shall be thoroughly cleaned, and all foreign matter shall be removed. The bells, spigots and rubber gaskets shall then be thoroughly washed with soapy water to make sure that no particles of sand or grit can damage the gasket.
- b. The gland followed by the gasket, painted with soapy water, shall then be place over the plain end of the pipe, and this end shall be inserted into the bell. The gasket shall then be pushed into position with the fingers making sure that it is evenly seated in the socket of the pipe bell. After the gland has been moved into position against the rubber gasket, the bolts shall be inserted and made finger tight. All bolts shall be tightened with a 10 inch wrench, alternately and evenly, until all bolts are drawn up tight.
- c. Mechanical joints shall be in accordance with Section 10-5.1 of "Gray Iron and Ductile Iron Fittings, 3" through 48" for Water and Other Liquids." (ANSI/AWWA C110/A21.10).

2. Push-On Joint

- a. Push-on joints shall be in accordance with Section 10-5.2 of "Gray Iron and Ductile Iron Fittings, 3" through 48" for Water and Other Liquids." (ANSI/AWWA C110/A.21.10).

G. Thrust Control

1. Restrained joints are an allowable method for thrust control. Furnish and place thrust blocks at all plugs, caps, tees, fittings, bends and elbows, where indicated on the Drawings.
 - a. Size and dimension of the thrust blocking is detailed in the Drawings or Owner's standard details.
 - b. Construct thrust blocks with minimum 3,000 psi compressive strength concrete.
 - c. The cost of thrust blocks shall be included in the cost of the Work.
2. Thrust blocks shall be reviewed by the Owner or Engineer before installation and backfilling.
3. Where restrained pipe plugs are required, submit pipe plug to be installed prior

3.6 PVC PIPE

- A. Assemble connections in gasketed-jointed PVC pressure pipe with mechanical fittings to provide a leak free system.
1. Threaded or solvent-cement joints and connections are not permitted.
 2. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations.

- B. Pipe joining by use of mechanical fittings, clamps, couplings, and mechanical joint restraint systems shall be completed considering the following:
1. All mechanical fittings shall be designed for use with PVC pressure pipe, and rated for operating pressures equal to or greater than that of the piping system being installed.
 2. Gap between pipe ends shall not exceed 1/2 inch within mechanical couplings and clamps.
 3. Install gaskets in accordance with fitting manufacturer's procedures.
 4. Tighten bolts in accordance with fitting manufacturer's procedures.
 5. Certain mechanical fittings are not designed to restrain the pipe at all, or are not designed to restrain for all forces, such as thermal contraction/expansion and hydraulic thrust.
 - a. Additional restrained fittings must be installed or other measures taken, such as installation of concrete thrust blocks, cement stabilized backfill or inline pipe restraint, to restrain the pipe from movement due to all forces.
 6. The installation of mechanical joint restraint systems does not relieve the Contractor of installing thrust blocks as specified unless otherwise indicated.
 7. The completed joint shall be watertight and fully restrained.
 8. All defective joints shall be disassembled and replaced or reinstalled at no cost to the Owner.

3.7 FIELD QUALITY CONTROL

A. General

1. When a section of pipe and appurtenances has been completed and bedding material is in place, provide the appliances, facilities, and water required for performing the specified pressure and leakage tests.
2. After testing is complete, drain the pipeline without injury to the work or surrounding area.

3.8 HYDROSTATIC TEST

A. Procedure

1. All pressure pipe shall be tested to the pressure given in the pipe schedule. All tests will be made by the Contractor using his own equipment, operators, and supervision, in the presence of the Owner or his duly authorized representative. The length of the section to be tested shall be as reviewed by the Owner, or as shown on the Drawings. The test shall not be against an existing valve, unless written permission is obtained from the water system operator. In no case shall a test be made against an existing valve that is found to be leaking or otherwise defective.
2. Testing shall be in accordance with AWWA C600.

B. Air Removal Before Test

1. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

C. Leakage Test

1. A leakage test shall be conducted in the presence of the Owner's representative after the pressure test has been satisfactorily completed. The Contractor shall furnish the

pump, pipe, connections, gages and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of the test shall be 2 hours, and during the test the pipe shall be subjected to a pressure as given on the pipe schedule or 1-1/2 time working pressure.

2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled, and the pipe has been filled with water. No piping will be accepted until the total leakage measured over the quantity of pipe installed is below the testing allowance per the formula:

$$L = \frac{S * D * \sqrt{P}}{148,000}$$

L = allowable leakage in gallons per hour

S = length of pipe tested in feet

D = nominal diameter of the pipe in inches

P = average test pressure during the test, in psi (gauge)

* For pipes tested with varying diameter sections, the allowable leakage rate shall be the sum of the computed leakage for each section of pipe diameter

3. The Owner shall be furnished a written report of the results of the leakage test that identifies the specific length of pipe tested, the pressure, the duration of the test, and the amount of leakage. The report shall be signed by the Contractor and the Engineer.

D. Variation from Permissible Leakage

1. Should any test of pipe installed disclose leakage greater than that specified above, the Contractor shall at his own expense, locate and repair the pipe or joints that show evidence of leakage and repeat the test until the leakage is within the specified allowance.
2. Any cracked or defective pipe, fittings or valves shall be removed and replaced with sound material at the Contractor's expense and the test repeated to the satisfaction of the Owner.

3.9 BACTERIOLOGICAL TESTING

- A. Bacteriological analysis and testing shall be completed by a laboratory reviewed by the State of Michigan for such testing or the Plant.
- B. Disinfect potable water lines in accordance with ANSI/AWWA C651 and conduct bacteriological testing of water samples taken from the pipeline. Coordinate this with Plant personnel, for securing samples.
 1. Provide chlorination and bacteriological testing plan to the Owner prior to initiating chlorination.
 - a. Indicate method of chlorination.
 - b. Indicate the number and location of sampling points
 - c. Indicate the schedule of sampling
 - d. Indicate method of dechlorination of flushing water, if applicable
 2. Following chlorination, all treated water shall be thoroughly flushed from the pipe.

- a. The treated water will be considered flushed when the residual chlorine content is less than 0.7 ppm.
 3. Bacteriological testing to be performed by the Plant and coordinated through the Contractor.
 - a. The first water sample shall be taken 24 hours after disinfection and flushing, and the second 24 hours after the first sample.
 - b. Prepare a chain-of-custody for all samples taken, signed by all persons who handle the sample from the field, throughout transport to the laboratory, and at the laboratory.
 - c. Analysis of other contaminants may be required if the Engineer has reason to believe that these contaminants are present.
 4. Test results shall be directly reported to the Owner.
- C. Should the initial treatment of all or any section of the pipe, in the opinion of the Engineer, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the new pipe conforms to the foregoing requirements.
- D. Repeat bacteriological testing if the system is not activated within 30 days after initial testing.

PRESSURE TEST REPORT FORM

PROJECT: _____ DATE: _____

CONTRACTOR: _____ JOB NO. _____

OWNER: _____ REPORT NO. _____

TEST LOCATION _____

GENERAL

System to Be Tested: _____

Location of Pipe: _____

Type of Pipe Material: DI/CI Steel Cu PVC HDPE Other ____

Length of Pipe Tested: _____ feet

SPECIFICATION

Type of Test: Hydrostatic Pneumatic Other _____

Bacteriological Test Required?: Yes No

Duration of Test: _____ hours

Test Pressure: _____ psi

Pressure / Gallons Loss Allowed: _____ psi/gallons

TEST DATA

Pressure

Time

Start of Test: _____ psi _____ AM / PM

Completion of Test: _____ psi _____ AM / PM

Pressure / Gallons Lost at Finish: _____ psi/gallon

Results: Pass Fail

SYSTEM TEST PERFORMED BY:

Contractor Date

WITNESSED BY:

Engineer Date

ACCEPTED BY:

Owner Date

END OF SECTION

SECTION 02831

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Permanent (Final) fence framework, fabric, and accessories.
- B. Temporary construction fencing to secure site areas of work and adjacent, off-site storage, material laydown locations.
- C. Excavation for post bases, concrete foundation for posts, and center drop for gates.
- D. Gates and related hardware.

1.2 RELATED SECTIONS

- A. Section 03300 - Concrete Work.

1.3 REFERENCES

- A. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
- B. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
- C. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.
- F. ASTM F567 - Installation of Chain-Link Fence.
- G. ASTM F669 - Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.
- H. ASTM F1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- I. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual.

1.4 SYSTEM DESCRIPTION

- A. Provide temporary fence and gates to secure the construction area (and off-site areas) as specified and/or indicated on the Drawings.
- B. Provide new permanent fence and gates as specified herein and indicated on the Drawings.

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- C. All fencework shall follow a uniform gradient conforming to finished grades and be placed on lines shown.
- D. Contractor will be required to inspect the property where fence is shown located, to ascertain conditions under which installation is to be made, and employ a responsible layout person to insure that fence is accurately placed.
- E. The new permanent fence shall be 8'- 0" high chain link, matching the existing, adjacent installation along the east and south side of the Plant.
- F. Fencing along top of landscape retaining wall blocks at southeast corner of new Clearwell shall be minimum 4 foot high as detailed on the Architectural Drawings.
- G. Line post spacing shall be at intervals not exceeding 10 feet for site fence and 5 foot on center for landscape retaining wall block fence.

1.5 SUBMITTALS FOR REVIEW

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, schedule of components, and fence manufacturer.
- D. Immediately after award of the Contract, the Shop Drawings and Product Data shall be submitted to the Owner for consideration in accordance with the applicable subdivision of the General Conditions. No such items, or the material therefor shall be ordered, fabricated, delivered or incorporated into the work until the proper approvals for same have been received from the Owner.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with the CLFMI - Product Manual, ASTM F567, and as herein specified.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in installation the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 PERFORMANCE PRODUCT REQUIREMENTS

- A. Chain Link Fence systems components shall meet the minimum requirements specified in paragraph 2.2. Installation contractor shall meet the requirements of paragraph 1.7.

2.2 MATERIALS

- A. Steel for the posts shall be high carbon steel and contain not less than .35 percent carbon. No used, re-rolled or open seam material will be permitted in posts or rails. Weights herein mentioned for pipes are subject to the usual 5% tolerance. Pipe 4" O.D. and less shall be butt welded. Pipe over 4" O.D. shall be seamless.
- B. Intermediate Posts:
1. Intermediate posts shall be standard galvanized steel pipe, 2-1/2" outside diameter, weighing not less than 3.65 lbs. per lineal foot or galvanized 2-1/4" H-beam weighing not less than 4.1 lbs. per lineal foot, and shall be spaced not over 10'-0" on centers.
- C. Corner Posts:
1. Corner posts shall be standard galvanized steel pipe 3" outside diameter, weighing not less than 5.79 lbs. per lineal foot.
 2. Each corner post shall be provided with one 1-5/8" outside diameter brace tube placed horizontally mid-height between corner post and next intermediate post each side of corner post. In addition at each corner post one diagonal brace rod not less than 3/8" in diameter, shall be provided each direction. Brace tubes and rods shall also be provided at posts on each side of all gates.
 3. Corner post forming swing gate post as required shall have brace tube and rod as per above.
 4. Any post occurring at a change in direction of fence shall be considered as a corner post.
- D. Terminal Posts:
1. Terminal posts as required shall be same as corner posts and similarly braced.
- E. Lengths of Posts:
1. Intermediate posts shall be of sufficient length to be set minimum 36" into concrete. Corner posts and terminal posts shall be of sufficient length to be set minimum 39" into concrete.
- F. Post Caps:
1. All terminal posts shall have suitable malleable iron caps, with screw or rivet connection.
- G. Swing Gate Posts:
1. Swing Gate Posts shall be hot dipped galvanized 3" O.D. steel pipe weighing 5.79 lbs. per lineal foot for single swings up to 6'-0" or double swings up to 12'-0".
- H. Top Rails:
1. Top rails shall be standard galvanized steel pipe 1-5/8" outside diameter, weighing 2.27 lbs. per lineal foot, in mill lengths, and shall be fitted with expansion sleeve couplings.
 2. Rails shall pass through intermediate post tops and shall be finished with malleable iron fittings and steel bands to securely fasten to end, corner and gate posts.

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I. Fabric:

1. New zinc coating chain-link fence fabric shall be individual pickets, helically wound and interwoven, in the form of continuous chain-link fabric without knots or ties except knuckling or twisting and barbing at the ends of the pickets and in the selvage of the fabric.
2. Fabric shall be No. 6 gauge wire woven in a two inch mesh. Weight of zinc coating shall be minimum 2 oz. per square foot of wire surface. Zinc coating shall conform to current ASTM B-6. Top and bottom selvage to have a barbed finish. Barbing to be done by cutting wire on bias, thus creating sharp points. Fabric shall be band fastened every 16" to posts and top rail. Bands shall be galvanized or stainless steel material. Number 7 galvanized coated spring steel tension wire shall be pulled taut, placed 6" from bottom of fabric and banded in place.

J. Tensile Strength Test:

1. The wire of which this fabric is made shall have a minimum tensile strength of 80,000 pounds per square inch.

K. Galvanizing:

1. Galvanizing on all posts, braces, caps, arms, fabric and accessories shall be a minimum of 2.0 ounces per square foot per current ASTM A120.
2. All posts, rails, braces and fittings (except bands), are to stand five, one-minute immersions in a solution of copper sulphate according to the "Preece" test. Line posts, corner posts, and braces shall be galvanized inside and out by the hot dip method.
3. Galvanized coating shall be smooth, of reasonably uniform thickness, free from dross, uncoated spots, and adhering particles of foreign material.
4. Fence, accessories, hardware, and hot dip galvanizing shall conform to ASTM Specifications A120, A121-Class III, A123, A153-Class A, A392-Class 2, and A475-Class A for tension wire.

L. Swing Gates:

1. Materials for swing gates shall be square or round tube with galvanizing matching fencing. All gates shall be equipped with keepers, locking devices capable of receiving a padlock, and hold-open device. Width of gates shall be as shown on the Drawings.

M. Concrete Piers:

1. Concrete piers shall be sized as shown on the Drawings.
2. All post holes shall be dug so that center of post will, when lined and spaced, shall be not more than 1" from center of concrete pier.
3. Erector shall use care in erecting fence. Contractor shall space posts not more than 10'-0" on centers, and carefully erect all corner bracing as specified.
4. Concrete for all posts shall be minimum 3500 psi concrete, meeting the material specifications for concrete mixes in Section 03300. Tops of piers shall be finished smooth and to pitch away from posts.

2.3 TEMPORARY FENCING FOR SECURING CONSTRUCTION AREA AND CONTRACTOR OFF-SITE STORAGE AREA

- A. Temporary fencing and gates shall be provided and installed following these specifications and details for new fencing, except that materials may be used but in good condition. Also, concrete piers are only required at corners and at gate posts for temporary fencing. All other posts may be driven.
- B. Base plate mounted temporary fencing posts to support fence mesh are not acceptable. (This is maintenance concern with wind and snow and will not be allowed.)
- C. Post and bracing shall not contain any scale type rust or have concrete residual from piers still adhering to them. Posts and bracing shall not be bent or damaged in any way.
- D. Fabric shall not contain scale rust nor shall the fabric be damaged in any way that affects its strength or impedes its neat installation or reduces its ability to provide a secure site.
- E. All bolts and nuts shall be soaked in a rust inhibitive oil prior to installation.
- F. All fencing and support piers shall be removed from the site at the completion of the project.
- G. Where openings are required through the fence to install sewers, headwalls, utilities, etc. the Contractor shall be responsible for securing these openings at the end of each work day until they can be reclosed at the completion of that work task.
- H. Temporary fencing shall be installed to secure the construction site; it shall also be used to secure adjacent off-site material storage, laydown areas, etc. as maybe set up and utilized by the Contractor. Provide swing gates for access.
- I. Temporary fencing and gates shall be 8 ft high.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567 and as designated herein and shown on the Drawings.
- B. Place fabric on outside of posts and rails.
- C. Set intermediate, terminal, corner and gate posts plumb, in concrete footings with top of footing 1 inch above finish grade. Slope top of concrete for water runoff.
- D. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- E. Provide top rail through intermediate post tops and splice with 6 inch long rail sleeves.
- F. Install center and bottom brace rail on corner gate leaves.

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- G. Do not stretch fabric until concrete foundation has cured 7 days.
- H. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- I. Position bottom of fabric 1 inch above finished grade.
- J. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 16 inches on centers.
- K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- L. Install bottom tension wire stretched taut between terminal posts.
- M. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt retainer and locking clamp.
- N. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.2 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.
- C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 03050

CRYSTALLINE WATERPROOFING – MIX ADDITIVE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete structures as indicated on the Drawings and as specified herein.
 - 1. The crystalline waterproofing material shall be added to concrete during the mixing cycle, and shall be used in above or below-grade walls and base slab for the new clearwell tank, hatch sidewalls, precast topping, chlorine contact chamber walls and chamber top slab.
 - 2. It is not required for the mud mat under the tank base slab and the precast planks.
 - 3. See Structural Drawings for additional notes regarding mix additive.
- B. Related Sections:
 - 1. Section 03300 – Cast In Place Concrete

1.2 REFERENCES

- A. Applicable Standards: The following standards are referenced herein.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Army Corps of Engineers (CRD)
 - 3. American Concrete Institute (ACI)
 - 4. NSF International (NSF)

1.3 SYSTEM DESCRIPTION

- A. Crystalline Waterproofing Additive: Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Testing Requirements: Crystalline waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.
- B. Independent Laboratory: Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-90 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.

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- C. Crystalline Formation: Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.
- D. Permeability: Independent testing shall be performed according to U.S. Army Corps of Engineers CRD-C48-73 “Permeability of Concrete”. Treated concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). The treated samples shall exhibit no measurable leakage.
- E. Chemical Resistance: Independent testing shall be performed to determine “Sulfuric Acid Resistance of Concrete Specimens”. Treated concrete samples (dosage rates of 3%, 5% and 7%) shall be tested against untreated control samples. All samples shall be immersed in sulfuric acid and weighed daily until a control sample reaches a weight loss of 50% or over. On final weighing the percentage weight loss of the treated samples shall test significantly lower than the control samples.
- F. Compressive Strength: Independent testing shall be performed according to ASTM C39 “Compressive Strength of Cylindrical Concrete Specimens”. Concrete samples containing the crystalline waterproofing additive shall be tested against untreated control sample. At 28 days, the treated samples shall exhibit a minimum of 10% increase in compressive strength over the control sample.
- G. Potable Water Approval: Independent testing shall be performed according to NSF Standard 61, and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

1.5 SUBMITTALS

- A. General: Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer’s specifications, installation instructions, and general recommendations for waterproofing applications. Also include manufacturer’s certification or other data substantiating that products comply with requirements of Contract Documents.
- C. Test Reports: Submit, for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.
- D. Manufacturer’s Certification: Provide certificate signed by manufacturer or manufacturer’s representative certifying that the materials to be installed comply in all respects with the requirements of this specification.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer to be ISO 9001 registered, and to have no less than 10 years experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturer must be capable of providing field service representation during

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construction phase. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.

- B. Applicator: Installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
- C. Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with Architect/Engineer, owner's representative, applicator (concrete supplier), concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - 1. Project requirements for waterproofing as set out in Contract Document.
 - 2. Manufacturer's product data including application instructions.
- D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

1.7 DELIVERY, STORAGE & HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- C. Storage: Store waterproofing materials in dry, enclosed location, at temperature and humidity conditions recommended by manufacturer.

1.8 WARRANTY

- A. Project Warranty: Refer to conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be five years from Date of Substantial Completion. Provide written copy of warranty for Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Basis of the specification is:
Xypex Chemical Corporation
13731 Mayfield Place
Richmond, B.C., Canada V6V 2G9
Tel: 800 961.4477 or 604 273.5265
Fax: 604 270.0451
E-mail: info@xypex.com
Website: www.xypex.com
- B. Proprietary Products: Xypex crystalline waterproofing materials as follows:
 - 1. Xypex Admix C-500 – For use with fly ash or slag

2. Xypex Admix C-1000 – For normal use
 3. Xypex Admix C-2000 – For extended retardation
- C. Substitutions: The following admixture products may be provided when furnished with manufacturer data and literature showing compliance with basis of specifications:
1. Kryton Products – “Krystol Internal Membrane (KIM)
 2. The Euclid Chemical Company- Eucon VandexAM-10.
- D. Source Quality: Obtain proprietary crystalline waterproofing products from a single manufacturer.

2.2 DOSAGE

- A. General: Xypex Admix must be added to concrete mix at time of batching.
- B. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at a rate of 2% - 3% by weight of portland cement content. For enhanced chemical protection or meeting specific project requirements, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

- A. Compliance: Comply with manufacturer’s product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.

3.2 PROJECT CONDITIONS

- A. Reinforcement: All reinforcement shall be rib deformed bar in accordance with applicable standards. Exposed concrete decks (joint free) shall contain sufficient reinforcement to minimize thermal movement and control cracking.
- B. Setting Time and Strength: Some retardation of set may occur when using Xypex Admix. The amount of retardation will depend upon the concrete mix design, the dosage rate of the Admix, temperature of concrete and climatic conditions. Concrete containing Xypex Admix may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or manufacturer’s representative regarding concrete mix design, project conditions and proper dosage rate.
- C. Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices as referred to in ACI 305R-77 (Hot Weather Concreting) and ACI 306R-78 (Cold Weather Concreting). For flatwork being placed in either hot, dry or windy conditions use of monomolecular film (evaporation retardant) is recommended to control loss of bleed water.

3.3 APPLICATION

- A. General: Xypex Admix shall be added to the concrete mix at time of batching. Thorough blending of the Xypex Admix throughout the concrete mix is essential for correct performance of the product and, therefore, care should be taken to ensure that a homogeneous mixture is obtained.
- B. Concrete Batching & Mixing: Procedures for mixing will vary according to type of batch plant operation and equipment:
 - 1. **Ready Mix Plant - Dry Batching Operation:** Add Xypex Admix powder to drum of ready-mix truck, then add 60% - 70% of required water along with 300 - 500 lb. (136 - 227 kg) of aggregate. Mix the materials for 2 - 3 minutes to ensure that the Admix is distributed evenly throughout the mix water. Add balance of materials to the ready-mix truck and mix in accordance with standard batch practices.
 - 2. **Ready Mix Plant - Central Mix Operation:** Mix Xypex Admix with water to form a very thin slurry (e.g. 15 - 20 lb. or 6.75 - 9 kg of powder mixed with 3 gal. or 13.6 l of water). Pour the required amount of material in drum of ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck). Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of the Xypex Admix throughout the concrete.
 - 3. **Precast Batch Plant - Pan Type Mixer:** Add Xypex Admix to the rock and sand, then mix thoroughly for 2 - 3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices.

3.4 CURING

- A. General: Concrete containing Xypex Admix shall be moist cured in accordance with ACI Reference 308, “Standard Practice for Curing Concrete”.
- B. Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309.

3.5 PROTECTION

- A. Protection: Protect installed product and finished surfaces from damage during construction.

3.6 FIELD QUALITY CONTROL

- A. Examination for Defects: Do not conceal Xypex treated concrete before it has been observed by Architect / Engineer, waterproofing manufacturer’s representative and other designated entities. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer’s repair procedures.

3.7 INTERACTION WITH OTHER MATERIALS

- A. Backfilling: Normal backfilling procedures may be used after concrete has been cured for at least seven days. If backfill takes place within seven days after concrete placement, then backfill material shall be moist so as not to draw moisture from the concrete. In no event shall backfilling take place before concrete has gained sufficient strength to withstand the applied load.

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- B. Grout, or Cement Parge Coat: Because concrete containing Xypex Admix forms a relatively smooth surface and the resulting crystalline formation fills the concrete pores thereby reducing suction characteristics of the concrete, it may be necessary to use a suitable bonding agent for proper bonding of cementitious systems.

- C. Responsibility to Ensure Compatibility: Xypex Chemical Corporation makes no representations or warranties regarding compatibility of Xypex treated concrete with coatings, plasters, stuccos, or other surface-applied materials.
 - 1. It shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex treated concrete, to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the waterproofing treatment. Surface applied materials for this project are the waterproof membranes specified in Section 07110.

END OF SECTION

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SECTION 03100

CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
 - 2. Openings for other work.
 - 3. Form accessories.
 - 4. Form stripping.

- B. Products Installed But Not Furnished Under This Section:
 - 1. Section 03300 - Cast-In-Place Concrete: Supply of concrete accessories for placement by this section.

- C. Related Sections:
 - 1. Section 03200 - Concrete Reinforcement.
 - 2. Section 03300 - Cast-in-Place Concrete.
 - 3. Other Sections of work requiring attachment of components to formwork.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
 - 4. ACI 350 – Code Requirements for Environmental Engineering Structures and Commentary.
 - 5. ACI 347 - Recommended Practice For Concrete Formwork.

- B. American Forest and Paper Association (AF & PA):
 - 1. AF&PA - National Design Specifications for Wood Construction.

- C. The Engineered Wood Association (APA/EWA):
 - 1. APA/EWA PS 1 - Voluntary Product Standard PS 1 Structural Plywood.

- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

- E. West Coast Lumber Inspection Bureau (WCLIB/ASTM):
 - 1. ASTM - Standard Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

- A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.4 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals
- B. Product Data: Submit data on formwork accessories and installation requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347 standards.
- B. For wood products furnished for work of this Section, comply with applicable provisions of AF&PA National Design Specifications for Wood Construction.
- C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Design formwork under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Michigan.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable ACI 301 and ACI 347 code for design, fabrication, erection and removal of formwork.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Products storage and handling requirements
- B. Protect PVC waterstops from direct sunlight.
- C. Protect hydrophilic waterstops from exposure to water.
- D. Store materials off ground in ventilated and protected manner to prevent deterioration from moisture.

1.9 COORDINATION

- A. Section 01300 - Administrative Requirements: Provisions for coordination of work.
- B. Coordinate this section with other sections of work requiring attachment of components to formwork.
- C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.2 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage (1.5 mm) matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- D. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes required.
- E. Permanent Forms: Consist of the material, size, shape, thickness and finish indicated on Drawings. Permanent forms are to be supported and fastened to supports as recommended by the manufacturer and as indicated. Unless otherwise indicated, use galvanized metal forms for slabs. Anchor hollow forms used to create voids in concrete to prevent displacement or floatation. Vent hollow forms to prevent concrete cracking caused by air expansion during concrete hydration.
- F. Slipforms: Designed, constructed and operated by personnel experienced in slipform work. Conform to the shape, form, line and grade indicated.
- G. Void Forms: Concrete void forms shall be 4" maximum thickness, Sonovoid VoidForm as manufactured by Sonoco or reviewed equal.
- H. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, metal, fixed length, cone type, with waterproofing washer, 1-1/2 inch (38 mm) back break dimension, free of defects that could leave holes larger than 1 inch (25 mm) in concrete surface.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch (25.4 mm) of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:

- D. Do not use anchors and hangers in exposed concrete leaving exposed metal at concrete surface.
- E. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member. Penetration of structural steel members is not permitted.
- F. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete and NSF approved for contact with potable water.
- G. Corners: Chamfer type; 3/4 x 3/4 inch (18 x 18 mm) size; maximum possible lengths.
- H. Vapor Barrier: Where shown on Contract Drawings, 15 mil thick polyethylene sheet.
- I. Bituminous Joint Filler: ASTM D 1751.
- J. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- K. Waterstops for Construction Joints: NSF/ANSI 61 approved non-bentonite hydrophilic waterstop manufactured from modified chloroprene rubber. See Structural Drawings for waterstop manufacturer and model number or submit substitution under provisions of Section 01600.
- L. Waterstops for Expansion Joints: NSF/ANSI 61 approved waterstop, manufactured from virgin polyvinyl chloride, minimum 1750 psi tensile strength, minus 35 degrees F to plus 175 degrees F working temperature range, maximum possible lengths, ribbed profile, preformed corner, and intersection sections, splicing, and jointing with an electric splicing tool. Waterstop shall have hog rings installed in holes the same size or smaller than the diameter of the wire used to form the hog ring. Hog rings shall be the manufacturer's standard design. See Structural Drawings for waterstop manufacturer and model number or substitution under provisions of Section 01600.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions before starting Work.
- B. Verify lines, levels and centers before proceeding with formwork. Verify dimensions agree with Drawings.

3.2 EARTH FORMS

- A. Earth forms are not permitted.

3.3 INSTALLATION

- A. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
 4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 5. Complete wedging and bracing before placing concrete.
- B. Forms for “Smooth Finish” Concrete:
1. Use steel, plywood, or lined board forms.
 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full size sheets of form lines and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Use care in forming and stripping wood forms to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- C. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- D. Framing, Studding and Bracing:
1. Space studs at 16 inch (400 mm) on center maximum for boards and 12 inch (300 mm) on center maximum for plywood.
 2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
 3. Construct beam soffits of material minimum of 2 inch (51 mm) thick.
 4. Distribute bracing loads over base area on which bracing is erected.
 5. When placed on ground, protect against undermining, settlement or accidental impact.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301 and ACI 347.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Align joints and make watertight. Keep form joints to a minimum.
- H. Obtain Engineer’s review and acceptance before framing openings in structural members that are not indicated on Drawings.

- I. Install chamfer strips on external corners of beams, columns, and walls.
- J. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Apply form coatings before placing reinforcing steel.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install Waterstops:
 - 1. Continuous around corners and intersections without displacing reinforcement. Heat seal joints watertight with an electric splicing tool. Do not bend waterstops.
 - 2. At locations indicated and anchor waterstops to formwork or reinforcing steel at a maximum spacing of 16-inches to prevent dislocation while placing concrete.
 - 1. At locations indicated and in the following locations:
 - a. All horizontal and vertical construction and expansion joints in walls with one surface in contact with soil and the opposite surface dry and exposed.
 - b. All horizontal and vertical construction and expansion joints in walls with one surface in contact with liquid and the opposite surface dry and exposed.
 - c. All horizontal and vertical construction and expansion joints in walls with one surface in contact with liquid and the opposite surface in contact with soil.
 - d. All horizontal and vertical construction and expansion joints in interior dividing walls of fluid containing structures and in suspended fluid containing slabs and walls.

- e. All horizontal and vertical construction and expansion joints in slabs on grade except building floor slabs located at or above finished grade or other slabs specifically omitted.
 - 3. Take extra care to prevent displacement or folding of waterstops. Exert extra effort to embed waterstops fully on both sides in dense concrete.
 - 4. Place waterstops to provide a complete seal with no gaps. Take care at complex joint intersections that waterstops are fully spliced (heat sealed) to form a continuous seal with preformed corner and intersection sections.
- F. Install preformed mastic waterstops only at locations shown on the Drawings.
- G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- I. Form Ties:
- 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Place ties at least 1-1/2 inch 38 mm away from finished surface of concrete.
 - 3. Leave inner rods in concrete when forms are stripped.
 - 4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless otherwise shown on Drawings.
- J. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- K. Construction Joints:
- 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
 - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
 - 4. Arrange joints in continuous line straight, true and sharp.
- L. Embedded Items:
- 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.
 - 2. Do not embed wood or uncoated aluminum in concrete.
 - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
 - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318, Section 6.3.

- M. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where required or as shown on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 2. Coordinate work to avoid cutting and patching of concrete after placement.
 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- N. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
 2. Slope slabs to drain where required or as shown on Drawings.
 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.
- O. Screed Supports:
1. For concrete over waterproof membranes and vapor barrier membranes, use cradle, pad or base type screed supports that will not puncture membrane.
 2. Staking through membrane is not permitted.
- P. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
 2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.6 FIELD QUALITY CONTROL

1. Section 01400 - Quality Requirements: Testing and inspection services.
2. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
3. Notify Engineer after placement of reinforcing steel in forms, but a minimum of 48 hours prior to placing concrete.
4. Schedule concrete placement to permit formwork inspection before placing concrete.

3.7 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.8 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal is acceptable to the Engineer.
- B. Except as otherwise noted in this Section, leave forms in place for minimum number of days as specified in ACI 347.
- C. Beam and girder side forms, column forms, and wall forms may be removed as soon as the concrete is strong enough to sustain its own weight, but no sooner than 24 hours after placement. Do not remove supporting forms and shoring for level slabs, sloping slabs, beams, girders, and other flexural members until they can support their weight and superimposed loads, but not sooner than 14 days and if test cylinders show a strength of 4,500 psi or more in compression. Cure test cylinders under conditions similar to those affecting the structure involved.
- D. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- E. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.9 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.
- C. Camber slabs and beams 1/4 inch per 10 ft (2 mm/m) in accordance with ACI 301 and ACI 347.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Reinforcing steel bars, welded wire fabric and accessories for cast-in-place concrete.
 2. Related Sections:
 3. Section 03100 - Concrete Forms and Accessories.
 4. Section 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
1. ACI 301 - Specifications for Structural Concrete.
 2. ACI 318 - Building Code Requirements for Structural Concrete.
 3. ACI SP-66 - Detailing Manual.
- B. American Society for Testing and Materials (ASTM):
1. ASTM A184/A184M - Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 2. ASTM A497 - Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
 3. ASTM A615/A615M - Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
 4. ASTM A704/A704M - Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
 5. ASTM A706/A706M - Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
 6. ASTM A775/A775M - Specification for Epoxy-Coated Reinforcing Steel Bars.
 7. ASTM A884/A884M - Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
 8. ASTM D3963/D3963M - Specification for Epoxy-Coated Reinforcing Steel.
- C. American Welding Society (AWS):
1. AWS D1.4 - Structural Welding Code for Reinforcing Steel.
 2. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- D. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI - Manual of Standard Practice.
 2. CRSI - Recommended Practice for Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals.

- B. Shop Drawings: Indicate bar sizes, spacings, splice lengths, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices and wall bar spreaders.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Certificates: Certifying welders employed on the Work, have AWS qualification within the previous 12 months.
- E. Submit certified copies of recent mill test report of reinforcement analysis.
- F. Resubmissions: Indicate on resubmissions all revisions made to previous submittals.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with CRSI Manual of Practice ACI 301, ACI SP-66, ACI 318, and ASTM A184/A184M. Use more stringent requirements where requirements may be contradictory.
- B. Maintain one copy of each document on site.
- C. Detail reinforcement under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Michigan.

1.5 QUALIFICATIONS

- A. Welders' Certificates: Submit under provisions of Section 01400 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.6 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi (420 MPa) yield grade; deformed billet steel bars, unfinished. Provide epoxy coated bars in accordance with ASTM A775/A775M, A934/A934M finish where specified to be provided on Drawings.
- B. Reinforcing Steel: ASTM A706/A706M, 60 ksi (420 MPa) yield grade where welding of reinforcing bars are required; deformed low-alloy steel bars, unfinished.
- C. Welded Steel Wire Fabric: ASTM A497 Deformed Type; in flat sheets; unfinished. Provide epoxy coated fabric in accordance with ASTM A884/A884M Class A finish where specified to be provided on Drawings.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type. Provide epoxy coated tie wire where epoxy coated bars or wire fabric is required.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.
- D. Supports on Grade: Precast concrete blocks with embedded tie wire. Block strength shall be equal to or greater than the compressive strength of the concrete.
- E. Epoxy
 - 1. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. The epoxy shall be a high modulus, moisture insensitive type. The epoxy shall be packaged in a cartridge type dispensing system with a mixing nozzle.
 - 2. Epoxy shall be certified by test to develop a pullout resistance in the specified concrete equal to 125 percent of the yield strength of the bar when embedded to the manufacturer's recommended depth. Embedment depth shall not be less than 10 times the nominal bar diameter or as shown on the Contract Drawings, whichever is greater.
 - 3. Epoxy shall be a slow cure and shall be the following:
 - a. HIT RE 500 -V3 System, by the Hilti Company.
 - b. Or approved equal.
- F. Where there may be insufficient space to lap splice reinforcing bars the required length or where necessary at construction joints to facilitate forming and backfilling where bars project from slabs and walls, the Contractor may use at his option, mechanical splices/couplers when approved by the Engineer. Splices/couplers shall develop 125 percent of the yield strength of the reinforcing bar. Mechanical splices/couplers shall be threaded rebar type couplers as manufactured by Erico International Corporation or swaged rebar couplers as manufactured by Bar Splice Products, Incorporated.

2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, ACI SP-66 and ASTM A184/A184M. Heating of reinforcing steel for bending is not allowed unless approved by Engineer.
- B. Weld reinforcement in accordance with AWS D1.4 or ANSI/AWS D12.1 only where specified to be welded on the Drawings.
- C. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Review location of splices with Engineer.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support, and secure reinforcement against displacement. Do not deviate from required position.
- B. Accommodate placement of formed openings.
- C. Position wall dowels projecting from base slabs on grade with templates or guides held in place above the concrete pour line. Position the templates to obtain the required clearance between the dowels and the face of the walls.
- D. Accommodate placement of formed openings.
- E. Stagger bar splices.
- F. Provide additional reinforcing bars to support top reinforcement in slabs. Do not shift reinforcing bars from positions in upper layers to positions in lower layers as a substitute for additional support bars.
- G. Provide additional reinforcing bars to support ties and stirrups in beams where top reinforcement is not continuous.
- H. Unless otherwise shown on the Drawings, do not bend reinforcing bars which project from in-place concrete.
- I. Drilled Dowels (Reinforcing Bars or Threaded Steel Rods)
 - 1. Drilled dowels shall be reinforcing dowels set in epoxy adhesive in a hole drilled into hardened concrete.
 - 2. Holes shall be drilled to the epoxy manufacturer's recommended diameter.
 - 3. The hole shall be drilled by methods which do not interfere with the proper bonding of epoxy.
 - 4. Reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any reinforcing bars.
 - 5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.
 - 6. Epoxy shall be injected into the hole through the injection system mixing nozzle (and any necessary extension tubes) placed to the bottom of the hole. The discharge end shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that insures that excess material is expelled from the hole during dowel placement.
 - 7. Dowels shall be twisted during insertion into the partially filled hole to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

3.2 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements: Construction Material Testing and Inspection Services.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Cast-in-place concrete slabs, foundation walls and other structures including tank.
 2. Control, expansion, and contraction joint devices associated with concrete work, including joint sealants.
 3. Equipment pads, thrust blocks, manholes.
 4. Leak testing of concrete clearwell tank.
- B. Related Sections:
1. Section 03050 – Crystalline Waterproofing- Mix Additive.
 2. Section 03100 - Concrete Forms and Accessories: Formwork and accessories. placement of joint devices and joint device anchors in formwork.
 3. Section 03200 - Concrete Reinforcement.
 4. Section 03390 - Concrete Curing.
 5. Other sections of work requiring items for casting into concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
1. ACI 207.1R - Mass Concrete.
 2. ACI 301 - Specifications for Structural Concrete.
 3. ACI 302 - Guide for Concrete Floor and Slab Construction.
 4. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
 5. ACI 305R - Hot Weather Concreting.
 6. ACI 306R - Cold Weather Concreting.
 7. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 8. ACI 308 - Standard Practice for Curing Concrete.
 9. ACI 318 - Building Code Requirement for Structural Concrete and Commentary.
 10. ACI 350/350R – Code Requirements for Environmental Engineering Concrete Structures and Commentary
 11. ACI 350.1/350.1R – Tightness Testing of Environmental Engineering Concrete Structures and Commentary.
 12. ACI 350.3/350.3R - Seismic Design of Liquid - Containing Structures.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C33 - Specification for Concrete Aggregates.
 2. ASTM C94 - Specification for Ready-Mixed Concrete.
 3. ASTM C150 - Specification for Portland Cement.
 4. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 5. ASTM C260 - Specification for Air Entraining Admixtures for Concrete.

6. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Methods)
7. ASTM C494 - Specification for Chemical Admixtures for Concrete.
8. ASTM C618 - Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
9. ASTM C920 - Specification for Elastomeric Joint Sealants.
10. ASTM C1017 - Chemical Admixtures for Use in Producing Flowing Concrete.
11. ASTM C1107 - Packaged Dry, Hydraulic Cement Grout (Nonshrink).

1.3 SUBMITTALS

- A. Section 01300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on joint devices, attachment accessories, admixtures and concrete and grout materials.
- C. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.
- D. Shop Drawings: Submit for review, the following:
 1. Submit complete concrete mix designs and documentation indicating compliance with ACI 301, ACI 318 and ACI 350.
 2. Concrete mix design submittal shall include, but not be limited to:
 - a. Sources of cement and aggregate.
 - b. Product data on all admixtures used.
 - c. Sieve analysis, mechanical properties, and deleterious substance content for coarse and fine aggregate in accordance with ASTM C33.
 - d. Chemical analysis and physical tests of cement.
 - e. Certification that admixtures used in the same concrete mix are compatible with each other and the aggregates.
 - f. Test data Alkali Silica Reactivity of Cementitious materials and aggregates.
 - g. Historical test records of concrete strength for mixes provided or three point curve strength data for new mixes proposed.
 3. The following information, if ready-mixed concrete is used:
 - a. Physical capacity of the mixing plant.
 - b. Trucking facilities available.
 - c. Estimated average amount which can be produced and delivered to the site during a normal 8-hour day, excluding the output to other customers.
 4. Locations of construction joints not shown on the Contract Drawings and sequence of placing concrete.
- E. Submit notarized certification of conformance to referenced standards.
- F. Delivery Tickets:
 1. Furnish to Engineer copies of all delivery tickets for each load of concrete delivered to the site. Provide the following items of information on the delivery tickets:
 - a. Contract/Job name.
 - b. Amount of concrete being delivered.
 - c. Time that water was added to the dry ingredients and

- d. All other information required by ASTM C94, Section 14, Batch Ticket Information.

G. Resubmissions: Indicate on resubmissions all revisions made to previous submittals.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of each document on site.

C. Acquire cement and aggregate from same source for all work. Testing and quality assurance that concrete mixture is not prone to excessive expansion from alkali silica reaction shall be included with the concrete mix submittal.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306R and ACI 306.1 when concreting during cold weather.

F. Maintain the temperature of concrete above 50 degrees F for not less than 5 days after placement. Transition the concrete to the outside temperature at a rate of 1 degree F each hour.

G. In no case shall the temperature of concrete exceed 90 degrees F. If insulated forms are used, the temperature of the concrete mixture shall not exceed 80 degrees F. Temperatures exceeding these values shall constitute batch rejection.

H. Conform to Paragraph 3.7 of this Section for Field Quality Control.

1.6 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Materials:

1. For pavements, walkways - see Civil Drawings.

2. For general purpose buildings, Portland Cement ASTM C150, Type I – Normal or ASTM C595 Type 1L.

3. For concrete tanks and domestic water treatments works.
 - a. Portland cement ASTM C150, Type II or ASTM C595, Type 1L.
 - b. Portland cement ASTM C150, Type I or ASTM C595 Type 1L and Fly Ash ASTM C618, Class C or F (not to exceed 15 percent of the total cementitious materials) with a total tricalcium aluminate (C₃A) content not more than 8 percent. Use where Portland cement ASTM C150, Type II is unavailable.
 4. Portland cement ASTM C150, Type III, high early strength, only where directed.
 5. Portland cement ASTM C150, Type IV, low heat of hydration, only where directed.
 6. Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the requirements of 100 or 120 (ASTM C989).
 7. Fly ash shall conform to the requirements of ASTM C-618 Class F.
- B. Fine and Coarse Aggregates: ASTM C33.
1. Fine Aggregate: For normal weight concrete consists of well graded natural sand conforming to ASTM C33. Michigan Department of Transportation 2NS classification.
 2. Coarse Aggregate: For normal weight concrete consists of well graded gravel or crushed stones conforming to ASTM C33 and following size numbers:
 - a. No. 467: For concrete sections 25 inches or more thick.
 - b. No. 57: For concrete sections less than 25 inches and greater than 8 inches thick.
 - c. No. 8: For slab toppings, contoured concrete fill and patching thickness 1/2-inch and larger.
 3. Test conformity of aggregates and ensure that aggregates intended for use in concrete are potentially non-reactive when tested in accordance with ASTM C289.
- C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Only chloride free admixtures are acceptable. The manufacturer to list the chloride content of the admixture. Make sure admixtures selected are compatible and not harmful to concrete mix. Use admixtures from same manufacturer.
- B. Air Entrainment: ASTM C260.
1. MB-VR manufactured by BASF Corporation.
 2. DAREX II-AEA manufactured by Grace Construction Products.
 3. AIR-MIX manufactured by Euclid Chemical Co.
 4. Substitution: Under provisions of Section 01600.
- C. Chemical: ASTM C494 Type A - Water Reducing, Type B – Retarding, Type C – Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding] admixtures.
1. Product manufactured by BASF Corporation.
 2. Product manufactured by Grace Construction Products.
 3. Product manufactured by Euclid Chemical Co.
 4. Section 01600 - Product Requirements: Product options and substitutions.

- D. Fly ash not to exceed 15 percent of the total weight of the cementitious materials.
- E. Ground Granulated Blast Furnace Slag (GGBFS) not to exceed 35 percent of the total weight of the cementitious material.
- F. Fly ash and Ground Granulated Blast Furnace Slag (GGBFS), if provided by the Contractor, may be used to provide a portion of the cement content required under Part 2.5 of this Section.
- G. Plasticizing: ASTM C1017.
- H. Waterproofing: Per Section 03050- Crystalline Waterproofing- Mix Additive.

2.3 ACCESSORIES

- A. Bonding Agent: Two component modified epoxy resin.
 - 1. Product manufactured by BASF Corporation.
 - 2. EUCO #352 manufactured by Euclid Chemicals, Co.
 - 3. Sikadur-32 Hi-Mod manufactured by Sika Corporation.
 - 4. Section 01600 - Product Requirements: Product options and substitutions.
- B. Non-Shrink Grout: ASTM C1107, Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi (17 MPa) in 48 hours and 7,000 psi (48 MPa) in 28 days.
 - 1. Five Star Grout manufactured by U.S. Grout Co.
 - 2. Sono Grout manufactured by Sonneborn.
 - 3. Masterflow - 928 Grout manufactured by BASF Corporation.
 - 4. Section 01600 - Product Requirements: Product options and substitutions.
- C. Waterstops: See Section 03100- Concrete Forms and Structural Drawings.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler Type A: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/2 inch thick; tongue and groove profile. Do not use in liquid containing structures.
- B. Joint Filler Type D: ASTM D1752, Type III; Premolded self-expanding cork, fully compressible with recovery rate of minimum 95 percent. Use in liquid containing structures.
- C. Sealant and Primer for Liquid Submerged Joints in Conjunction with Clearwell Tank: Cold applied two-part polyurethane-base elastomeric sealant, NFS 61 approved for use when exposed to water in Clearwell. Products by the following are acceptable for use:
 - 1. Sonneborn Building Products.
 - 2. Sika Corporation.
 - 3. Euclid Chemical Co.
 - 4. Section 01600 - Product Requirements: Substitutions.

2.5 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ACI 301, ACI 304, and ASTM C94. Conform to more stringent requirements where requirements contradict.

- B. Select proportions for normal weight concrete in accordance with ASTM C94, Option C and establish and confirm proportions in accordance with ACI 301, trial mixtures.
 - C. Provide concrete which has minimum shrinkage cracks, has high durability, high impermeability, and maximum resistance to natural or processing chemicals. Provide concrete to the following criteria:
 - 1. Class A: Concrete placed against earth in slabs and footings, where used as a topping, where used as contoured concrete fill and for pipe thrust blocks.
 - a. Minimum number of bags (pounds) of cement per cubic yard of concrete: 6.00 (564).
 - b. Maximum water-cement ratio: 0.42.
 - c. The ratio of sand to total aggregate: 33 to 42 percent by weight based upon surface dry material.
 - d. Compressive strength (7 days): 2,700 psi (19 MPa).
 - e. Compressive strength (28 days): 4,500 psi (31.5 MPa).
 - f. Maximum Slump: 3 inches (76 mm).
 - 2. Class B: Concrete in supported slabs, beams, columns, and walls.
 - a. Minimum number of bags (pounds) of cement per cubic yard of concrete: 6.00 (564).
 - b. Maximum water-cement ratio: 0.42.
 - c. The ratio of sand to total aggregate: 33 to 42 percent by weight based upon surface dry material.
 - d. Compressive strength (7 days): 2,700 psi (19 MPa).
 - e. Compressive strength (28 days): 4,500 psi (31.5 MPa).
 - f. Maximum Slump: 4 inches (102 mm).
 - 3. Class C: Concrete in fillets, cradles and where used to fill voids or for foundation backfilling and as a mud slab covering for subgrade at locations specifically designated on the Drawings:
 - a. Minimum number of bags (pounds) of cement per cubic yard of concrete: 4.50 (423).
 - b. Maximum water-cement ratio: 0.50
 - c. Compressive strength (28 days): 2,000 psi (14 MPa) minimum.
 - d. Maximum slump: 4 inches (102 mm). Provide smaller slump where required for placement.
 - 4. Class D: Concrete for sections greater than 2'-0" in thickness. Class D concrete shall conform to the requirements of Class A and B concrete except that Type IV cement for low heat of hydration shall be substituted for Type II cement and other means of temperature control shall be used in conformance with industry standards including, ACI 207.1 and the Portland Cement Association to prevent excessive temperature differential between the internal concrete and the surface of the concrete.
 - D. Use accelerating admixtures in cold weather only when acceptable to the Engineer. Use of admixtures will not relax cold weather placement requirements.
 - E. Do not use calcium chloride.
 - F. Use set retarding admixtures during hot weather only when acceptable to the Engineer.
 - G. Use water-reducing, high range or water-reducing, high range and retarding admixture.
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- H. Add air entraining admixture to all normal weight concrete to mix. Ensure average air content in field mixtures equal to 5 percent plus or minus one percent (5 percent \pm 1 percent) in conformance with ASTM C231. For concrete with trowel finished surfaces ensure minimum 3 percent air content.
- I. Add waterproofing admixture for walls and tank floor slab.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, waterstops, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete, concrete more than 60 days old, by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with epoxy. Refer to Section 03200.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and ACI 304.
- B. Place concrete so segregation is prevented. Place concrete for walls through openings in the forms spaced at frequent intervals, or through "elephant trunks" (heavy duck canvas or galvanized iron) equipped with hopper heads. Tremies shall be of variable lengths so that free fall will not exceed three feet and a sufficient number shall be used so that the concrete is kept level.
- C. Notify Engineer minimum 48 hours prior to commencement of operations.
- D. Ensure reinforcement, inserts, embedded parts, formed expansion and construction joints, and waterstops are not disturbed during concrete placement.
- E. Install continuous waterstops at locations specified and in accordance with manufacturer's recommendations. Refer to Section 03100, Concrete Forms and Accessories.
- F. Install joint fillers, primer, and sealant in accordance with manufacturer's instructions.
- G. Separate slabs on grade from vertical surfaces with 3/8 inch thick joint filler, unless otherwise shown on Drawings.

- H. Set joint filler top to required elevations. Secure to resist movement by wet concrete.
- I. Extend joint filler from bottom of slab to within 3/8 inch of finished slab surface.
- J. Install joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- L. Place concrete continuously between predetermined expansion, control, and construction joints.
- M. Do not interrupt successive placement; do not permit cold joints to occur.
- N. Do not place concrete walls on footings or slabs until 7 days after the footings or slabs have been cast and if field cured test cylinders show a strength of 4500 psi or more in compression.
- O. Place floor slabs on ground in long-strip pattern with strip width not to exceed 40 ft . Allow minimum 72 hours to elapse prior to placing adjacent strips.
- P. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/8 inch in 10 ft .
- Q. Spade and rod or vibrate concrete to embed anchors, fixtures, and other inserts fully in dense concrete.
- R. Take special care to prevent displacement or folding of PVC waterstops. Exert extra effort to embed waterstop fully on both sides in dense concrete.
- S. At the bottom of wall pours and other horizontal construction joints, roughen, clean, and wet concrete surface against which new concrete is to be placed. Apply 1-1/2 inches of grout just before placing new concrete. The grout is the same mixture as the concrete but with the coarse aggregate omitted.
- T. Allow minimum 72 hours to elapse before placing concrete against previously placed concrete in walls and slabs.

3.4 CONCRETE FINISH

- A. Finish concrete wall surfaces in accordance with ACI 301.
 - 1. Smooth Form Finish: Concrete surfaces below grade adjacent to earth and surfaces not exposed to view such as enclosed chambers, vaults, wet wells, inside surfaces of open tanks and basins.
 - 2. Grout Cleaned Finish: Grout cleaned finish surfaces include, but are not limited to the following:
 - a. Exposed exterior walls of clearwell tank and structures adjacent to earth to one foot below finished grade.
 - b. Retaining wall surfaces exposed to view.

- c. Foundation wall surfaces exposed to view, including new supports wall along the east side of the Filter Building, to one foot below finish grade.
- B. Finish concrete tank floor surfaces in accordance with ACI 301.
 - 1. Steel trowel surfaces which are scheduled to be exposed, including all floor surfaces, including those of liquid containing structures. Slope floors as shown on the Drawings.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete surfaces to requirements of Section 03390.
- D. All concrete slabs supported on soil shall be protected against frost action and danger from heaving by insulating the slab with insulating material thick enough to prevent frost penetration into the subgrade.

3.6 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements: Field inspection and testing.
 - 1. In accordance with Section 01400, QUALITY REQUIREMENTS, the Contractor will retain the services of a testing laboratory and pay all laboratory costs to make tests and submit reports. All additional tests required because concrete fails to meet Specifications shall also be paid by the Contractor.
 - 2. The Contractor shall provide all necessary labor and devices to obtain samples and provide field curing.
 - 3. The testing laboratory will provide for inspection of the concrete batch plant to see that the concrete is properly mixed, and the consistency of the mix is being controlled.
 - 4. Test and inspection firm responsibilities and limits on testing authority shall conform to Section 01400, QUALITY REQUIREMENTS.
 - 5. The laboratory will immediately submit two copies of laboratory reports on all concrete tests to the Engineer. Reports will be made on a form acceptable to the Engineer and will indicate, in addition to the requirements of Section 01400, QUALITY REQUIREMENTS, Article I, placement location, delivery ticket numbers, mix ingredients, including weight of aggregates, cement, water/cement ratio, admixtures, percent of air entrainment, inches of slump, 7 and 28 day strength, concrete temperature and remarks on property changes.
 - 6. Production of concrete to comply with specified requirements is the responsibility of Contractor. If any specimen test falls below the specified strength, the Engineer will determine the appropriate corrective measures to be provided at the Contractor's expense. Test failure can constitute sufficient reason for the Engineer to direct the Contractor to remove all parts of a structure or structural element.
- B. Perform tests in accordance with ACI 301.

- C. Provide free access to Work and cooperate with appointed firm.
- D. Submit proposed mix design of each class of concrete with each variation of admixture types to be used, to Engineer and inspection and testing firm for review prior to commencement of Work. Unfavorable results of actual pours may necessitate redesign of mixes.
- E. Perform tests on cement and aggregates to ensure conformance with specified requirements.
- F. Sample specimens for strength tests of concrete shall be taken not less than once a day, nor less than once for each 50 cubic yards of concrete placed, nor less than once for each 5000 square feet of surface area for slabs and/or walls, of each class of concrete placed. Five specimens shall be secured in accordance with ASTM C172. Three specimens will be laboratory-cured in accordance with ASTM C31. The other two shall be cured entirely under field conditions. Compressive strength tests will be made at the age of 7 days on one field-cured and one laboratory-cured specimen. Compressive strength tests shall be made at the age of 28 days on one field-cured and one laboratory-cured specimen. The fifth specimen shall be tested at such time as directed by the Engineer. All tests will be in compliance with ASTM C39.
- G. Take two additional test cylinders where required to check concrete strength at 14 days, cured on job site under same conditions as concrete it represents.
- H. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- I. Take additional test cylinders where required or desirable to determine concrete strength at other times or conditions, cured on job site under same conditions as concrete it represents.
- J. Take one slump test for each set of test cylinders taken, but not less than one test for slump per truckload of concrete. Measure slump in accordance with ASTM C143 and ACI 301.
- K. Take one air content test for each set of test cylinders taken, but not less than one test for air content per truckload of concrete. Measure air content in accordance with ASTM C138, ASTM C173, ASTM C231 and ACI 301.
- L. Record temperature of concrete sample for each strength test and atmospheric temperature at that time.
- M. Concrete Clearwell Hydrostatic Leakage Testing:
 - 1. Test new concrete tank container for watertightness in accordance with ACI 350.1/ACI 350.IR-01, tightness testing of environmental engineering concrete structures and commentary and in conformance with the following requirements. Where requirements conflict, comply with the more stringent requirement.
 - 2. Perform leakage test after the concrete has attained a minimum compressive strength equal to 4,500 psi, determined by compressive strength test of cylinders cured under conditions similar to those affecting the liquid holding structure to be tested, but not until 14 days after the last concrete part of the container has been cast.
 - 3. Precast planks and topping need to be installed prior to tank leak testing.

4. Test cells separately as called for on the Drawings. (This is so that it can be determined that interior divider walls don't leak.)
5. Perform leakage test prior to:
 - a. Backfilling around structures.
 - b. Installing concrete fills and toppings, waterproof membrane on exterior walls.
 - c. Making permanent pipe connections.
6. Clean interior by removing debris and sweeping.
7. Close temporarily and make leakproof all openings below the maximum operating liquid level, which is leakage test liquid level.
8. Use ONLY POTABLE WATER for leakage test. (Owner will provide water via the Filter Building.)
9. During the test period, keep excavation around the tank structure dewatered.
10. Fill test structural unit at a rate of not more than one foot depth per hour. Fill the unit to maximum operating liquid level and let it stand for at least 72 hours. (Half height water tests are not compliant with requirements.)
11. Measure the drop in liquid level over the next 48 hours to determine the liquid volume loss for comparison with the allowable leakage.
12. If the unit being tested is subjected to evaporation losses, measure evaporative losses by following procedure:
 - a. A watertight 36 inch square welded metal pan 18 inch deep open only at the top and supported by drum floats, shall be moored in a location designated by the Engineer.
 - b. The pan shall be filled with water to within 3 inch from the top and the floats so adjusted such that the water level within the pan is the same as the water level in the structure.
 - c. Add the total fall of water level in the pan to the allowable fall of water level in the structure as specified herein.
13. The net allowable liquid loss due to leakage, total loss minus evaporative loss, for a period of 24 hours shall not exceed 0.1 of 1 percent of tank capacity.
14. If the leakage exceeds the maximum allowable, extend the leakage test to a total of five days. If at the end of five days average daily leakage does not exceed the maximum allowable, the test is considered satisfactory.
15. Damp spots on the exterior wall surface or measurable leakage of water at the wall base is not permitted. Damp spots are defined as spots where moisture can be picked up on a dry hand.
16. If visible leaks or damp spots appear on the exterior wall surface, or if the net liquid loss in 24 hours exceeds 0.1 of 1 percent the tank capacity, dewater the tanks and make the necessary repairs. Seeps in walls shall be repaired with a high-pressure epoxy injection grouting system acceptable to the Engineer and NFS 61 approved. Epoxy grout shall be injected into the cracks in strict accordance with the manufacturer's instructions. After the epoxy grout has sufficiently cured, the surface of the cracks shall be finished flush with adjacent wall surfaces.
17. Floor slab repairs may also be accomplished by the above method, or other alternative methods acceptable to the Engineer.
18. Honeycombed and other defective concrete shall be removed and replaced with a nonshrinking aggregate grout acceptable to the Engineer.
19. Repeat leakage tests until satisfactory results are obtained.

20. At completion of satisfactory test, remove liquid and dispose of it in a manner which will not damage construction, the site, adjacent areas, or affect the operation of any existing facilities.
21. Leakage repairs shall be guaranteed for a period of one year.
22. Cost of leakage testing and repairs to make the structure watertight is part of lump sum Contract Price and no additional compensation is allowed for such work.

3.7 PATCHING

- A. Allow Engineer to review concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- C. Patch imperfections as directed by Engineer.

3.8 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
- B. The Engineer will determine repair or replacement of defective concrete.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

SECTION 03390
CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302 - Guide for Concrete Floor and Slab Construction.
 - 3. ACI 308 - Standard Practice for Curing Concrete.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C171 - Specifications for Sheet Materials for Curing Concrete.
 - 2. ASTM C309 - Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

1.3 SUBMITTALS

- A. Section 01300 - Submittals: Requirements for submittals.
- B. Product Data: Submit data on curing compounds, product characteristics, compatibility and limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.
- B. Maintain one copy of each document on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Membrane Curing Compound Type A: ASTM C309 Type 1-D Class A, type, with fugitive dye.
- B. Absorptive Mats Type B: ASTM C171, cotton fabric, minimum 8 oz/sq yd (270 grams/sq m) bonded to prevent separation during handling and placing.
- C. Water: Potable and not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions before starting Work.
- B. Verify that substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

- A. Clearwell tank slab is referred to as “floor” or base slab for the purpose of this Section.
- B. Cure floor surfaces in accordance with ACI 308.
- C. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days. Use for all topping slabs.
- D. Absorptive Mat: Spread cotton fabric over floor slab areas. Spray with water until mats are saturated and maintain in saturated condition for 10 days. Use for all at or below grade slabs and fluid retaining slabs.
- E. Membrane Curing Compound: Apply curing compound in accordance with manufacturer’s instructions in 2 coats with second coat at right angles to first.
 - 1. Use for all above grade slabs.
 - 2. Use for all at or below grade or fluid retaining slabs only when cold weather conditions do not allow for a wet cure.

3.3 INSTALLATION - VERTICAL SURFACES

- A. Cure surfaces in accordance with ACI 308.
- B. Spraying: Drape surfaces with cotton mats and spray water over surfaces until mat is saturated. Maintain wet for 10 days. Use for all at or below grade and fluid retaining walls. At contractor’s option, spraying (wet cure) may be suspended after 3 days and a membrane curing compound may be applied in accordance with this Section.

- C. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in 2 coats with second coat at right angles to first.

3.4 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over unprotected floor/slab surface.
- B. Curing compound application to be recoated during the curing period if subjected to any activity which may disturb the seal.

END OF SECTION

SECTION 03400
PRECAST CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Precast and /or precast prestressed structural concrete construction, including product design not shown on Contract Drawings, shop drawings, review requirements, manufacturing, transportation, erection, and other related items such as anchorage, bearing pads, storage and protection of precast concrete.
- B. The Contractor shall provide portland cement concrete mixtures that are resistant to excessive expansion caused by alkali-silica reactivity (ASR). The evaluation as to the resistance of submitted concrete mixtures to excessive expansion caused by ASR shall be by the Engineer as described herein.

1.2 RELATED SECTIONS

- A. Section 03100 - Concrete Forms and Accessories.
- B. Section 03200 – Concrete Reinforcement.
- C. Section 03300 – Cast-In-Place Concrete.
- D. Section 03390 – Concrete Curing.

1.3 RELATED INFORMATION

- A. Contractor shall refer to the referenced Specifications and the Contract Drawings for additional requirements:

1.4 STANDARD SPECIFICATIONS

- A. All precast concrete shall be designed, manufactured and installed to meet the minimum requirements of both the current American Concrete Institute Standard "Building Code Requirements for Reinforced Concrete" (ACI 318) including current applicable interim specifications, and the "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products" (MNL-116), published by the Prestressed Concrete Institute.
- B. Dimensional tolerances, except as otherwise specified, shall conform to the American Concrete Institute Standard, "Recommended Practice for Concrete Formwork" (ACI 347), current edition.
- C. All applicable provisions of the related Specification sections identified herein shall automatically be a part of this Section.

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1.5 MANUFACTURER'S QUALIFICATIONS

- A. Experience - All precast concrete elements shall be produced by a manufacturer thoroughly experienced and qualified in this type of work. The manufacturer shall have satisfactorily performed work of similar magnitude and complexity.
- B. Facilities - The manufacturer shall have sufficient facilities to produce the precast concrete elements inside under controlled conditions and at a sufficient rate to meet the required delivery schedule.
- C. Equipment - Production equipment must be capable of producing a high-quality concrete product. This includes mixing equipment which distributes coarse and fine aggregate uniformly throughout the mix, accurate batching equipment, equipment for consolidating low slump concrete in forms of the required configurations without causing segregation of the mix while producing the desired surface finish and reinforcing steel fabrication equipment. In addition, adequate testing equipment should be available to ascertain that required concrete strengths are obtained.

1.6 SUBMITTALS

- A. Shop Drawings for all installations under this Section shall be submitted for review as specified under the Shop Drawings specifications.
- B. Shop Drawings shall show all pertinent details of construction, methods of assembly, materials and finishes employed, dimensions, inserts, details of anchorage and erection methods and sequences.
- C. The Contractor shall furnish copy of design computations for all precast-prestressed structural elements prepared by Professional Engineer registered in the State of Michigan for review by the Engineer.

1.7 CALCULATIONS

- A. Sealed calculations prepared by a Professional Engineer, registered in the State of Michigan shall be submitted for Owner review. Calculations shall include working load stresses under all loading conditions, ultimate strengths at maximum loading condition, deflections and cambers.
- B. Maximum allowable tensile working stress shall not exceed three times the square root of the 28 day compressive strength.
- C. If computer printouts are submitted in lieu of manual calculations, all input parameters shall be indicated and all values shall be clearly defined. Each printout shall be sealed as described above.

1.8 REINFORCEMENT

- A. Reinforcing and connections shown on the Drawings are adequate for normal temperature and building stress conditions.

- B. The precast supplier is responsible for additional reinforcing as required for fabrication, storage, handling, shipping, and erection stresses.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Precast Elements
 - 1. Precast prestressed concrete solid slabs.
- B. Concrete- Concrete shall be as specified in the concrete work sections with all appropriate paragraphs applying.
- C. The Contractor shall provide portland cement concrete mixtures for the project that are resistant to excessive expansion caused by alkali-silica reactivity (ASR).
- D. The evaluation as to the resistance of submitted concrete mixtures to excessive expansion caused by ASR shall be by the Engineer as described herein.

2.2 RELATED SECTIONS

- A. This provision is supplemental to all other sections within the specifications of the Contract related to the construction of concrete items for the project.

2.3 SUBMITTALS

- A. One week after the Owner awards this project the Contractor shall submit to the Owner all proposed concrete mix designs. These shall include the following:
 - 1. Sources for all fine and coarse aggregates proposed to be used identified by their MDOT or ASTM Class designations and gradation certifications.
 - 2. Sources and recent mill test reports for all cementitious materials and supplementary cementitious materials proposed to be used.
- B. The Contractor also may submit for consideration the following:
 - 1. Recent ASTM C 1260 (Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)) test results for the fine and /or coarse aggregates indicated on the proposed concrete mix designs.
 - 2. Recent ASTM C 1567 (Determining the Potential Alkali Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)) test results for the specific proportionate combinations of cementitious, supplementary cementitious, fine, and coarse aggregate materials indicated on the proposed concrete mix designs.
 - 3. Recent ASTM C 1293 (Determination of Length Change of Concrete Due to Alkali-Silica Reaction) test results for the fine and /or coarse aggregates indicated on the proposed concrete mix designs.

2.4 REFERENCES

- A. Portland Cement ASTM C 150

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- B. Fine Aggregate ASTM C 33
- C. Coarse Aggregate ASTM C 33
- D. Ground Granulated Blast Furnace Slag, Grade 100, 120 ASTM C 989

2.5 QUALITY ASSURANCE

- A. The Engineer shall review the submitted information and testing data submitted with the proposed concrete mixtures and any information and/or any test results with respect to ASR the Engineer has on record for the proposed aggregates and/or proportionate combinations of cementitious materials and aggregates.
- B. If the Contractor intends to change suppliers or if the supplier intends to change concrete mixtures after the evaluation and/or Mortar-Bar tests are performed, the Contractor shall inform the Owner immediately, but not less than forty-five (45) days prior to concrete batching.
 - 1. Upon notification, all concrete work will be postponed, without any additional costs or extension of time allowed by the Owner, until evaluation of the new mixtures and testing of the new materials, if needed, have been completed.
- C. Facility and Fabrications Inspection – The Owner will retain Special Inspections personnel to inspect precast fabrications for this project in accordance with the Michigan Building Code requirements for Special Inspections and as specified on the Structural Drawings.
- D. Concrete for precast elements shall develop compressive strengths as follows:
 - 1. Minimum 5000 psi @ 28 days for solid slabs.
- E. Fabricator shall provide concrete testing for mixes used in the production of the precast planks. Provide test results to Contractor, Owner and Engineer. Advise immediately of any non-conforming test results. Precast elements that do not meet specifications may be rejected and replaced at no cost to the Owner. See item 2.8 TESTING.
- F. Reinforcement- Reinforcement shall be as specified in the Concrete Section with all appropriate paragraphs applying including minimum yield strength.
- G. Prestressing strands shall meet the minimum requirements of the manufacturer's printed specifications and current ASTM A416, Grade 250, "Standard Specifications for Uncoated Seven-Wire Stress Relieved Strand for Prestressed Concrete", unless otherwise specified on the Drawings.

2.6 MANUFACTURING PROCEDURES

- A. Uniformity - to minimize irregularities in appearance and/or color, the cement, aggregates, admixtures and water shall be each obtained from the same source for all units exposed to view.
- B. Manufacturing procedures shall use wet cast methods and be in general compliance with PCI MNL-116. Dry mix machine cast products will not be accepted.
- C. Manufacturing tolerances shall comply with PCI MNL-116.

- D. Finishes:
 - 1. Precast Prestressed Concrete Solid Slabs.
 - a. Bottom and sides:
 - b. Commercial Finish. Concrete may be produced in forms that impart a texture to the concrete (e.g., plywood or lumber). Fins and large protrusions shall be removed and large holes shall be filled. All faces shall have true, well-defined surfaces. Any exposed ragged edges shall be corrected by rubbing or grinding.
 - c. Top: Screed and scratched. Final finish with stiff brush or rake to produce contact surface intentionally roughened to full amplitude of approximately 1/4 inch.
 - d. Exposed vertical ends: Strands shall be recessed and the ends of the member shall receive sacked finish.
- E. Strand Protection
 - 1. Coat ends of strand and any depressions with bituminous material acceptable to the Engineer.

2.7 CONCRETE MIX

- A. The precast supplier shall be responsible for the design of the concrete mixes to give the desired finishes while producing the required physical properties.
- B. In order to prevent shrinkage cracks the cement content and water cement ratio shall be kept to the minimum which will produce concrete with the required physical properties.
- C. Air content of concrete shall be 6%.
- D. Curing of the concrete shall be done with utmost care so as to prevent shrinkage and loss of ultimate strength.
- E. At time of stripping, all concrete shall have obtained strength sufficient to withstand the stresses to be encountered as determined by an engineering analysis.
- F. The precast concrete elements shall be carefully handled, stored, and shipped so as to prevent warpage, spalling, cracking, or staining.
- G. Lifting points shall be designated on the Shop Drawings.

2.8 TESTING

- A. Contractor shall submit mill test reports for reinforcement and prestressing strands and concrete test reports; and minimum one set of 5 cylinders for each 30 cu. yds. of concrete used in precast elements. Testing and cost of testing shall be borne by the precaster.

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PART 3 EXECUTION

3.1 INSTALLATION

- A. Inspection - Prior to commencement of erection operations, the manufacturer in conjunction with his erector and the Contractor, shall check all relevant job site conditions insofar as they affect the installation of precast elements. Any discrepancies or variations or other conditions that may prevent the satisfactory and proper execution of erection operations will be duly noted and corrective action taken by the Contractor prior to the execution of the erection operations.
- B. Erection Procedure - Contractor shall erect precast-prestressed concrete items to proper lines and levels, plumb and true, and in correct relationship to other work. Contractor shall also secure parts in a rigid and substantial manner during construction.
 - 1. Precast units shall be set to within ; 1/8" of the location shown for supports on the reviewed shop drawings. Joints shall not vary by more than ;1/8".
 - 2. Total permissible variation in camber shall be ; 1/4 inch, with variation between adjacent and abutting units to be a maximum of one-half the total variation. On site Owner acceptance of same prior to grouting is mandatory.
 - 3. Precautions shall be taken during erection to prevent warpage, spalling, cracking or staining.

3.2 CONNECTIONS

- A. Precast members shall be supported as shown on the Drawings.
- B. Precast joints shall be keyed and properly grouted.

3.3 FIELD CUTTING

- A. Field cutting of openings is not permitted without Engineer review and acceptance.
- B. All openings required shall be cast into the precast element.

3.4 GROUTING

- A. Grouting for this work shall be completed by this Contractor.
- B. Grouting of joints and connections shall be done with essentially a zero slump, expanding type concrete mix consisting of 1 part cement to 2 parts sand. The mix shall be thoroughly worked, rodded, and compacted into all corners and spaces, and into slab voids at all ends, including at openings.

3.5 CLEANING

- A. Following installation, the precast supplier shall clean any elements requiring cleaning. Protection of the precast concrete elements after installation is the responsibility of the Contractor who, therefore, shall be responsible for any additional repairs or cleaning that might be required.

3.6 GUARANTEE

- A. The Contractor shall guarantee all precast concrete work against defects in materials and workmanship for a **two (2) year period** dating from the acceptance of the respective areas, by the Owner. See Acceptance of Precast Concrete below.
- B. Date of guarantee will be determined by Engineer and Owner based on date of Owner acceptance not on date of installation, or material arrival at the site.
- C. Submit guarantee in writing at project closeout; provide draft of guarantee at shop drawing submittal phase.

3.7 ACCEPTANCE OF PRECAST CONCRETE

- A. General
 - 1. Completed precast concrete work which meets all applicable requirements will be accepted without qualification.
 - 2. Completed precast concrete work which fails to meet one or more requirements but which has been repaired to bring it into compliance will be accepted.
 - 3. Completed precast concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these specifications. In this event, modifications may be required to assure that remaining work complies with the requirements.
- B. Dimensional Tolerances
 - 1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerance shall be considered potentially deficient in strength.
 - 2. Formed surfaces resulting in concrete outlines larger than permitted by the tolerance may be rejected and the excess material shall be subject to removal. If removal of the excess material is allowed it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.
 - 3. Precast concrete members erected in the wrong location may be rejected if the strength, appearance, or function of the structure is adversely affected or the misplaced items interfere with other construction.
 - 4. Inaccurately formed precast concrete surfaces exceeding the tolerances and which are exposed to view, may be rejected and shall be repaired or removed and replaced, if required.
 - 5. Finished precast units exceeding the tolerances may be repaired provided that strength or appearance is not adversely affected. High spots may be removed with a terrazzo grinder, or other remedial measures performed as acceptable.
- C. Appearance
 - 1. Precast concrete exposed to view with defects which adversely affect the appearance of the specified finish will require complete replacement.
 - 2. Precast concrete not exposed to view is not subject to rejection for defective appearance.

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3.8

A. Strength of Precast Concrete

1. The strength of the precast concrete in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the precast concrete, including but not necessarily limited to the following conditions:
 - a. Low concrete strength.
 - b. Reinforcing or prestressing steel size, quantity, strength, position, or arrangement at variance with the requirements.
 - c. Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.
 - d. Curing less than that specified.
 - e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
 - f. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
2. Structural analysis and/or additional testing may be required when the strength of the precast concrete is considered potentially deficient.
3. Core test may be required when the strength of the precast concrete in place is considered potentially deficient.
4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and their results evaluated in accordance with Chapter 20 of "Building Code Requirements for Reinforced Concrete," (ACI 318).
5. Precast work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction if so acceptable to the Owner, or shall be replaced, at the Contractor's expense.
6. The Contractor shall pay all costs incurred in providing the additional testing and/or structural analysis required by this section.

3.9 SHOP DRAWINGS,

A. Reports & Samples - Immediately after award of Contract, the following Review Requests, Shop Drawings, Reports, and Samples shall be submitted to the Owner for consideration in accordance with the applicable subdivisions of the General Conditions. No such items, or the materials therefore, shall be ordered, fabricated, delivered, or incorporated in the work until the acceptance for the same have been received from the Engineer.

B.	REVIEW REQUESTS	SHOP DRAWINGS
	Precast Mfrs.	All Precast Units
	Joint Filler	Concrete Design Mixes & Materials
	Joint Sealant	Concrete Strength Tests
	Metal Inserts	

END OF SECTION

SECTION 07110

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall waterproofing membrane consisting of self-adhering sheet membrane waterproofing for below grade structures including clearwell tank and east wall of Filter Building. See Sheet A-2 for coordination of this work with above grade wall application of waterproofing/damp proofing products on Filter Building.
- B. Under slab waterproofing consisting of blindside composite sheet membrane waterproofing.
- C. Membrane accessories, application materials.
- D. Protection Board.

1.2 RELATED SECTIONS

- A. Section 03050 – Crystalline Waterproofing Mix Additive.
- B. Section 03200 – Concrete Reinforcement.
- C. Section 03300 – Cast-In-Place Concrete – Leak testing of tank prior to installation of waterproof membrane.

1.3 REFERENCES

- A. ASTM C-836 – Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membranes for Use with Separate Wearing Course.
- B. ASTM D-146 – Standard Specification for Sampling and Testing Bitumen-Saturated Felts and Fabrics Saturated used in Roofing and Waterproofing.
- C. ASTM D-412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers in Tension.
- D. ASTM D-570 – Standard Test for Water Absorption of Plastics.
- E. ASTM D-903 – Standard Test for Peel or Stripping Strength of Adhesive Bonds.
- F. ASTM D-1876 – Standard Test for Peel Resistance of Adhesives (T – Peel Test).
- G. ASTM D-1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used for Steep Roofing Underlayment for Ice Dam Protection.
- H. ASTM E-96 (Method B) – Standard Test Methods Water Vapor Transmission of Materials.

- I. ASTM E-154 – Standard Test Method for Water Vapor Retarders used in Contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.
- J. NRCA (National Roofing Contractors Association) - Waterproofing Manual.

1.4 SYSTEM DESCRIPTION

- A. Waterproofing System: Capable of resisting water head of 150 feet and preventing moisture migration to interior.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- C. Product Data: Provide data for surface primer, flexible flashings, joint cover sheet, joint and crack sealants, temperature range for application of waterproofing membrane, protection board and protection board mastic/adhesive, terminations bars and anchorage devices.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.

1.7 QUALIFICATIONS

- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with three years' experience.
- B. Applicator: Company specializing in performing the work of this section with minimum three years, documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured. For cold weather applications or temperature ranges below specified degrees, Contractor shall consult and coordinate with membrane manufacturer.

1.9 WARRANTY

- A. Provide one year warranty under provisions of Section 01700.

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- B. Warranty: Include coverage for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change of shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. W.R. Meadows.
- B. W. R. Grace & Co.
- C. Carlisle Coating and Waterproofing.
- D. Substitutions: None.

2.2 MEMBRANE MATERIALS

- A. Wall waterproofing membrane:
 - 1. W. R. Meadows: MEL-ROL.
 - 2. W. R. Grace & Co: BITUTHENE 3000.
 - 3. Carlisle Coating and Waterproofing: MIRADRI 860/861.
- B. Under Slab Waterproofing Membrane:
 - 1. W. R. Meadows: PRECON.
 - 2. W. R. Grace & Co: PREPRUFE 300R
 - 3. Carlisle: MiraPLY-H with SeamLOCK.

2.3 ACCESSORIES

- A. Primer: Compatible with membrane, as recommended by membrane manufacturer for substrate.
- B. Protection Board: Provide over all wall membrane surfaces, as recommended by membrane manufacturer for vertical use.
- C. Mastic: Asphalt mastic for sealing terminations, patches, and detail areas.
- D. Liquid Membrane: Elastomeric material with 100% solids content for forming cants, fillets, and waterproofing detailed areas.
- E. Corner Tape.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of waterproofing system.

- B. Verify items which penetrate surfaces to receive waterproofing are securely installed.
- C. Confirm that Leak Testing for the new tank has been successfully completed and documented prior to beginning waterproofing installation.

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- C. Patch all holes and voids and smooth out any surface misalignments.
- D. Install corner tape on all inside and outside corners including footings and tank mats.
- E. Apply strip of self-adhering membrane over control and expansion joints.
- F. Seal all terminations with pointing mastic.
- G. Prime surfaces in accordance with manufacturer's recommendations. Note that concrete mix for clearwell tank has crystalline waterproofing admixture – see Section 03050 and coordinate surface preparation for membrane with Admixture to be used on the project.
- H. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
- I. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer. Pre-strip all cracks and joints over 1/16 inch in width with membrane strips as required by membrane manufacturer.

3.3 INSTALLATION - SELF ADHERED

- A. Install membrane waterproofing in accordance with manufacturer's instructions for horizontal and vertical surfaces.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Overlap edges and ends and seal in accordance with manufacturer's installation instructions. Seal permanently waterproof.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or moving.
- F. Seal items penetrating membrane and install counter flashing membrane material.
- G. Seal all terminations with pointing mastic.

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3.4 FIELD QUALITY CONTROL

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

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit traffic over unprotected or uncovered membrane.
- C. Protect membrane from damage by adhering protection board, applied with mastic over membrane surface. Scribe and cut boards around projections and interruptions.

END OF SECTION

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SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and field application of paints and coatings for field piping to be painted and painting of new door and frame in Pipe Gallery; miscellaneous new interior metals.
- B. Painting of galvanized railings and stair/platform framing on south end of Filter Building; painting of railings on retaining walls.
- C. Surface preparation and application of SHOP APPLIED coatings and interior lining for carbon steel and ductile iron pipe in direct contact with potable water; coating compliance with NSF 61 and AWWA standards as specified in Section 15060.
- D. Painting of components inside Pump Station, Valve Vault.

1.2 RELATED SECTIONS

- A. Section 11390 – Perimeter Drain Pump Station Equipment – painting piping and components inside pump station.
- B. Section 15060 – Piping and Pipe Fittings

1.3 REFERENCES

- A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. International Concrete Repair Institute (ICRI) Guideline No. 310.2-R2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- C. NACE (NACE International) -Industrial Maintenance Painting.
- D. SSPC (SSPC: The Society for Protective Coatings) SSPC Painting Manual Volumes 1 and 2.
- E. NAPF (National Association of Pipe Fabricators) Section 500 Surface Preparation Standards.

1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data on all products and special coatings. Data shall include manufacturer's suggested surface preparation and coating thicknesses.

- C. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention, environmental considerations and any restrictions regarding time recoat.
- D. A letter certifying the applicator as a Manufacturer's Approved Applicator shall accompany the submittal package.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section and one of the companies listed.
- B. Applicator: Company specializing in performing the work of this section with minimum ten 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; review products to verify acceptability and conformance with reviewed shop drawing submittals.
- 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 reviewed and acceptable 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.

- E. Provide adequate ventilation at all enclosed spaces. Additional ventilation may be required to prevent fumes from affecting adjacent Owner-occupied spaces.

1.9 SURFACES NOT REQUIRING PAINTING

- A. Aluminum (except for back coating as specified.)
- B. Stainless Steel.
- C. Copper.
- D. PVC, CPVC, HDPE and Fiberglass Pipe and Ductwork (including hangers).
- E. PVC Coated Electrical Conduit.
- F. Galvanized grating does not need to be painted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers – For the purposes of this Specification, Carboline coating products are the basis of design. Engineer reviewed and acceptable products and coatings from the following may also be used:
 - 1. TNEMEC Products
 - 2. Sherwin Williams Industrial Coatings
- B. Substitutions for Paint and Special Coatings: No substitutions are allowed.

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.

2.3 FINISHES

- A. Colors for paints and special coatings will be selected by the Owner from color samples submitted.

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.

3.2 PREPARATION

- A. Remove hardware, 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. Mildewed 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 back coated with bituminous based (or other Engineer acceptable isolation coating) prior to installation to provide separation of dissimilar materials.
- F. 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-16 – Brush Off Blast Cleaning of Coated or Uncoated Galvanized Steel, Stainless Steel and Non-Ferrous Metals.
 - 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. Once prepared, galvanized surfaces are to be treated per coating manufacturer's published instructions for paint coating preparation.
 - 4. Cleaned surfaces shall not remain overnight without a prime coat.
- G. 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 zinc-rich paints containing <80% zinc dust by weight of cured film.
 - 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, Carbozinc 11 HSN Carboline, 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.

H. Ductile Iron:

1. Remove grease, dirt, and other visible contaminants by washing with solvent (NAPF 500-03-01).
2. Where mill scale, weld spatter, and rust are evident, remove by power tool wire brushing (NAPF 500-03-03) or where required, abrasive blast cleaning (NAPF 500-03-04 and 500-03-05).
3. Spot prime paint after repairs.
4. Actual surface preparation procedure shall be based on coating manufacturer's published recommendations.

I. Shop Primed Steel Surfaces:

1. Prepare surfaces per SSPC 2/3 hand or power tool cleaning. 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.

J. Mechanical Equipment components to be field painted are to be pre-coated on site prior to assembly.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Apply each coat to uniform finish.
- C. Do not apply signs or pipe/equipment labels, etc. prior to installing coatings.
- D. Control panels 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.
- E. Paint shop primed equipment.
- F. Prime and paint exposed pipes and supports.

3.4 FIELD QUALITY CONTROL

- A. Areas may 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 reviewed 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.

- B. 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.

3.5 CLEANING

- A. Clean work under provisions of 01700.
- B. Collect waste material, 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.

3.6 SCHEDULE - ALL INTERIOR AND EXTERIOR SURFACES

Paint System	Surfaces
1	Submerged Metal Equipment and Piping/Components; exposed piping and components in Pump Station and Valve Vault
2	Not Used
3	Not Used
4	Hollow Metal Doors and Frames; steel stair/platform framing, railings, misc. new interior metals

- A. Aluminum Surfaces shall be back coated as specified for dissimilar materials protection.
- B. The schedule above pertains to new surfaces and materials, unless noted otherwise under each painting system.

3.7 PAINTING - SYSTEMS

A. **PAINTING SYSTEM NO. 1** – Submerged Metal Equipment and Piping/Components; buried below grade piping; exposed piping and components in Pump Station and in Valve Vault. **Manufacturer has specific requirements and DFT for POTABLE WATER applications. Coordinate with Field Representative from paint manufacturer and reviewed shop drawings.

1. Surface Preparation, Ductile Iron Pipe – NAPF 500-03-04 (Abrasive blast)
2. Surface Preparation, Ductile Iron Valves and Fittings – NAPF 500-03-05 (Abrasive blast)
3. Surface Preparation, Steel – SSPC-SP 10 (minimum; abrasive blast)

	Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
Stripe Coat	1	Carboline Phenoline Tank Shield	5.0-8.0 *	Phenolic Epoxy Novolac, (NSF/ANSI 61 compliant)
Primer	1	Carboline Phenoline Tank Shield	15.0 – 20.0	
Finish	1	Carboline Phenoline Tank Shield	15.0-20.0	

*CONTRACTOR shall coordinate stripe coat requirements with paint manufacture’s Field Representative and specific surfaces to be coated. Stripe coat flanges, bolts, sharp protrusions, outside corners, etc.

**Total Thickness of System – 30.0 to 40.0 Dry Mils (DFT), for primer and finish coat total.

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

PAINTING SYSTEM NO. 4 – Hollow metal doors and frames (interior and exterior faces), steel stair and platform framing, railings and supports, including rails on retaining walls; new miscellaneous interior metals. Exterior metals are galvanized; factory primer coat on door and frame by door manufacturer - apply field prime coat over factory coating. Do NOT paint galvanized grating.

4. Surface Preparation - SSPC-SP6

	Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
Primer*	1*	Carboline Carboguard 890 VOC	4.0 – 6.0	Cycloaliphatic Amine Epoxy
Finish	1	Carboline Carbothane 134 MC	2.0 – 3.0	Aliphatic Acrylic Polyurethane, Low VOC
<p>1* for steel stair, platform, railing assemblies and interior miscellaneous metals, provide primer coat and one intermediate coat of same product, prior to applying finish coat. For factory primed door and frame, only primer and finish coats are required.</p> <p>Total Thickness of System – 6.0 to 9.0 Dry Mils (DFT)</p>				

3.8 SCHEDULE -EQUIPMENT AND PIPING COLORS – Match Owner’s existing color scheme.

END OF SECTION

SECTION 11282

GATES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, tools, equipment, and supervision required to complete all gate installations and all other work incidental thereto as indicated on the Drawings and specified herein. The scope of supply shall include all gate components and accessories, including accessories not listed, to make gates fully functional for the purpose and service intended.

1.2 REFERENCES AND STANDARDS

- A. The gates and appurtenances shall be designed, fabricated, and tested in accordance with the latest edition of ANSI/AWWA standards as modified herein.
- B. Gates for a water treatment plant potable water application - the gate and all materials in contact with the water must be NSF/ASNI 61 compliant.

1.3 ITEMS SPECIFIED ELSEWHERE

- A. Section 01300 Submittals.
- B. The requirements of Section 15000, "Equipment, General," and all other applicable sections of the Specifications, form a part of this Section and govern work covered in this Section.
- C. Grout is specified in Division 03.
- D. Additional details are provided on the Drawings. These additional sources include specific gate requirements, including gate ID, size, gate frame (self-contained or conventional/open), mounting (wall thimble, surface, embedded), design head (seating and unseating), operation (downward or upward opening), and appurtenances.

1.4 SUBMITTALS REQUIRED

- A. Shop Drawings, including design calculations to certify compliance with ANSI/AWWA standards, including deflection, safety factors, seat contact pressure, stem design loads, etc. as well as an Affidavit of Compliance.
- B. Product Data Sheets
- C. Operation and Maintenance Manuals
- D. Means of Field Leakage Testing or Factory Certified Leak Test Results when field tests are not possible.
- E. Training Agenda and Materials

F. Start-up Report and Certificate of Proper Installation

G. Warranty

1.5 QUALITY ASSURANCE

A. All gates, plates, accessories, and/or appurtenances shall be by the same manufacturer. Gate manufacturers are required to coordinate designs to match seating/unseating torques, gate speed, etc.

B. Wall thimbles, pedestals, and steel stem covers must be designed, and shop drawings submitted by the gate manufacturer, but can be fabricated and/or galvanized locally, subject to review and acceptance by the Engineer.

C. Gates shall confirm to the appropriate ANSI/AWWA standards listed.

D. All welding shall be conducted in accordance with American Welding Society (AWS) D1.6 – Structural Welding Code, Stainless Steel. Welders shall be qualified and certified in accordance with ASME Section IX.

E. All gates that cannot be leak tested in the field, shall be leak tested in the factory. The leakage test shall apply pressures matching or exceeding the design head. Provide a certified test result prior to shipment.

F. All stainless-steel gates and materials shall be cleaned and passivated prior to shipment. The pre-cleaning solution, pickling paste, and neutralizing rinse shall be applied in accordance with the manufacturer's instructions. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared, and shop coated with a primer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Stainless steel flap gates shall be as manufactured by Rodney Hunt, Waterman, Hydro Gate, Whipps, Orbinox, or equal.

B. Duckbill flap gates shall be Red Valve TideFlex or Proco.

2.2 FLAP GATES

A. Fabricated Stainless Steel Flap Gates (Type FG-1)

1. Frame

a. The frame shall be constructed of formed stainless steel plate with a minimum thickness of 1/4- inch.

b. Frame design shall be of the flanged back type suitable for mounting directly to pipe flange, wall thimble, or wall surface grout or wall gasket. Mounting style shall be as shown on the Gate Schedule.

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- c. The angle of the flap when seated against the frame shall be between 3 degrees and 7 degrees from the vertical.
 - d. Lifting lugs shall be provided on the top of the frame to facilitate installation.
 2. Hinge Arms
 - a. Hinge arms shall be constructed of formed stainless steel plate with a minimum thickness of 3/4-inch and shall connect the frame to the flap.
 - b. Flap gates 18 inches wide and larger shall have two pivot joints per arm. An adjustable lower pivot with limited rotation and a fixed or adjustable upper hinge lug arrangement to permit adjustment of the opening sensitivity to unseating head.
 - c. The hinge pins shall have a minimum diameter of 1-inch and shall be constructed of solid stainless steel. Hinge Pins shall have UHMWPE sleeves. Greasable bushings are not acceptable.
 3. Flap
 - a. The flap and reinforcing stiffeners shall be constructed of stainless-steel plate with a minimum thickness of 1/4-inch.
 - b. The flap shall not deflect more than 1/360 of the span under the maximum design head.
 - c. Reinforcing stiffeners shall be welded to the flap.
 4. Seals
 - a. All flap gates shall be provided with a replaceable seal system to restrict leakage in accordance with the requirements listed in this specification.
 - b. A continuous resilient seal shall be mounted to the seating surface of the frame to restrict leakage.
 - c. The seal system shall be durable and shall be designed to accommodate frequent operation without loosening or suffering damage.
 - d. All seals must be bolted or otherwise mechanically fastened to the frame. Arrangement with seals that are force fit and/or held in place with adhesives are unacceptable.
 - e. The seals shall be mounted so as not to obstruct the water way opening.
 - B. Duckbill Flap Gates (Type FG-4)
 1. Specific construction requirements for duckbill flap gates shall be as follows:
 - a. Rubber construction with flap bottom.
 - b. Slip on connections shall fasten on the exposed piece of pipe with compression clamps. The inside diameter of the gate shall exactly match the outside diameter of the pipe.
 - c. Flanged connections with steel back-up rings shall be drilled to conform to ANSI B16.1 standards and port area equal to 100% of mating pipe port area.
 - d. The body shall be drilled and tapped for supplied clean out plug on top and flushing connections with plugs on bottom.
 - e. Maximum opening head required of 6-inches WC against no backpressure and designed to resist 20 feet of head back pressure.
 2. Valve size per line size shown on the schedule.

2.3 ANCHOR BOLTS

- A. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and plates.

1. Quantity and location shall be determined by the gate manufacturer for the mounting application.
2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
3. Anchor bolts shall have a minimum diameter of 1/2-inch.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Gates must be clearly marked prior to shipment.
- B. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
- C. The Contractor shall review the installation drawings and installation instruction prior to installing the gates.
- D. Contractor shall confirm that wall thimble and gate hole alignment prior to forming thimbles. The wall thimbles and gate assemblies shall be installed in a true vertical plane, square and plumb. Wall thimbles must be properly supported – vertically and horizontally – to prevent movement during the pour. Plug tapped holes prior to the concrete pour. Contractor shall move and vibrate concrete under the thimble so that it flows up through the vent holes.
- E. For flush mounted installations, the Contractor shall fill the void between the gate frame and the concrete wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations. Double nutting is not acceptable. Contractor shall wedge the frame true and plumb, fill the void with non-shrink gout, and remove the wedges after curing, then tighten all bolts sequentially.
- F. The Contractor shall add a mastic gasket between the gate frame and wall thimble (when thimble is not machined) in accordance with the manufacturer's recommendations.

3.2 INSPECTION REQUIREMENTS

- A. Factory gate representatives shall visit the site to certify proper installation, set open/close contacts and torque overloads, perform leakage tests, perform operator 40 lb . effort test and to provide training. The scheduling of this service shall be coordinated with the Owner and the cost of this service shall be included in the price of the equipment.
- B. Provide a Certificate of Proper Installation for each gate.

3.3 FIELD TESTING

- A. After installation, all gates and plates shall be field tested in the presence of the Engineer and Owner to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting.

- B. Each gate and plate shall be tested by the Contractor, to confirm that leakage does not exceed the acceptable leakage rate. The acceptable leakage rate is the allowable ANSI/AWWA leakage rate adjusted linearly for the actual head conditions encountered at the time of the test. (i.e. If the actual head is 50% of the design head, the acceptable leakage rate is 50% of the allowable ANSI/AWWA leakage rate.
- C. The effort to open and close manual operators shall be measured and shall not exceed the maximum operating effort specified herein.
- D. Provide field calibration/startup report and as build wiring diagram for each gate.
- E. If any of the above do not meet the specifications, the equipment shall be remedied as necessary and re-tested at the Contractor's expense.

END OF SECTION

SECTION 11390

PERIMETER DRAIN PUMP STATION EQUIPMENT

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish all labor, materials, tools, equipment and supervision required to install the pumping equipment, as indicated on the Drawings and specified herein, and all other work incidental thereto, except as otherwise noted.
- B. The work under this Section is intended to include the necessary materials and workmanship which are required for the completion of the pumping station, as shown on the Drawings, unless otherwise specified.
- C. The work shall be complete and ready for satisfactory operation whether or not each and every item is shown on the Drawings or specifically mentioned in these specifications.
- D. The requirements of Division 16, "Electrical," and all other applicable sections of the Specifications, form a part of this Section and govern work covered in this section.

1.2 ITEMS SPECIFIED ELSEWHERE

- A. Force Mains external to the pumping station shall be as specified in Section 02669.
- B. Piping inside Pump Station shall be painted per Section 09900.

1.3 ELECTRICAL REQUIREMENTS

- A. Refer to Division 16 of the Specifications for electrical equipment, wiring, etc. included in this section of the Specifications.
- B. All wire and conduit provided shall meet the requirements of the Electrical Division of these Specifications.
- C. Wire and terminal numbering and wire color requirements shall be as specified in the Electrical Division of these Specifications. Wiring diagrams are required in the form called for in the Electrical Division of these Specifications.
- D. Control cabinet, level systems and other electrical devices furnished as part of this Section shall be installed under Division 16 of these Specifications.

1.4 SHOP DRAWINGS & OPERATION & MAINTENANCE MANUALS

- A. Shop drawings are required for each item in this section of the Specifications, including pumps, motors, valves, piping, miscellaneous metal, control panel, etc. Each shop drawing submittal shall include as a minimum the following information.
 - 1. Identification of the item, i.e., written description, reference to equipment schedule.

2. Assembly drawings which identify each part of the item specified. These should include dimensions and a materials of construction list.
 3. Information which verifies that the item meets process specifications, i.e., corrosion resistance, temperature rating, pressure rating, strength, performance curve.
 4. Electrical and control information for the appropriate equipment, including motor nameplate data, wiring diagrams, and control panel layouts, where applicable.
- B. The Contractor shall furnish electronic PDF and two (2) complete sets of loose leaf bound operating and maintenance instruction manuals covering each item of equipment, apparatus, and device furnished or erected, to include, but not limited to:
1. Catalog data or literature
 2. Installation instructions
 3. Manufacturer's operating instructions
 4. Manufacturer's maintenance instructions
 5. Wiring diagrams
 6. Equipment operating characteristics
- C. For detailed shop drawing requirements, refer to Section 01300.

1.5 INSPECTION TRAINING REQUIREMENTS

- A. A factory representative employed by the pump manufacturer shall visit the site prior to equipment start-up to verify the proper installation of the equipment and to instruct the Owner's operating personnel in the maintenance and operation of these units. The scheduling of this service shall be coordinated with the Owner and the cost of this service shall be included in the Contractor's bid price.
- B. Training requirements shall be 1 day (8 hours at site) unless otherwise specified.

1.6 PAINTING

- A. All piping valves, pumping equipment and miscellaneous metals inside pump station shall be sandblasted and painted with not less than two coats – product as specified in Section 09900.

PART 2 PRODUCTS

2.1 WORK INCLUDED

- A. This section covers the supply and installation of pumping equipment, piping, valves and associated electrical work. All pumps shall be furnished by a single manufacturer.
- B. The Contractor shall furnish and install all necessary supports, framing, motors, cable supports and all other appurtenances specified herein or required for a complete installation.
- C. All piping shall be flanged unless otherwise called for and the flanges shall be drilled to suit 125 lbs. ANSI piping system.
- D. Liquid filled pressure gauges and isolators shall be provided at locations shown within the valve chamber. Pressure gauges shall be as specified hereinafter.

- E. The Contractor shall provide certified copies of head capacity curves for all pumps based on test data from similar pumps. Curves shall also include pump efficiency and horsepower. The motor HP specified or shown on the Drawings shall be considered the maximum acceptable HP for the pump.
- F. Pumps shall have grease or oil lubricated bearings with a minimum AFBMA B-10 rating of 50,000 hours, unless otherwise specified.
- G. All pumps shall be mounted on rigid cast iron base elbows as specified hereinafter. Baseplates shall be capable of supporting pumps without additional support.
- H. Alignment of all pumps shall be field checked and adjusted as required prior to startup of pumps.

2.2 DESIGN CHARACTERISTICS

Pump Designation:	P-PD01, P-PD02
Number of Units:	2
Capacity - Each Pump:	See Drawings
Rated Discharge Head:	See Drawings
Suction Head:	See Drawings
NPSHA at Design Point	See Drawings
Shutoff Head	See Drawings
Drive Type:	Submersible
Pump Speed:	1800 RPM
Minimum Efficiency	See Drawings
Motor Horsepower:	See Drawings
Motor Speed:	1800 RPM
Service Factor:	1.15
Motor Enclosure:	IP 68
Motor Electrical:	460V /3 pH /60 Hz

2.3 PUMPS

- A. Pumps shall be submersible explosion-proof pumps capable of handling perimeter drain water. Their design shall be such that each pump shall be automatically and firmly connected to its discharge piping when lowered into place on its mating discharge connection, permanently installed in the wet well. The pumps shall be easily removable for inspection or service requiring no bolts, nuts or other fastenings to be disconnected.
- B. Each pump shall be equipped with a system for connecting a hoisting hook to the pump without requiring personnel to enter the wet well. The pump removal system shall be one of the following systems:
 - 1. Gripping Eye Pump Removal System
 - a. Each pump shall be fitted with a Type 316 stainless steel forged link chain sling of adequate strength and length to permit a chain "gripping eye" to be positioned on it to grip the chain and allow the pump to be removed from and installed into the wet well. The "gripping eye" shall be suitable for attachment to an Owner furnished hoist. Two "gripping eyes" shall be

furnished. A Type 316 stainless steel guide cable of sufficient length to span from the lifting chain on the pump to 5 ft. above the top of the pump station shall be provided for each pump and shall be securely attached to the lifting chain and a stainless steel eye bolt located within or adjacent to the wet well access hatch. The "gripping eye," pump chain, guide cable and all appurtenances required to provide a complete pump removal system shall be supplied by the pump manufacturer.

2. Remote Control Pump Removal System
 - a. Each pump shall be fitted with dual 316 stainless steel guide cables of sufficient length to span from the pump to the top of the pump station. The guide cables shall be securely attached to a bracket within the pump access hatch. Two remote controlled latching mechanisms for attachment to an Owner furnished hoist shall be furnished. The latching mechanisms shall be designed to be lowered to the pump along the guide cables. When the mechanism reaches the pump, a pull rope actuated by the operator shall cause the latching mechanism to positively engage the pump lifting bail. The guide cables, latching mechanism, pull rope, brackets and appurtenances required to provide a complete pump removal system shall be provided by the pump manufacturer.
 - C. Each pump, with its appurtenances and cable, shall be certified to have withstood a test for continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.
 - D. The pump shall be tested at start-up and voltage, current, and other significant parameters recorded. The manufacturer shall provide a formal test procedure and forms for recording data.
 - E. Major pump components shall be of ASTM A-48, Class 30 or 40 gray cast iron with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts and bolts shall be ASTM A-276, Type 316 stainless steel. All surfaces coming into contact with wastewater, other than stainless steel, shall be protected by an approved resistant coating. Pump exterior shall be sprayed with manufacturer's standard epoxy paint system.
 - F. All mating surfaces where watertight sealing is required shall be machined and fitted with Buna-N or Nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of O-rings without requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical o-rings, grease or other devices shall be used.
 - G. The cable entry water seal design shall preclude specific torque requirements to ensure a watertight seal and shall be strain relieved. The cable entry shall be designed with a gland or grommet having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body. The cable entry design shall incorporate those features necessary to preclude entry of water to the terminal board and motor even if the cable is damaged or severed below water level.
 - H. Each pump motor shall be an explosion-proof squirrel-cage, induction, shell type design motor, housed in an air-filled, watertight chamber, NEMA Design B type. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of 155°C (311°F). The motor shall be designed for continuous duty, capable of sustaining a minimum of ten (10) starts per hour. The motor shall also have cooling
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characteristics suitable for continuous operation in a totally, partially or non-submerged condition in a hazardous atmosphere. The pump shall be capable of running dry for a period of 24 hours without damage. The rotor bars and short circuit rings shall be made of aluminum. The pump motor shall not rely on circulated water to satisfy its cooling requirements.

- I. Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board within the junction chamber on top of the motor.
- J. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches, embedded in the end coils of the stator winding (one switch in each stator phase). These shall be used in conjunction with and supplemental to external motor overload protection and wired to the control panel.
- K. The pump shaft shall be ASTM A-276, Type 420 stainless steel or ASTM A-576-1045 carbon steel protected by an ASTM A-276, Type 420 stainless steel shaft sleeve.
- L. Each pump shall be provided with a tandem mechanical rotating shaft seal system. Seals shall run in an oil reservoir. Lapped seal faces shall be hydrodynamically lubricated at a constant rate. The lower seal unit, between the pump and oil chamber, shall contain one stationary and one positively driven rotating tungsten carbide or silicon carbide ring. The upper seal unit, between the oil sump and motor housing, shall contain one stationary silicon carbide or tungsten carbide ring and one positively driven rotating carbon ring. Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to assure that air is left in the oil chamber, to absorb the expansion of the oil due to temperature variations. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.
- M. A seal failure leak detector shall be furnished to detect the presence of moisture in the motor stator chamber or the oil chamber. The leak detector shall be a float switch mounted in the stator chamber or a probe in the oil chamber. The float switch or probe shall be wired to a leak detector relay used to indicate an alarm condition. A leak detector relay compatible with the pump leak detector shall be provided by the pump supplier.
- N. The pump shaft shall rotate on two (2) permanently lubricated bearings. The upper bearing shall be a roller or ball bearing and the lower bearing shall consist of one, single row angular contact ball bearing and a single row roller bearing or a double row ball bearing.
- O. The impeller shall be of gray cast iron, Class 30, dynamically balanced, non-clogging design having a long thrulet without acute turns. The impeller shall be capable of handling normal perimeter drain water applications. The fit between the impeller and the shaft shall be a sliding fit with one key, and the fastening of the impeller to the shaft shall be made by a locking assembly consisting of a bolt threaded to the shaft terminal.
- P. The volute shall be of single piece design and shall have smooth fluid passages large enough at all points to pass any size solid which can pass through the impeller, the volute bottom shall be of a suction bell design. The volute shall be provided with a cleanout hand hole with a removable cover.
- Q. The pump motor cable shall be suitable for submersible pump application with P122-MSHA approval indicated by a code or legend permanently embossed on the cable or on a stainless

- steel nameplate attached to the pump. Cable sizing shall conform to National Electrical Code requirements for motors. The cable shall also be suitable for use in Class I, Division 1, Group "D" hazardous locations per N.E.C. requirements, including requirement that cable is incapable of transmitting gases or vapors through the cable core.
- R. Cable supports shall be provided, and shall be stainless steel wire braid, split sleeves with attachment tails for connection to the support cable.
- S. A sliding guide bracket shall be an integral part of each pump unit. Each volute casing shall have machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the wet well and discharge line, shall receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices.
- T. Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit, guided by either a single or dual guide rail or cable system. Sealing of the pumping unit to the discharge connection shall result from the simple linear downward motion of the pump, with the entire weight of the pumping unit guided to and pressing against the discharge connection; no portion of the pump unit shall bear directly on the floor of the wet well. An upper guide bracket, chain hook, and cable holder shall be provided for each pump. All components shall be of stainless-steel construction. Lower guide holders shall be integral with pump discharge connection pipe. Guide bars shall be made of Schedule 40, 304 Stainless Steel Pipe or type 316 stainless steel cable, as shown on the Drawings.
- U. Each pump shall be a submersible non-clog pump capable of passing a minimum 3" diameter sphere. Each pump shall be equipped with a 1750 RPM, 480 Volt, 3 phase, 60 Hertz explosion-proof electric motor. Maximum pump horsepower shall be 9.4. Pumps shall be suitable for connection to the electric service shown on the Drawings. Each pump shall be furnished with a sufficient length of electrical cable to run from the pump to the junction box mounted at the control cabinet as shown on the Drawings. The electric cable shall contain sufficient conductors for power, thermal switches, leak detectors and ground, sized as required by the National Electrical Code as a minimum. Prior to shipment the cable end shall be sealed with a high quality protective covering to make it impervious to moisture or water.
- V. Pumps shall be as manufactured by ABS or Flygt.
- W. The pump manufacturer shall perform the following inspections and tests on each pump before shipment from the factory:
1. Impeller, motor rating and electrical connections shall be checked for compliance with the specification requirements.
 2. A motor and cable insulation test for moisture content or insulation defects shall be made.
 3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
 4. The pump shall be run for 30 minutes submerged, a minimum of six (6) ft. under water.
 5. After operational test 4.), the insulation test 2.) shall be performed again.
- X. A written report stating the foregoing steps have been done shall be supplied with each pump at the time of shipment.
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- Y. The pump manufacturer shall warrant all pumps being supplied to the Owner against defects in workmanship and material for a period of five (5) years from the date of acceptance under normal use, operation and service.

2.4 PRE-CAST CONCRETE WET WELL

- A. Furnish and install pre-cast concrete wet well as shown on the Process Drawings.

2.5 ACCESS FRAMES

- A. Furnish and install vault access door, as shown on the Drawings. Length denotes hinge side. The access door shall be single leaf and pre-assembled from the manufacturer. Access cover shall be Halliday Products or Bilco.
- B. Performance characteristics:
1. Cover: Covers shall be H-20 rated designed for vehicular loads. Manufacturer to provide structural calculations stamped by a registered professional engineer upon request.
 2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
- C. Cover: Shall be aluminum diamond pattern.
- D. Frame: Channel frame shall be extruded aluminum with bend down anchor tabs around the perimeter.
- E. Drain Coupling: Provide a 1-1/2" drain coupling located in the right front corner of the channel frame.
- F. Fall Protection Grating System:
1. Door manufacturer shall provide fall protection grating system under access cover, factory fabricated with cover.
 2. Grating performance characteristics:
 - a. Lock automatically in the full open position.
 3. Grating: Panels shall be aluminum with a powder coat paint finish and designed to meet OSHA 29 CFR 1926.502(c) requirements for fall protection.
 4. Hold open feature: A Type 316 stainless hold open device shall be provided to lock the cover in the fully open 90-degree position.
 5. Hardware: All hardware shall be Type 316 stainless steel.
- G. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.
- H. A removable exterior turn/lift handle with a spring-loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.

I. Hardware:

1. Hinges: Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4" (6mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
2. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position.
3. Cover shall be fitted with the required number and size of compression spring operators. Springs and spring tubs shall be Type 316 stainless steel.
4. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
5. Hardware: Shall be Type 316 stainless steel throughout.
6. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

2.6 PIPING

- A. Pump station discharge piping and fittings shall be AWWA C900 PVC of the size indicated on the Drawings in conformance with the current editions of C900 "PVC Pressure Pipe" for water or other liquids.
- B. Piping within the wet well and valve chamber shall have flanged joints; other piping shall have mechanical or push-on type joints. Buried piping shall be installed in conformance with AWWA C-600. Exposed bolts, nuts and washers on above ground and buried piping shall be 304 stainless steel.

2.7 CHECK VALVES

- A. Check valves shall be as specified in Section 15100 "Valves and Actuators".

2.8 PLUG VALVES

- A. Plug valves shall be as specified in Section 15100 "Valves and Actuators".

2.9 COMPATIBILITY OF PUMPS AND ACCESSORIES

- A. To ensure compatibility between the pumps and the various accessories for all pumping stations, including electrical components, the pump manufacturer shall furnish the mounting hardware, float switches, access frame, guides, and pump motor cables. The pump manufacturer shall also furnish a Pump Control Panel including all electrical and control equipment as detailed on the Drawings and specified hereinafter. All electrical and control equipment shall be as specified hereinafter and shall be installed under Division 16 of these Specifications.

2.10 DUPLEX PUMP CONTROL PANEL (INSTALLED AND SUPPLIED BY SYSTEM HOUSE)

- A. The Duplex Pump Control Panel shall be a free standing, rack-mount enclosure containing all the instruments, devices, and equipment in accordance with and as required to afford the operations for the pump station as herein described and as shown on the Drawings. The Duplex Pump Control Panel shall be furnished by Tempest Enterprises, LLC in accordance with their scope letter contained in these specifications.

- B. The motor control panel shall be assembled and tested by a controls system manufacturer meeting the Standards of UL 508A for industrial controls and be UL labeled and serialized accordingly.
- C. The panel shall contain all components required by the pump manufacturer for starting and protecting the motor as well as features required by the pump manufacturer for warranty of the pumps.
- D. Incoming pump power shall be 3-phase, 480VAC, 60 Hz.
- E. The pump station shall incorporate one (1) radar level sensor and two (2) normally open mechanically activated float switches with sufficient length of cable for the installation. These will be used to control the pumps and the float switches will provide low-low level signal to Stop Pumps and high-high level for the Lag Pump Start/Alarm.
- F. Provide magnetic motor starters, rated for the pump horsepower. A motor protective switch shall be used to provide adjustable overload protection, protect from line faults, and disconnect the pump from the incoming power. Motor protective switches shall be adjustable to meet NEC requirements for motor controls.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine conditions under which products are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install products in conformance with governing codes, applicable standards, manufacturer's instructions and recommendations, and the Contract Documents.
- B. See Section 15000 "Equipment, General"

3.3 FIELD QUALITY CONTROL

See Section 15000 "Equipment, General" for field testing, start-up, and training.

END OF SECTION

SECTION 15000

EQUIPMENT, GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. The Contract Drawings and the general provisions of the specifications included in Division 0-Contract Provisions and Division 1-General Requirements, are a part of these specifications. The Contractor shall consult them for instructions pertaining to the work.
- B. This Section is comprised of standards for construction and materials for those divisions of these specifications under which Process and Service Equipment is provided and installed. The Contractor shall refer 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 specification section to which they apply and/or shown on the Drawings. Where more stringent construction methods are required than imposed by this Section, they are specified in the detailed sections and shall apply.

1.2 WORK INCLUDED

- A. These specifications and the accompanying Drawings are intended to comprise the furnishing and installing of all materials, equipment and supplies as specified herein and required for the satisfactory completion by the Contractor of all work including the installation of Owner furnished equipment.
- B. The Drawings and these specifications are complementary to each other in that all apparatus, materials and equipment shown on the Drawings and/or specified herein shall be considered essential to the contract requirements.
- C. The Contractor is responsible for all work shown on the Drawings and all the systems described herein, unless otherwise shown on the Drawings or specified herein.
- D. All apparatus and equipment furnished and installed by the Contractor must be of such dimensions and design as to be adapted to the arrangement of the installation and to fit within the limits of the space available for them.

1.3 SHOP DRAWINGS & OPERATION & MAINTENANCE MANUALS

- A. Shop drawings are required for each item of equipment, apparatus, device and piping furnished. Each shop drawing submittal shall include as a minimum the following information.
 - 1. Identification of the item, i.e., written description, reference to equipment schedule.
 - 2. Assembly drawings which identify each part of the item specified. These should include dimensions and a materials of construction list.
 - 3. Information which verifies that the item meets process specifications, i.e., corrosion resistance, temperature rating, pressure rating, strength.
 - 4. Electrical and control information, where applicable, for the appropriate equipment, including wiring diagrams in specified form and cut sheets for all components.

5. The location, size and quantity or flow rate of any, compressed air or water service to the equipment.
 6. Information on painting systems used for all components.
- B. Operation & Maintenance Manuals – At Contract Close-Out, the Contractor shall furnish for all equipment requiring periodic maintenance, one (1) electronic version in PDF format and two (2) hard copy complete sets of loose leaf bound operating and maintenance instruction manuals covering each item of equipment, apparatus, and device furnished or erected, to include, but not limited to the following:
1. Catalog data or literature
 2. Installation instructions
 3. Manufacturer's operating instructions
 4. Manufacturer's maintenance instructions
 5. Wiring diagrams
 6. Equipment operating characteristics

PART 2 PRODUCTS

- A. Not Used.

PART 3 EXECUTION

3.1 DRAWINGS AND MEASUREMENTS

- A. The Drawings show the arrangement, general design and extent of the systems. The equipment, main lines and connections are shown more or less in diagram and in their general locations, except where, in certain cases, the Drawings may include details giving the exact location and arrangement.
- B. 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.
- C. Field measurements necessary for getting out materials and fitting in the installation to the building construction shall be taken by the Contractor.
- D. Shop drawings and/or equivalent information shall be submitted to the Contractor by sub-contractors and will be passed upon by the Owner and returned through the Contractor.
- E. Shop drawings and/or equivalent information shall be processed in accordance with Sections 01300 and 01600 of Division 1 and any additional requirements of the detailed sections.

3.2 LINES AND GRADES

- A. Work shall be constructed in conformity with lines and grades as indicated on Drawings.
- B. The Contractor shall lay out his work and be responsible for lines, elevations and measurements required for the installation of his work.

3.3 "AS BUILT" DRAWINGS

- A. The Contractor shall comply with all requirements of Section 01700 of these specifications.

3.4 CUTTING AND REPAIRING

- A. All cutting and repairing of existing and completed work, including manholes, which is required for the installation of the Contractor's work shall be done by the respective subcontractors for the various trades involved, at the Contractor's expense.
- B. The Contractor shall provide openings in the floors, walls, etc., as required for the installation of the piping and equipment.

3.5 APPORTIONMENT OF THE WORK

- A. The Contractor shall classify and apportion all materials and the performance of all labor to the several trades involved in accordance with all local customs, rules, regulations, jurisdictional awards, decisions, etc., insofar as they may apply to and as required to efficiently execute the work involved in this contract, regardless of the classification indicated in these specifications.

3.6 MATERIALS AND EQUIPMENT

- A. All material shall be new and be the standard products of the manufacturer, unless otherwise specified or accepted by the Owner. The Owner reserves the right to reject any materials, proposed or installed, which in his opinion fail to meet these quality standards. The Contractor shall, at his own expense, remove and replace with acceptable materials, any materials which in the opinion of the Owner do not comply with these quality standards.
- B. When a specific manufacturer or trade name is mentioned in these specifications, and/or on the Drawings, it is used to establish a standard of quality. Substitution of other makes of equal quality may be made, subject to the review and acceptance of the Owner, in accordance with the General Conditions.
- C. Any items required to complete the work and not specifically mentioned herein, shall conform fully to the quality pattern established by these specifications.

3.7 STORAGE AND HANDLING OF MATERIALS AND EQUIPMENT

- A. The Contractor shall coordinate delivery of equipment with his construction program so that an undue amount of storage space is not required. Space for Contractor's use will be designated by the Owner.
- B. The Contractor shall exercise care in the protection of materials and equipment furnished and/or installed under this contract while they are in storage at the site and during and after installation prior to final acceptance.
- C. All materials and equipment shall be handled in a manner to avoid damage or breakage and delay in the completion of the work. The Contractor shall repair or replace, without cost to the Owner and to the satisfaction of the Owner, all items damaged or broken as a result of his operation.

- D. All machined surfaces of the equipment subject to corrosion shall be protected by coating with grease immediately after finishing.
- E. All flanges shall be protected prior to installation by means of wooden flanges bolted in place.
- F. Equipment and materials stored outdoors shall be blocked up at least six inches above the ground.
- G. All materials shall be protected from serious shock, denting, and marring of surfaces.
- H. All unpainted steel surfaces shall be prevented from rusting by an Owner acceptable method.
- I. Plate and sheet metal work shall be handled and stored with care to prevent permanent deformations or crimps in the material.
- J. Whenever the shop coat of protective paint is damaged, spot coating shall be made immediately to prevent rusting.
- K. All parts of the equipment shall be carefully crated to facilitate shipping and handling. The crates shall be constructed to completely protect the equipment and shall be sufficiently strong to permit lifting and skidding without requiring additional bracing or reinforcement.
- L. All materials shall be delivered, stored, and handled as to prevent the inclusion of foreign materials and/or damage by water, breakage or other causes. Packaged materials shall be delivered in original unopened containers and shall be stored until ready for use. Packages or materials showing evidence of damage or contamination, regardless of cause, will be rejected. All materials which have been stored shall be subject to retest and shall meet the requirements of these specifications at the time they are used in the work and at the time of final acceptance of the work.
- M. The Contractor shall obtain a letter from the equipment manufacturer describing the recommended methods of outdoor or indoor storage of the equipment at the site and shall fully comply with such recommendations.
- N. All materials to be incorporated in the work shall be properly arranged, covered, and protected and the Contractor shall be solely responsible for the safety of the same.
- O. Materials may be stored on the site in locations designated by the Owner.

3.8 MAINTENANCE PRIOR TO FINAL ACCEPTANCE

- A. The Contractor shall be responsible for the maintenance of equipment and systems installed until final acceptance by the Owner, and shall take such measures as necessary to insure adequate protection of all equipment and materials during delivery, storage, installation, start up, temporary operation, and shut down.

3.9 ADJUSTMENT AND OPERATION OF SYSTEMS

- A. When the work included in these specifications is complete, and at such time as directed by the Owner, the Contractor shall adjust all parts of the systems, advising the Owner when this has been done and the work is ready for final tests.

- B. If it becomes necessary for temporary use of the systems by the Contractor, before all parts are complete, the Contractor shall adjust all parts as far as possible in order to make said temporary use as effective as possible.
- C. If such temporary use is for the Owner's benefit and cleaning or repairing of damage is necessary due to the Owner's actions, such cleaning and repair cost shall be paid by the Owner based on a prior negotiated price.
- D. After temporary use and before acceptance tests, all systems shall be readjusted to meet permanent operational requirements. All systems shall be cleaned internally and externally before placing in operation, and any damaged surfaces shall be restored to as new condition.

3.10 EQUIPMENT BASES

- A. All equipment on concrete floors shall be mounted on minimum 6" high concrete pads, unless otherwise noted on the Drawings or required by the equipment for proper installation.
- B. All motor driven equipment installed by suspension from building structure shall be so designed and so installed as to effectively isolate all vibration of the equipment from the building structure. The Owner will reject any installations where equipment vibration is not effectively isolated.
- C. Except where otherwise hereinafter specified, the Contractor shall provide structural steel or cast iron bases for all equipment which is to be installed on concrete floor slabs. Unless otherwise shown on the Drawings, motors and the equipment they drive, shall be mounted on common bases from the floor.
- D. Where equipment is mounted outdoors, equipment shall be mounted on structural steel frames with foundations and concrete slab pavement under, as detailed.

3.11 OIL AND GREASE FITTINGS

- A. The Contractor shall furnish all oil and grease required to place all of the equipment in initial operation. Oil and grease shall be in accordance with the equipment manufacturer's recommendations.
- B. Oil and grease fittings throughout the entire job shall be of one standard type, as acceptable to the Owner. Where equipment is furnished by the manufacturer with unacceptable fittings, the Contractor, at his own expense, shall provide and install standard fittings. All fittings shall be installed in a readily accessible location or provided with extension lines for ease in lubrication.

3.12 NAMEPLATES

- A. Each component of equipment and valves, unless otherwise specified, shall have the manufacturer's name and catalog number on a plate securely attached to the item or equipment, or the name and catalog number may be stamped or cast into the body of the item, nameplates shall also give data pertinent to the operation and characteristics of the equipment.
- B. All equipment installed shall be identified in accordance with the following unless otherwise indicated on the Drawings.

- C. Individual pieces of equipment and valves shall bear legend plates identifying the equipment numbers as called for on the Drawings. Plates shall be white laminated plastic with engraved black letters.
- D. The legend plates shall be 1-1/4" high and 3-1/2" wide and shall be attached to the equipment by means of stainless steel countersunk head machine screws with Phillips slots. The plates shall be approximately 3/32 inch thick with beveled edges and shall have letter sizes and legends as acceptable to the Owner.

3.13 COORDINATION

- A. Before proceeding with installation of piping, ductwork or other system, 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 shall then determine the resolution of the interference and shall so inform the Contractor. The Owner's decision shall be binding.

3.14 WELDER QUALIFICATIONS AND PROCEDURES

- A. All welding of piping covered by this specification, regardless of conditions of service, shall be performed as follows:
 - 1. Pipe welding shall comply with the provisions of the latest revision of the following applicable codes, rules or regulations.
 - 2. Rules for construction of power boilers (Sections I, VI, and appendix, ASME Boiler and Pressure Vessel Code).
 - 3. Qualification standard for welding procedures, welders, and welding operators (Section IX ASME Boiler and Pressure Vessel Code).
 - 4. Code for pressure piping ANSI 831.1 with supplement No. 1 ANSI B 31.1A.
 - 5. State or local requirements as may supersede the above codes.
 - 6. Standard procedure specifications and welders qualified by the national Certified Pipe Welding Bureau shall be considered as conforming to the requirements of these specifications.
 - 7. All pipe welding may be by either oxy-acetylene or arc method, and shall be done by qualified welders. 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.
 - 8. Tee connections in welded piping shall be made with a factory fabricated butt welding tee or with Weld-o-lets. 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.
 - 9. Short radius welding ells shall be used in changing pipe directions of welded pipe lines. Mitered joints shall not be used unless acceptable to the Owner.

3.15 ACCEPTANCE TESTS

- A. Upon completion of each installation of each equipment or process system and within 60 days after the date of initial operation of each system, the Contractor shall, at his expense, conduct complete performance tests in the present of the Owner, to fully demonstrate the capacity and all other characteristics of each system. These tests shall be run for not less than one (1) hour for each point, and shall fully demonstrate the ability of each piece of apparatus to perform as

herein required and/or as called for on drawings and/or shown on the catalog of the manufacturer of the specified item and/or shown on the submitted shop drawings.

- B. Upon completion of the work, the Contractor shall conduct a complete inspection of all items of work required by the contract documents, and make whatever corrections and adjustments are necessary to obtain a complete, well-functioning system, which meets the requirements of the Owner. All nameplates on equipment shall be kept clean for easy reading.
- C. Pumps, motors and apparatus shall be made to operate at any condition up to full capacity without undue vibration, objectionable noise or overheating. Motors shall be proven not to heat to a temperature exceeding 80 degrees centigrade.
- D. The Contractor shall provide all materials and labor necessary to perform these tests.
- E. This specification shall apply unless more stringent tests are outlined for a particular item of equipment.

3.16 PRESSURE TESTS

- A. The testing requirements for the respective piping systems shall include all those of the applicable governing codes, such as state, local, and insurance, and those hereinafter specified. All code required inspection certificates shall be furnished by the Contractor, as required.
- B. The Contractor shall make pressure tests on all piping included in the contract. All tests shall be made before piping is painted, covered or concealed. The Contractor shall furnish all pumps, compressors, gauges and other necessary testing equipment and make all connections necessary for the tests.
- C. All tests shall be made in the presence of the Owner and where required, the inspection department having jurisdiction, who shall be notified by the Contractor in sufficient time to enable him to be present. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated. All repair to piping shall be made with new material and to the satisfaction of the authorized inspectors.
- D. All piping systems shall be tested hydrostatically at 50 psi greater than maximum operating pressure but not less than 50 psig for two hours, unless otherwise noted.
- E. The Contractor shall provide all materials, equipment and labor necessary to perform these tests.

3.17 VIBRATION

- A. Equipment shall be designed and installed so as to preclude excessive vibration. The Owner will reject any installations where excessive equipment vibration is in evidence.

END OF SECTION

SECTION 15010

ELECTRICAL REQUIREMENTS FOR MECHANICAL WORK

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Electrical equipment shall be furnished and installed where called for in other Sections of other Divisions and noted on the Drawings, as noted therein in accordance with the requirements hereinafter.
- B. Complete information required for wiring and connecting electrically operated or electrically controlled equipment under other Divisions of these Specifications shall be furnished. Control devices shall be installed in proper time and sequence to meet the Electrical Work schedule.
- C. All motorized equipment shop drawings shall include motor data sheets indicating all nameplate data and motor features, materials, and special construction details.
- D. The size and voltage of all motors furnished under these various Specification Sections, for which starters are to be furnished under Division 16, shall be verified. If starters are to be provided with the equipment under Division 15, or other Division under which the equipment is specified, they shall be of the same manufacturer as those provided under Division 16 and the number of auxiliary contacts required on each motor starter shall be provided. Any conflicts with related equipment furnished under Division 16 of these Specifications shall be coordinated and resolved to make a complete and operable system.
- E. All equipment shall be grounded as specified herein and the number and location of all grounding connections shall be coordinated with the grounding system provided and installed under Division 16.

1.2 WORK NOT INCLUDED

- A. Refer to Division 16.

1.3 ELECTRICAL EQUIPMENT AND WORKMANSHIP

- 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 IEEE, ANSI, NEMA, ISA, and Underwriters' Laboratories.
 - 4. Division 16 of these Specifications.

PART 2 PRODUCTS

2.1 PACKAGE EQUIPMENT

- A. All package equipment shall be factory wired where possible from motors to control panels, starters, or to junction boxes. Coordinate all final connections to package equipment with equipment supplier before installation.
- B. Packaged mechanical and service equipment and systems with electric motors and controls and with mechanical, electrical, and other components which may or may not be integrally mounted shall be totally furnished and installed under Division 15 or the Division under which the equipment is specified. Division 16 shall furnish power connections to each "package" and connect alarm signals to specific locations for each "package" as indicated on the Drawings or specified under that particular equipment Specification Section.
- C. All electric solenoid valves and motor operated valves furnished as a part of "package" equipment.
- D. For all Specification Divisions, the equipment manufacturer shall provide power, control interlocking, and alarm connection terminal blocks.
- E. All equipment shall be grounded as specified herein.

2.2 ELECTRICAL CONTROL EQUIPMENT REQUIREMENTS

- A. All controls for equipment furnished as part of a "package" supplied by the equipment manufacturer shall meet the requirements of Division 16 of these Specifications. Control systems shall be complete with a main service switch and minimum NEMA Size 1 combination starters incorporating motor circuit protectors with current limiters where available short circuit current exceeds 15,000 amperes.
- B. Combination molded case circuit breaker and contactor shall be provided for all three phase, non-motor loads. All single phase motors powered out of control panels supplied with equipment shall be provided with manual motor starters as specified in Division 16, unless specified otherwise.
- C. Control systems shall also include control transformers, heavy duty disconnect switches, industrial control relays, control devices, pilot lights, selector switches, pushbutton switches, alarm contacts, terminal strips, wire numbers, foreign circuit disconnects, and other such devices as may be required. All components shall be heavy duty, industrial type. Panels shall, as a minimum, meet all requirements of the National Electrical Code. Control panels shall be NEMA Type 4, unless otherwise specified, and shall be mounted such that the top of the panel is no higher than 6'-0" above the floor, platform, or slab and such that 3'-6" clear work space is provided in front of the panel. The control panel shall be manufactured by a UL listed industrial control panel manufacturer. Each device shall be permanently identified by a lamicaid nametag, attached to the panel, subpanels or mounted adjacent to the device and engraved with the device's wiring diagram designation and its function.

- D. Where control panels incorporate failure, lockout, and/or alarm devices, a single pole, double throw, dry and isolated contact indicating equipment "Trouble" shall be provided for remote alarm indication.
- E. Voltage conditioning and surge suppression devices shall be provided as required by the equipment manufacturer for use in a waste treatment plant environment.
- F. All field wiring and wiring connections for field mounted components of packaged equipment systems shall be provided under Division 16 of these Specifications.
- G. A written sequential description of operation under various modes of control shall be provided, describing the complete control circuit and equipment operation and logic.

2.3 ELECTRIC MOTORS

- A. Electric motors shall be as specified for mechanical equipment.

2.4 ELECTRICAL WIRING

- A. Electrical wiring shall be installed in heavy wall steel, hot-dip galvanized or sherardized conduit, minimum size to be 3/4", unless otherwise noted. Use of lengths of flexible conduit will be permitted where rigid conduit is not applicable, however, all flexible conduit shall be of the liquidtight type, approved by Underwriters' Laboratories, and length shall not exceed 24", except where specifically directed. All conduit ends shall be provided with O.Z./Gedney Co. Type HBLG insulated bushings, Thomas & Betts Co., or equal, except at couplings or threaded type outlets.
- B. 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 National Electrical Code requirements at no additional cost to the Owner.
- C. All connections between conduits and general purpose enclosures shall be made with double locknuts. All NEMA Type 3, 3R, 4, and 4X enclosures without integral watertight hubs shall have watertight, threaded, rigid, conduit hubs. NEMA Type 4 enclosures shall be equipped with a drain and a breather, Crouse-Hinds ECD Universal series, or Appleton. The drain shall be mounted on a bolt-on, gasketed hub.
- D. All conduit, fittings, outlets, disconnect switches, gas detectors, receptacles, junction boxes, luminaires, control stations, damper operators, thermostats, and other electric equipment supplied for installation in areas classified as hazardous and/or where called for on the Drawings shall be factory encased in a .040 inch thickness of polyvinyl chloride (PVC).
- E. Wire external to panels shall be stranded copper, Type THWN/THHN or XHHW. Wire within panels shall be Type MTW. Minimum size shall be No. 12 for power and No. 14 for control and alarms, unless otherwise indicated. All work shall conform to the National Electrical Code and local electrical codes. Certificates of inspection approval from authorities having jurisdiction shall be provided. Ground conductors shall be carried in all conduits. All work

including wire numbering, color coding of wire, and preparation of ladder diagram format control diagrams shall be in accordance with Division 16 of these Specifications.

- F. All wires shall be identified and tagged. Identification shall be by number or number-letter combination which shall be the same as that used in the ladder diagram. The identification shall be used only once in the electrical system and shall be marked at each termination. Where systems interconnect and the identification is not continuous, wires shall be tagged twice at each termination, once with the originating number and once with the terminating number.
- G. Equipment ground conductors passing through conduit sleeves with no related circuit conductors therein, shall be bonded to conduit at each end.
- H. Remote instrumentation controllers, transmitters, indicators, relays, converters, ratio stations, recorders, process alarm relays, etc., shall be 120 volt powered, unless noted otherwise on the Drawings.

PART 3 EXECUTION

3.1 EQUIPMENT GROUND CONNECTION REQUIREMENTS

- A. All electrically powered mechanical equipment shall include provisions for connection of equipment grounding conductor(s). Electrically powered "Package" equipment may have a single ground connection lug, if all electrical components are attached to and in good electrical contact with a common metal frame, enclosure, or base. The grounding of external electrical components shall be by Division 16.
- B. All grounding conductors, lugs, exothermic welds, and other grounding devices shall comply with Division 16 of these Specifications and shall be installed as indicated on the Drawings.

3.2 SHOP DRAWINGS

- A. Motor control shop drawings shall be provided for all "Package" equipment. Motor control shop drawings shall meet all of the requirements of Sections 01300 and 16010 of these Specifications.
- B. "Package" equipment control panel shop drawings shall include a "ladder" type diagram of the control logic, panel arrangement showing front and subplate devices, and a complete bill of material. In addition, a written sequential description of operation under various modes of control shall be provided, describing the complete control circuit and equipment operation and logic.

3.3 FOUNDATION AND SETTING DRAWINGS

- A. For equipment requiring a foundation, the size, purpose, and location of conduit and incoming lines that must be installed under Division 16, Electrical, shall be shown on the foundation plan furnished by the equipment supplier.

- B. Shop drawings as required in Section 01300 shall be submitted for review prior to being furnished to the electrical trades and before the slab is poured.

3.4 PAINTING OF ELECTRICAL ENCLOSURES

- A. Exterior of electrical enclosures and cabinets shall be painted to match the finished color of the pre-packaged equipment on which they are mounted or shall be painted ANSI 61 light gray and the interior shall be gloss white.
- B. Exterior of stainless steel and NEMA Type 4X non-metallic electrical enclosures and cabinets shall not be painted and interior steel subplates shall be gloss white.

END OF SECTION

SECTION 15060

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SUMMARY OF WORK

- A. Furnish all labor, materials, tools, equipment, testing, and supervision required to complete all piping systems, as indicated on the Drawings and specified herein, and all other work incidental thereto, except as otherwise noted.
- B. The requirements of Section 15000, "Equipment, General" form a part of this Section and govern work covered in this Section.
- C. In the event that provisions of this specification conflict with information on a pipe schedule provided in the Contract Drawings, the information in the pipe schedule shall take precedence.

1.2 SUBMITTALS

- A. Submit all submittals in accordance with Section 01300, including:
 - 1. Layout Drawings including slope and high and low points
 - 2. Pressure Test Reports
 - 3. Bacteriological Tests on potable water pipe
 - 4. Pipe and Valve Support Locations and Data
 - a. Include design calculations and indicate size and characteristics of components and fabrication details.
 - b. Submit manufacturer's load rating for all components intended for use.
 - 5. Product Data:
 - a. Submit product data on each type of coupling, expansion joint, and other piping specialties and accessories including gaskets, hardware, and appurtenances sufficient to demonstrate compliance with the Contract Documents.
 - 6. Informational Submittals: Submit the following:
 - a. Welding Certificates: Copies of certificates for welding procedures and operators
 - b. Test Procedures: For linings and coatings as applicable.
 - c. Submit certificate signed by manufacturer of each product that product conforms to applicable referenced standards and the Contract Documents.
 - 7. Source Quality Control Submittals:
 - a. When requested by Engineer, submit results of source quality control tests.

1.3 DELIVERY STORAGE AND PROTECTION

- A. Properly store, protect, and handle all pipe per manufacturer recommendations.
- B. Store all plastic pipe indoors or cover until installed.

1.4 COORDINATION

- A. Inspect the contract documents before proceeding with installation of piping, etc. and determine that the location of the work does not interfere with other work. In case of interference, notify the Owner in writing. The Owner will then determine the resolution of the conflict and his decision shall be binding.
- B. Coordinate the elevations of cores, sleeves, pads, equipment connections, pump connections, etc. such that all pipe connections are properly aligned in vertical and horizontal planes.

1.5 REFERENCE STANDARDS

- A. ANSI/AWWA Standards
 - 1. C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 2. C200 Steel Water Pipe – 6 inch and Larger
 - 3. C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4-inch and Larger - Shop Applied
 - 4. C206 Field Welding of Steel Water Pipe.
 - 5. C207 Steel Pipe Flanges for Waterworks Service – Sizes 4-inch through 144-inch
 - 6. C208 Dimensions for Fabricated Steel Water Pipe Fittings
 - 7. C210 Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
 - 8. C600 Installation of Ductile Iron Water Mains and Their Appurtenances.
 - 9. C606 Grooved and Shouldered Joints.
 - 10. C651 Disinfecting Water Mains.
 - 11. M9 Concrete Pressure Pipe.
 - 12. M11 Steel Pipe - A Guide for Design and Installation.
 - 13. M23 PVC Piping - Design and Installation.
 - 14. M41 Ductile-Iron Pipe and Fittings.
 - 15. M45 Fiberglass Pipe Design.
 - 16. M55 PE Pipe - Design and Installation.
- B. ANSI/ASME Standards
 - 1. B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)
 - 2. B16.47 Large Diameter Steel Flanges NPS 26 through NPS 60
 - 3. B18.2.1 Square and Hex Bolts and Screws (Inch Series)
 - 4. B18.2.2 Square and Hex Nuts (Inch Series)
 - 5. B36.10 Welded and Seamless Wrought Steel Pipe
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
 - 1. MSS SP-58 – Pipe Hangers and Supports – Materials, Design and Manufacture

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. Various types of piping materials are used to meet the specific requirements of different piping systems as indicated in the “Piping Systems Schedule.” Follow this schedule. Where a

particular piping material is chosen for a piping system, use that material alone throughout that entire system of pipe and fittings, unless noted otherwise on the Drawings.

- B. Use NSF 61 compliant pipe, fittings, valves, gaskets and other appurtenances used for potable water applications.

2.2 EXPOSED OR ABOVEGRADE DUCTILE IRON PIPE (DI)

- A. Provide flanged joints or grooved joints for above grade pipe couplings. Provide flanged connections to valves or equipment unless otherwise indicated on the Drawings.
- B. Pipe Thickness
 - 1. Provide, at a minimum: Thickness Class 53 or Pressure Class 350.
- C. Lining
 - 1. Cement lining: conform to AWWA C104
- D. Flanged Pipe Couplings
 - 1. Provide flanged joints which conforming with ASME B16.1 Class 125.
 - a. Non-Threaded mechanical flange fittings are not allowed.
 - b. Do not assemble flanges in the field.
 - 2. Pipe: comply with AWWA C115
 - 3. Fittings: comply with AWWA C110
 - 4. Gaskets
 - a. Conform to AWWA C111
 - b. Provide full face gaskets, minimum 1/8-inch-thick as manufactured by Manville, Garlock or equal.
 - c. Gaskets for blind flanges shall cover the full face of the blind flange.
 - d. Styrene Butadiene Rubber (SBR) or Neoprene.
 - e. NSF 61 compliant
- E. Grooved Pipe Couplings
 - 1. Couplings for ductile iron pipe
 - a. Victaulic Style 31 or engineer approved equal
 - 1) For direct connection between IPS / steel pipe and AWWA / ductile iron pipe, Victaulic Style 307 transition coupling.
 - b. Grooves cut for rigid joints.
 - c. For potable water service provide Grade M FlushSeal® gaskets
 - d. For all other applications provide Grade S FlushSeal® gaskets
 - 2. Fittings for ductile iron pipe
 - a. Victaulic with rigid grooves
 - b. Conform to ANSI/AWWA C-606.
 - 3. Couplings shall engage the grooved pipe around the entire circumference, and bolt together with two or more track head bolts.
 - 4. Bolts and nuts shall be:
 - a. General service: zinc plated except
 - b. Wet well or corrosive service: 316 SS.

2.3 POLYVINYL CHLORIDE PIPE (PVC)

- A. Provide schedule 80 pipe and fittings for all PVC piping systems unless otherwise noted

- B. General Service PVC Piping
 - 1. Provide for all PVC pipe and fittings unless otherwise specified.
 - 2. Pipe: Class 12454 B
 - 3. Joints: socket welded or flanged,
 - 4. in accordance with the latest edition of ASTM D 1784 and D 1785.
 - 5. Provide pipe connections in conformance with the manufacturer's recommendations including supply of gaskets, where necessary.
 - 6. Provide schedule 40 pipe and fittings only where indicated on the Drawings.
 - 7. Provide Drain/Waste/Vent (DWV) Drainage fittings for all PVC drain lines
 - 8. Provide: "Chemtrol" as manufactured by Nibco, Inc., Plastiline, Inc., Harvel Plastics, Inc., Asahi America, Inc., R & G Sloane, or equal.

- C. For Chemical Service
 - 1. Solvent-welded joints with solvent cement per the pipe manufacturer's recommendations and in accordance with ASTM F493, "Solvent Cements for CPVC Plastic Pipe and Fittings,"
 - 2. Primer: in accordance with ASTM F656, "Primers for Use in Solvent Cement Joints of PVC Plastic Pipe and Fittings."
 - 3. Provide Weld-On 724 solvent cement and Weld-On P-70 Primer as manufactured by IPS Corporation for all pipe joints.
 - a. Provide products with chemical resistance to sodium hypochlorite solutions.
 - 4. Provide low-torque gaskets, full face to ANSI B16.5 dimensions with two raised convex molded rings concentric to the center hole and bolt circle.
 - a. Gasket material: EPDM durometer A, hardness 65-68, PTFE bonded EPDM or PVDF bonded EPDM.
 - b. Provide Low Torque AV Gaskets as manufactured by Ashai/America, Inc., Malden, MA, no substitutions.

2.4 POLYVINYL CHLORIDE PRESSURE TUBING (PVC-T)

- A. Reinforced flexible, clear tubing designed.
 - 1. Reinforced with a white polyester cord embedded in the tube walls.
 - 2. Wall thickness: 3/32" minimum.
 - 3. Pressure rating: 160 psi minimum.
 - 4. Provide brass compression type fittings

2.5 PIPE FLANGE SHIELDS FOR CHEMICAL PIPING

- A. Provide pipe flange shields for chemical piping system on all flanges, unions and screwed joints.
 - 1. Polypropylene construction with an indicating patch affixed to the bottom of the shield.
 - 2. Patch shall be covered with a Teflon "window."
 - 3. The shield shall be Ramco Spra-Gard or equal.

2.6 INSULATING COUPLINGS (PREVENTION OF ELECTROLYSIS)

- A. Provide at all joints between piping systems constructed of dissimilar metals.
 - 1. Pressure rating: match associated piping test pressure.
 - 2. Provide material suitable for the application and service.
 - 3. Provide insulating couplings manufactured by Romac, Smith-Blair, or equal.

2.7 WALL AND FLOOR PIPE

- A. Material: Same as specified for the piping connected to wall or floor pipe unless otherwise acceptable to the Engineer.
- B. End Connections: As shown on the Drawings.
- C. Thickness: Same as specified for the piping connected to wall or floor pipe.
- D. Collars: Provide collars at mid point of wall for anchorage and watertightness.
- E. Pipes ends shall be flush with wall face unless otherwise shown.
- F. Drill and tap flanged ends and mechanical joint bells for studs. Provide studs of same material as connected piping except submerged and buried studs shall be of Type 316 stainless steel.

2.8 MODULAR SEAL RUBBER LINKS, HDPE SLEEVES, AND CELL CAST DISKS

- A. Modular Seal Rubber Links (Link-Seal)
 - 1. Provide modular seal rubber links of the mechanical type, consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.
 - 2. Seal to provide air tightness for above ground installations and water tightness for below grade installations.
 - 3. Caulking or other type mastic sealants or lead oakum joints are not acceptable.
 - 4. Provide 316 stainless steel fasteners
 - 5. Provide Link-Seal modular seals as manufactured by Garlock (formerly PSI/Thunderline) with long bolts for seals deeper in the sleeve.
 - 6. Each link must have a permanent identification of the size and manufacturer's name molded into it.
 - a. For Standard Service Applications:
 - 1) Model C -40 to +250°F (-40 to +121°C)
 - 2) EPDM
 - 3) Color = Black
 - b. For Potable Water/NSF 61 Service Applications
 - 1) Model S61, -40 to +250°F (-40 to +121°C)
 - 2) EPDM
 - 3) Color = Black
 - 7. Provide NSF-61 certification for applications in direct contact with the modular seals.
 - 8. Reference must always be made to the latest published LINK-SEAL® modular seal selection guide for the service intended.
- B. HDPE Sleeves (CS Century Line)
 - 1. Penetrations or openings up to 24.75" passing through walls and floors of new structures:
 - a. Install molded non-metallic high-density polyethylene Model CS Century-Line® sleeves as manufactured by Garlock.
 - b. Provide end caps manufactured of the same material as the sleeve itself. Install at each end of the sleeve so as to prevent deformation during the initial concrete pour, and to facilitate attaching the sleeve to the wall forms.

- c. Leave end caps in place to protect the opening from residual debris and rodent entry prior to pipe insertion.
- C. HDPE Cell-Cast (CC) Disks
 - 1. Penetrations or openings from 29.25" to 64.74" diameter passing through walls and floors of new structures:
 - a. Install molded non-metallic high-density polyethylene Model CC Cell Cast® disks as manufactured by Garlock, providing a round hole in conformance with LINK-SEAL modular seal sizing data.
 - b. HDPE disks must consist of 3" and/or 4" lightweight interlocking polyethylene cells stacked to form the thickness of the poured concrete wall.
 - c. Molded into each cell must be a cavity to accept a 2" x 4" nailer.
 - d. Leave Cell-Cast forms in place to protect the opening from residual debris and rodent entry prior to pipe insertion.
- D. Penetrations for pipes passing through existing concrete or masonry walls
 - 1. Schedule 40 steel pipe,
 - 2. Either black steel, galvanized or stainless steel depending on the environment.
 - 3. Provide acceptable anchoring lugs.
 - 4. Provide sleeves of sufficient diameter to allow for pipe insulation and its jacketing, where insulation is required.

2.9 BOLTS, STUDS, NUTS AND HARDWARE

- A. Conform with the current Tentative Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners, ASTM Designation: A 307, Grade B.
- B. Carbon steel bolts and nuts used for joining flanged pipe
 - 1. Galvanized or cadmium plated unless otherwise called for.
 - 2. Coat all bolts with anti-seize compound prior to assembly.

2.10 PIPE SUPPORTS AND HANGERS

- A. MANUFACTURERS
 - 1. The following manufacturers are named to establish a standard of quality necessary for the project:
 - a. Anvil (previously Grinnell Company).
 - b. Empire Industries.
 - 2. Unless stated otherwise, the catalog figure numbers in this Section refer to products of the Anvil. Equivalent products by other acceptable manufacturers will be reviewed.
- B. CROSS MEMBERS
 - 1. Structural steel shapes, ASTM A36.
- C. UPPER HANGER ATTACHMENTS
 - 1. Standard-Duty Beam Clamps for piping: Malleable iron jaw, steel tie-rod, nuts, and washer. Underwriters Laboratories (UL) listed, Factory Mutual approved. Anvil figures 218.
 - 2. Heavy-Duty Beam Clamps for large pipe and equipment: Forged steel, Anvil figures 292 and 228.
 - 3. Welded Structural Attachments: Carbon steel, Anvil figures 55 and 66.

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4. Brace Fitting: Malleable iron bracket and pipe end, hex-head cap screw and nut. Anvil figure 112.
 5. Wall Brackets: Factory-fabricated carbon steel bracket with knee brace. Anvil figures 194, 195, and 199.
 6. Concrete Inserts:
 - a. Malleable iron inserts, threaded for rod. Anvil figure 152.
 - b. Carbon steel inserts with lateral adjustment capability. Anvil figures 281, 282, and 285.
- D. RODS
1. Rods: Carbon steel, ASTM A36, continuous thread or end thread.
- E. PIPE SUPPORTS AND RESTRAINTS
1. Adjustable Swivel Ring: 3/4-inch through 8-inch pipe, malleable iron construction, black finish, Underwriters Laboratories (UL) listed, Factory Mutual (FM) approved, MSS SP-69. Anvil figure 104.
 2. Clevis Hanger: Adjustable clevis, wrought carbon steel, Underwriters Laboratories (UL) listed, Factory Mutual (FM) approved, Anvil figure 260, 300, and 590.
 3. Trapeze: Anvil figure 45.
 4. Roll Hangers: Adjustable steel pipe roll hangers, Anvil figure 181.
 5. Roll Supports: Anvil figures 171, 175, 177, 271, 274, and 277.
 6. Pipe Guides: Unless otherwise indicated, guides shall be carbon steel spider clamp, sized for insulation. Anvil fig 256.
 7. Insulation Protection Saddle: Carbon steel protection saddle shall prevent crushing of insulation by transmitting hanger contact load to pipe while minimizing heat transfer. Saddle shall be a minimum of 12 inches long and shall cover a 60-degree arc. Anvil figures 160 through 164.
 8. Insulation Protection Shield: Sheetmetal protection shield shall prevent crushing of insulation by spreading hanger contact load while minimizing heat transfer. Shield shall be a minimum of 12 inches long and cover a 180-degree arc. Anvil figure 167.
 9. Riser clamps: Carbon steel, black for steel, iron and plastic pipes; copper-plated for copper pipe; Anvil figures 261 and 40.
- F. FASTENERS
1. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
 2. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- G. STRUCTURAL STEEL
1. Structural Steel: ASTM A36, steel plates, shapes, and bars, black and galvanized.

PART 3 EXECUTION

3.1 INSTALLATION – GENERAL

- A. Install Pipe and Fittings according to manufacturer recommendations.

- B. Run pipe parallel with the lines of the building unless otherwise shown or noted on the Drawings.
 - 1. Install all horizontal runs of piping shall be kept at least 7'-0" high so as to provide maximum head room.
 - 2. Keep vertical lines as close to the columns or walls as possible.
 - 3. Install pipe lines so as not to interfere with ducts, conduits, truss work or other trades and with appropriate offsets around columns, beams and other obstructions, and with necessary expansion joints, pipe bends or fitting offsets, as may be indicated on the shop drawings or required as essential to provide an acceptable installation.
- C. Ream all pipe ends. Take care at all times to prevent foreign material from entering any pipe.
- D. Make all threaded couplings using an NSF 61 approved Teflon tape. Take care to prevent the tape from reaching the pipe interior.
- E. Install all horizontal lines to pitch to low points to provide for complete drainage of each system.
 - 1. Pitch for general service: Not less than 1 inch in 40 feet against direction of flow.
 - 2. Pitch for hot water heating, gas and air lines: as stated above, but in direction of flow.
- F. Install air vents on all water and sewage lines at all high points and at locations where air may pocket.
 - 1. Drain air vents to floor, sump, sewers or suitable receivers with PVC pipe.
- G. Do not cut, burn, or weld structural steel interfering with pipe installation to aid in installation except with written authorization of the Owner.
- H. Disinfect water piping in accordance with Section 02669 and AWWA C651.

3.2 PIPING HANGERS AND SUPPORTS

- A. General
 - 1. The Contractor shall be responsible for providing hangers and supports for all interior piping. Unless otherwise indicated, all pipe supports shall be standard, commercially accepted pipe supports and accessories.
 - 2. Piping shall not introduce any strains or distortion to the connected equipment. The Engineer will direct the Contractor to remove any piping to verify zero strain.
 - 3. Adequately support all piping by installing hangers and supports.
 - 4. Carry overhead lines directly on supports or suspended by clevis hangers from supports.
 - 5. Support piping at all equipment, control valves, etc., so that equipment, valves, etc., can be removed without compromising pipe support.
 - 6. Support cantilevered pipe at couplings.
 - 7. Provide additional support for valves installed in fiberglass and PVC pipelines as required.
 - 8. Provide spacing of supports for horizontal piping no greater than as detailed or called for on the Drawings.
 - 9. Cast iron and ductile iron pipe: Support at each joint or at 10'-0" maximum centers, whichever is closer.
 - 10. Prior to installing fiberglass pipe, obtain the manufacturer's recommendations in writing for method and location of supports, guides and anchors.

11. Support hose and/or flexible tubing continuously in iron channel, or acceptable ladder racks.
12. Support risers at intermediate points as required for rigidity.
13. Support vertical piping 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.
14. For all fiberglass pipe, provide pipe protection shields or half pipe saddles at all hangers or supports.
15. Whenever possible, provide supports at tees, dresser/Victaulic style couplings and adjacent to valves.

B. Pipe Hangers

1. Size hanger rods used in conjunction with clevis hangers as indicated in the following schedule. Provide rods of cold rolled carbon steel, ASTM A36, continuous thread or end thread.

Pipe Size	Hanger Rod Dia.
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"
18" and greater	1 1/4"

2. Trapeze hangers with U-Bolt type fastening may be used in lieu of clevis hangers in congested areas.
3. Connect hanger rods to beam clamps, concrete inserts, or expansion shields.
 - a. Provide Underwriter's Laboratories approved devices.
 - b. C-clamps are not allowed.
4. Perforated band iron or wire hangers shall not be used.
5. Provide wrought-steel riser clamps with extension lugs and suitable bolts and nuts.

C. Concrete Supports

1. Support ductile Iron and large diameter pipe by concrete supports when the exterior surface of the pipe is within 30" of the finished floor.
2. Concrete support details are shown on the Drawings.
3. Place concrete supports according to the spacing listed above.

3.3 PIPE TAPS

- A. Provide pipe taps in the locations and the sizes indicated on the Drawings.
- B. Temporarily plug all taps at the point of fabrication.
 1. Tapping method and thread: meet the requirements of the pipe manufacturer
 2. Pressure rating: match pressure rating of the pipe.
- C. Install corporation stops, pipe saddles or other devices where required to facilitate installation of the connecting pipe.

1. Materials: compatible with environmental conditions, as well as liquid and pressure of the fluid in the pipeline.

3.4 UNIONS AND FLANGES

1. Provide unions at all valves up to 4" size, and at final connections to equipment, or apparatus.
2. Provide bolted flexible coupling, companion flange or grooved coupling for valves 4" and above.
3. Provide sufficient joints in piping systems to allow each system to be readily dismantled.
4. Materials: compatible with environmental conditions, as well as liquid and pressure of the fluid in the pipeline.
5. Do not install unions or companion flanges in walls, ceilings, partitions or other inaccessible locations.
6. Wherever flanges with raised faces are joined to companion flanges with a flat face, machine down the raised face to a smooth matching surface and provide a full-face gasket.

3.5 REDUCER FITTINGS

- A. Provide eccentric type reducers on horizontal pipelines when decrease in pipe size is necessary, for proper drainage and air elimination.
 1. Bushings shall not be permitted.
 2. For water, wastewater and other liquid lines, maintain a continuous top-of-pipe elevation.
 3. For hot water heating, gas and air lines, maintain a continuous bottom-of-pipe elevation.
- B. Provide concentric reducers for vertical pipelines and where shown on the Drawings

3.6 WALL PIPE SLEEVES, COVER PLATES & FLASHINGS

1. Furnish, locate and set all required wall pipe, pipe sleeves, flashings and plates for sections of the work where piping passes through floors, walls, ceilings or roof.
2. Where wall pipe and sleeves pass through new concrete construction, locate and set wall pipe and sleeves before concrete is poured.
3. Provide water stop at mid slab for wall pipe passing through walls or floors with water, earth or weather on one side.
4. Extend floor pipe sleeves a minimum of 2" above floor surface.
5. Provide escutcheon plates matching the room aesthetic, large enough to cover the pipe sleeves, for piping extending into finished areas of the building.

3.7 SOIL, WASTE, STORM AND VENT PIPES

1. Material: As acceptable for use in the applicable plumbing codes or as noted on the Drawings.
2. Size: Conform to the requirements of the plumbing code unless larger pipe sizes are shown on the Drawings.
3. Vent and re-vent all fixtures as required to comply with the plumbing code, whether or not so indicated on the Drawings.
4. Provide accessible cleanouts on all vents and foot conduits.

3.8 PIPE SADDLES AND INSULATION

- A. Provide pipe covering protection saddles for hot steel piping at roller supports and other places where required for the purpose of protecting the insulation at the pipe supports.
 - 1. Construction: Curved steel plates with the edges turned up, welded to pipe, and formed to fit the outside radius of the pipe covering.
 - 2. Fill each saddle with specified covering material after being welded to pipe
- B. Cover all insulated cold piping with a vapor barrier jacket support on saddles.
- C. Wood Blocking
 - 1. For installations where the supported weight of the pipe is sufficient to distort the pipe insulation with the shield in place, install hard wood blocking against the pipe.
 - 2. Thickness: same thickness as the insulation
 - 3. Paraffin coated.
 - 4. Provide B Line Systems Fig. B3169, Elcen Fig. 216 or equal.
 - 5. Install vapor barrier over the wood blocking to maintain the integrity of the system.

3.9 EXPANSION LOOPS

- A. Where expansion loops, L bends or Z bends are indicated on the Drawings, fabricate of pipe and long radius elbows in sizes shown.
- B. Provide pipe alignment guides 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.
 - 1. First guides at 4 pipe diameters on each side of device.
 - 2. Second guides at 14 pipe diameters beyond first guide.
 - 3. Intermediate guides per standard of Expansion Joint Manufacturers Association (E.J.M.A.).

3.10 PRESSURE TESTS

- A. Perform pressure tests on all piping included in the contract.
- B. The testing requirements for the respective piping systems include all those of the applicable governing codes, such as state, local, and insurance, and those hereinafter specified.
 - 1. Provide all code required inspection certificates, as required.
- C. If there are no Laws and Regulations covering the test, use the test procedures described in the following standards:
 - 1. AWWA C600 for Ductile Iron Pipe
 - 2. AWWA C605 for Thermoplastic and Fiberglass Pipe
 - 3. ASTM F2164 for HDPE Pipe
- D. Test all piping before piping is painted, covered or concealed.
- E. Furnish all pumps, compressors, gauges and other necessary testing equipment and make all connections necessary for the tests. Provide all materials, equipment and labor necessary to perform these tests.

- F. Perform all tests in the presence of the Owner and, where required, the inspection department having jurisdiction.
- G. Replace and re-test all defective material identified by the tests. Repair piping with new material and to the satisfaction of the authorized inspectors.
- H. Test all piping systems hydrostatically at test pressures listed in the Pipe Schedule, unless specified elsewhere.
- I. If test pressure is not listed in the Pipe Schedule, or if a test is required for piping not listed in the Pipe Schedule, test pressure will be determined by the Engineer based on the maximum anticipated sustained operating pressure and the methods described in the applicable ANSI/AWWA manual or standard that applies to the piping system.
- J. Test Procedure
1. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate not to exceed 1 foot of pipe length per second in pipe being tested.
 2. Expel air from pipe as required. Consult Engineer prior to tapping pipe for expelling air.
 3. Examine exposed joints and valves and make repairs to eliminate visible leakage.
 4. After specified wetting period, add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
 5. For HDPE Pipe: After filling pipe, gradually pressurize pipe to test pressure and maintain required test pressure for three hours to allow for pipe to expand. During expansion, add fluid to maintain required test pressure. Begin timed test period after expansion period and other requirements are met.
 6. Begin timed test period only after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
 7. During timed testing period maintain test pressure for at least 2 hours. Add fluid as required to maintain pressure within 5-psig of required test pressure.
 8. For HDPE pipe, after 3-hour expansion phase, reduce test pressure by 10-psig and do not add liquid. Test pressure shall then remain steady for 1 hour indicating no leakage.
 9. Pump from test container to maintain test pressure. Measure volume of fluid pumped from test container and record on test report.
 10. Record pressure at test pump at 15-minute intervals for duration of test.
- K. Allowable Leakage Rates: Leakage is defined as the quantity of fluid supplied to pipe segment being tested to maintain pressure within 5 psi of the test pressure during timed test period. Allowable leakage rates for piping are:
1. No Leakage: Pipe with flanged, welded, fused, threaded, soldered, or brazed joints.
 2. Allowable leakage rates for metal and fiberglass with rubber gaskets as sealing members, including the following joint types: bell and spigot and push-on joints, Mechanical joints, bolted sleeve type couplings, grooved and shouldered couplings and thermoplastic pipe joined with O-ring gasket sealing members is provided as follows:

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

L = allowable leakage in gallons per hour

S = length of pipe tested in feet

D = nominal diameter of the pipe in inches

P = average test pressure during the test, in psig

* For pipes tested with varying diameter sections, the allowable leakage rate shall be the sum of the computed leakage for each section of pipe diameter

3.11 GRAVITY PIPE LEAK TESTING

- A. Test all gravity pipes in accordance with ASTM C969 and C1244.
- B. Plug and bulkhead ends and lateral connections of pipe segment to be tested and admit fluid until the pipe is full. Admit fluid slowly to minimize air entrapment.
- C. Before measuring leakage, allow fluid to wet pipe interior for the following period:
 - 1. Concrete Pipe: 48 hours.
 - 2. Cement Mortar-lined Pipe: 24 hours.
 - 3. Other Pipe: Wetting period not required.
- D. Provide a minimum hydrostatic head during test of 2 feet above highest point of pipe segment tested. Add fluid from a test container or from a metered supply as required to maintain the test water level within 3 inches of the test head throughout the test.
 - 1. Test duration: at least 2 hours.
- E. Leakage is defined as the quantity of fluid that must be supplied to pipe segment tested to maintain the hydrostatic head within 3 inches of test head during the test after pipe has been filled and exposed to required wetting period, plus the quantity required to refill to original head at end of test.

3.12 PIPING SCHEDULE (SEE DRAWINGS)

SECTION 15100

VALVES AND ACTUATORS

PART 1 GENERAL

1.1 SUMMARY OF WORK

- A. Furnish all labor, materials, tools, equipment, and supervision required to complete all valve installations as indicated on the Drawings and specified herein, and all other work incidental thereto, except as otherwise noted.
- B. Supply valves per the valve schedule contained herein, or as shown on the Drawings.

1.2 SYSTEM DESCRIPTION

- A. Valves and operators shall be of the type and size indicated on the Valve Schedule shown on the Drawings or included herein.
- B. Valves and actuators shall be factory assembled by the valve manufacturer.
- C. Valves shall be certified to NSF/ANSI 61 and certified to be Lead-Free in accordance with NSF/ANSI 372.

1.3 SUBMITTALS

- A. Shop drawings
- B. O&M Manuals
- C. Actuator Warranties

1.4 WARRANTY

- A. The warranty period for all items covered by this Section of the Specifications, shall be one year from the date of equipment acceptance as specified in the General Conditions. Electric actuators shall be warranted against defects in workmanship and material as specified hereinafter.

1.5 STORAGE OF MATERIAL

- A. All material shall be stored prior to installation in accordance with Division 1, and the manufacturer's instructions. Valve actuators shall be stored in a manner to prevent damage due to moisture or water intrusion.
- B. Conduits connected to valve actuators shall be temporarily sealed during construction to prevent water entrance through open conduit systems.

PART 2 PRODUCTS

2.1 Gate Valves

A. Resilient Wedge Gate Valve (RGV-F and RGV-M)

1. Gate valves shall be of the non-rising stem, ductile iron body, resilient wedge type, minimum 150 psi water working pressure and shall conform to AWWA C-509 or C515. Valves shall include ends (flanged "F" or mechanical joint "M" as shown on Drawings or elsewhere in the specifications), a ductile iron wedge encapsulated with a resilient elastomer material, cast bronze stem and nut, and Delrin thrust bearing. The stem seal plate shall include an O-ring gasket to seal against the bonnet. The stem seal shall be replaceable with the valve under pressure and full open. The body, bonnet, and seal plate shall have a factory applied fusion bonded epoxy coating on all interior and exterior surfaces. The coating shall comply with AWWA C-550-81. The valve body shall be free of pockets or ledges where sediment or debris can collect.
2. Valve actuators shall be as indicated in the valve schedule. Motorized valves shall be equipped with a mounting yoke and stem coupling suitable for connection of the motor actuator.
3. For buried service, supplied with cast iron slide extension type valve boxes, with flanged cover. Extension stems shall be 304 stainless steel with 2" sq. C.I. operating nuts. All exposed bolts, nuts and hardware for buried valves shall be of stainless-steel construction.
4. Valves shall be as manufactured by EJ, Mueller, or Clow.

2.2 PLUG VALVES

A. Full Port Plug Valve (PV)

1. Full port plug valves 4" dia. and larger shall be flanged, plug valves smaller than 4" in dia. shall have screwed joints. All plug valves shall be eccentric type, non-lubricated valves with resilient faced plugs and 100% flow area equivalent to adjoining pipe. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard.
2. Valve bodies and plugs shall be semi-steel, cast or ductile iron. All exposed nuts, bolts, springs, washers, etc., shall be zinc plated. Resilient plug facings shall be Buna-N or other elastomer as required by the application.
3. The valve packing shall be adjustable and replaceable, consisting of multiple vee-rings or U-cup design and shall be visible, allowing service without removing the actuator.
4. The valve seat shall be welded nickel with a nominal thickness of 1/8". The valve shall incorporate upper and lower stainless-steel bushings with grit excluders.
5. Valve pressure rating shall be 150 psi and shall be established by hydrostatic tests as specified by the current edition of ANSI Standard B16.1. Valves shall provide drip tight shutoff up to the full pressure rating with pressure in either direction.
6. Valve operators, regardless of the type, shall be mounted by the valve manufacturer and tested as an assembly at the factory of origin. Test documents shall be furnished upon request.
7. For buried service, valves shall be supplied with gear actuators. Extension stems shall be 304 stainless steel with 2" sq. C.I. operating nuts. All exposed bolts, nuts and hardware for buried valves shall be of stainless-steel construction.
8. Valves shall be as manufactured by DeZurik, Pratt, Val-Matic, and Mueller.

2.3 CHECK VALVES

A. Type C-1 (Outside Lever)

1. Outside lever check valves 6" and larger shall be flanged, 125 psig, swing type. Valves shall have ductile iron bodies and discs, stainless steel disc shaft and Buna-N disc seat. Valves shall be complete with outside lever suitable for vertical or horizontal service.
2. Check valves 2" to 6" in size shall be flanged, 125 psig, swing type, ductile iron body and disc complete with outside lever and weight. Discs shall be Buna-N faced. Valves shall be suitable for vertical or horizontal service.
3. Valves shall be as manufactured by DeZurik, Pratt, Val-Matic, and Mueller.

2.4 BUTTERFLY VALVES

A. Type BV-F (Flanged)

1. Butterfly valves shall be of the flanged type conforming to AWWA C-504, Class 150 B requirements.
2. Valve body shall be ASTM A-126 Class B cast iron. Valve disc shall be ASTM A-48 Class 40 C cast iron or ASTM A-536 grade 65-45-12 ductile iron.
3. Seat material shall be Buna-N with stainless steel shaft, permanently self-lubricated non-metallic bushings and self-adjusting seal.
4. Valves 12" or greater shall have field replaceable seats and shaft seals.
5. Valves shall be as manufactured by DeZurik, Pratt, Val-Matic, Milliken, or Crispen.

B. Type BV- F (Mechanical Joint)

1. Mechanical joint butterfly valves shall have ends complying with ANSI/AWWA Standard C111/A21.11-90, "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings"
2. Mechanical joint gaskets, glands, and high strength cast gray or ductile iron tee-head bolts and hex nuts shall be included with the valve.
3. Follower glands held in place with set screws will not be acceptable. Bolts holes in the flanges of the mechanical joints shall be equally spaced and shall straddle the vertical centerline.
4. Buried valves shall be as manufactured by DeZurik BAW, Pratt Groundhog, Val-Matic American BFV, and Mueller LINSEAL III.
5. For buried service, valves shall be supplied with cast iron slide extension type valve boxes, with flanged cover. Extension stems shall be 304 stainless steel with 2" sq. C.I. operating nuts. All exposed bolts, nuts and hardware for buried valves shall be of stainless-steel construction.
6. All other conditions for BF-F shall apply to BF-M.

2.5 VALVE OPERATORS

A. Gear Operators (G)

1. Gear operators shall be provided. The gear mechanism shall be the totally enclosed type. The gear operator shall be selected to operate the valve at the indicated test pressure on the Piping Schedule with an operator pull of no more than 40 lbs. Gear operators for buried or submerged valves shall be sealed and specifically designed for buried/submersed service as indicated on the Drawings.

2. Manual operators for valves 24-inch and smaller shall be of totally enclosed worm gear or traveling-nut type, permanently lubricated, suitable for buried or submerged operation in accordance with ANSI/AWWA Standard C504-94.
 3. Manual operators for valves 30-inch and above shall be totally enclosed worm gear operators, permanently lubricated, suitable for buried and submerged operation in accordance with ANSI/AWWA Standard C504-94, with AWWA input shaft stop.
- B. Handwheel Operators (H)
1. Handwheel operators shall be provided as indicated in the Valve Schedule and shall be of the valve manufacturer's standard design. Handwheels shall operate with 40 lbs. maximum applied force, with the test pressure indicated on the Piping Schedule applied across the valve.
- C. Chainwheel Operators (CW)
1. Valves shall be provided with chainwheel operators wherever indicated and where valve operator centerlines are installed higher than 7'-0" above the floor.
- D. Operator Accessories
1. General
 - a. Where indicated in the valve schedule and/or on the Drawings, extension stems (ES) with bronze bushed stem guides spaced as required, floor stands (FS), valve boxes, gearing (G), handwheel (HW), chainwheels (CW) and chains, lever, etc., shall be provided. Valve operator accessories shall be as follows:
 - Extension Stems - Type 304 S.S.
 - Couplings - Bronze or Stainless Steel
 - Chains - Galvanized Steel
 - Valve Boxes - C.I. with 8" clear opening and removable cover
 - Operating Nuts - 2" square cast iron
 2. Floor Stands (FS)
 - a. Valves shall be provided with floor stands whenever indicated in the valve schedule or on the Drawings.
 - b. Floor stands shall be hot-dipped galvanized or stainless steel depending on the environment, see valve schedule or Drawings.
 - c. Manually operated floor stands will be right angle crank or handwheel type as indicated in the valve schedule or called for on the Drawings. Each floor stand shall be provided with a threaded stem. Tapered roller bearings or ball bearings shall be provided above and below a flange on the operating nut to support both opening and closing thrusts. Bench stands shall operate under the specified operating head with not greater than a 40 lb. pull on the crank or handwheel. Gears shall be steel with machine cut teeth. The pinion shafts shall be supported on tapered bearings. All components shall be totally enclosed in a cast iron case and cover. Positive mechanical seals shall be provided on the operating nut to exclude moisture and dirt and prevent leakage of lubricant. Lubricating fittings shall be provided for the lubrication of all bearings.
 3. Position Indicators (PI)
 - a. Visual valve position indicators shall be provided where indicated in the valve schedule and shall be model BM3-5 as manufactured by Westlock Controls Corp.
-

2.6 FINISHES

- A. Interior Coating
 - 1. The interior coating of the valve bodies shall be a two-part epoxy specially formulated for potable water service and applied according to the coating manufacturer's recommendations.
 - 2. All interior coating products must meet the approval of the United States Environmental Protection Agency for contact with potable water. The coatings shall conform to ANSI/AWWA C550-90, "Protective Epoxy Interior Coatings for Valves and Hydrants", MDWASD 8/1999 15110 - 6 R-2 and shall not contain coal tar. All parts of the interior of the valve body and disc, except for rubber or stainless steel, shall be so coated.
- B. Exterior Coating
 - 1. Exterior painting shall be asphalt varnish as required by AWWA Standards.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Piping and valve installation shall be as specified in Division 15 and as specified in other applicable sections of these specifications. Electric actuators, solenoid valves shall be installed per Division 16.
- B. Plug valves shall be installed with the plug in the horizontal position, per the manufacturer requirements
- C. Install flushing connections on all check valves installed vertically on sludge lines

3.2 PLACEMENT OF VALVES

- A. Valves shall be installed at all service connections to and from equipment, branch lines from main lines, at low points for draining each system, at high points to vent air and as shown on the Drawings.
- B. Plug valves shall be installed horizontally with the plug up when open, per the manufacturer's recommendations.
- C. Pump suction isolation valves shall be placed a minimum of 5 diameters away from the pump suction flange.
- D. Install ball valves and vent/drain piping to vent air at the high points. Pipe shall be installed from the high point to the valve located at an accessible location. Continue piping to floor drain.

3.3 TESTS

- A. All diaphragm type pressure/surge relief valves, motor, pneumatic, hydraulic and solenoid actuated valves shall be calibrated and/or set up in the field by the manufacturer's field

technician. When complete, a certificate of proper installation and As-Built Wiring diagram is required prior to acceptance tests.

- B. Field acceptance tests shall include operation of a full cycle under local and remote manual and remote automatic conditions, verification of proper position, panel lights, SCADA Screen indication (when required), and all alarm functions such as over-torque, failure to open/close, etc. (if applicable).
- C. All automatically operating valves shall be adjusted to the set points specified or those identified by the Engineer. Testing shall then be conducted to verify operation including any alarm functions.

3.4 MANUFACTURER'S FIELD SERVICE

- A. A factory representative employed by the manufacturer shall visit the site prior to equipment start-up to certify proper installation of the equipment, set open/close contacts and torque overloads, perform leakage tests, perform operator 40 lb. effort test and to instruct the Owner's operating personnel in the maintenance and operation of these units. The scheduling of this service shall be coordinated with the Owner and the cost of this service shall be included in the Contractor's bid price for the equipment.
- B. Operation and maintenance training shall be provided for each type of actuator, unless otherwise specified.

3.5 VALVE TAGS

- A. Provide valve tags for all new and existing valves listed in the Valve Schedule in accordance with Section 15000.

3.6 PAINTING

- A. All valve interiors shall be coated with an NSF/ANSI 61 epoxy coating approved for potable water.
- B. The following schedule shall be used for outer surface painting of items specified in the following Piping Sections and Valve Sections

Painting Item	System No.
Interior, valves & operators (not specified elsewhere)	6

- C. For detailed painting requirements and system descriptions refer to Section 09900 of the Specifications.

END OF SECTION

INSPECTION

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.

LOOSE AND DETACHABLE PARTS

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, therefor, 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.

STORING OF EQUIPMENT

All equipment shall be stored in accordance with the manufacturer's recommendations. A letter from the manufacturer shall be provided stating those recommendations.

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.

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.

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.

CONTRACTOR'S ASSISTANCE

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.

Tests will be witnessed by the Owner and four (4) copies of all field tests, as specified above and in other Sections, shall be submitted to the Owner. Twenty-four (24) hours 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.

STANDARDS

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. The installation of all electrical, instrumentation, and control equipment shall meet the requirements of the State and Federal Occupational Safety and Health Statutes.

GUARANTEE

The equipment and installation furnished under this Section shall be guaranteed for a period of one (1) year as specified under the General Conditions included hereinbefore.

CLEANUP

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.

De-energization of equipment to accomplish the cleaning work shall be done at a time as acceptable to the Owner.

PAINTING

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.

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.

CONDUIT AND FITTINGS

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 iron, malleable iron, or galvanized steel.

All wiring, except where indicated otherwise, shall be run in rigid steel, heavy wall conduits of mild steel tube, hot-dipped galvanized with threads electrogalvanized after cutting and especially selected with reference to uniformity of thickness and freedom from defects. All fittings shall be suitable and reviewed for use in rigid steel conduit systems. No Electrical metal tubing or so called "Thin Wall" conduit or fittings may be used.

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.

Joints shall be made tight with standard galvanized couplings and corners turned with elbows or long radius bends in pipe.

All 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, Type HBLG as manufactured by O.Z./Gedney, Anderson Co., or equal. Conduits terminated in metal boxes or enclosures without knockouts and secured with double locknuts shall be terminated with a high impact resistant, thermoset plastic, 150°C rated, insulating bushing, Type A as manufactured by O.Z./Gedney, Anderson Co., or equal.

Conduit sealing compound shall be Watguard Desiccants Industrial Encapsulant, Polywater FST-250, or equal.

The threads (metallic) of all outdoor and below grade, equipment connections including conduit, conduit fittings, pull and junction box covers, anchor bolts, transformer base 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.

All conduits and sleeves, metallic and non-metallic, intended for the passage of wire or cable and not terminated in boxes, fittings, or enclosures, shall be terminated with a bushing or end bell.

No threadless couplings or running threads will be permitted on rigid conduits.

No conduit smaller than 3/4 inch shall be used, unless otherwise indicated or specified.

Conduit shall be LTV Steel Duct, Wheatland, Allied Tube & Conduit Corp., or equal.

WIRE, 600 VOLTS AND LESS

All wiring for general power shall be single conductor, cross-linked polyethylene insulated and designed for 600 volt service.

This wire shall be rated for 75 degrees C in wet or 90 degrees C in dry locations and shall be Type THHN/THWN or XHHW as defined by Underwriters' Laboratories, Inc.

The conductors shall be annealed, copper wire. All conductors No. 10 AWG and larger shall be stranded. The minimum size of conductors shall be No. 12 AWG, unless specifically reviewed by Engineer and/or shown otherwise on the Drawings. Control circuit wire shall be No. 14 AWG, unless shown otherwise on the Drawings.

All wire shall be in conformity with Underwriters' Laboratories Standard UL-83, Federal Specification JC-30A, and ANSI Standard C 33.80.

Wire shall be Cablec Durasheath, American Insulated Wire Corp., Rome, or equal.

COLOR CODE FOR WIRE AND CABLE

The color schedule for the conductor insulation of wire and cable shall be in conformity with the following:

Three phase lighting and power, 480 VAC- Brown, Orange, Yellow, and Green ground.

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 tape as manufactured by 3M Co. "Scotch" No. 35, Plymouth "Slipknot" No. 45, or equal.

Grounding conductors shall be continuous green or bare for all systems. Neutral conductors shall be continuous white or gray for all systems.

WIRE AND CABLE SPLICES, TERMINATIONS, AND SUPPORTS (600 VOLTS AND LESS)

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.

All wire and cable, 600 volts or less, shall be equipped with 75°C rated lugs and connectors, except where conductor terminations are included with the equipment being connected.

All conductor terminations, lugs, and connectors on all equipment supplied under this Contract shall be 75° C rated for copper conductors.

Spade or fork tongue lugs shall not be used, except where acceptable to the Owner.

Conductors shall be terminated with insulated pressure indented lugs as manufactured by Thomas and Betts Company, Burndy, 3M, or equal where lugs are not provided on the equipment being connected.

Wires and cables shall, in general, be run continuously, without splicing, from origination to termination. Where splicing is unavoidable, connections shall be as follows:

Splicing of cables at 1000 volts or less, in all locations shall utilize in-line compression, H or C tap connectors with insulating and sealing materials, and other Engineer reviewed connectors with watertight, insulating covers for positive watertight connections. The insulating and sealing materials shall be watertight and suitable for direct burial and shall consist of molds and resins, 3M "Scotchcast" kits or equal; heavy-wall, heat-shrinkable sleeves with integral, heat-melt, environmental and watertight sealants, Raychem WCS Series or equal; watertight, twist-on connectors for wire sizes up to three No. 10 AWG, 3M Direct Bury Splice Kits, King Innovation "DryConn" connectors, or equal; or watertight, insulated connector blocks, Utilco Type USPA-SS, Type PSA-SS, or Type PED-SS, IlSCO Type USPA-AA, or equal. No cold shrink materials will be allowed in wet locations.

Splicing of cables at 1000 volts or less, in dry locations only, shall consist of in-line compression, H or C tap connections with insulating materials. All connections shall be taped. Final connections to equipment wire leads for No. 8 AWG and smaller wire in dry locations only. "Dry locations" refers to National Electrical Code defined dry locations where the enclosure, raceway, or terminal box, in which the connection or splice is made, is located.

TAPE

Electrical insulating tape for use in lighting fixture and high temperature equipment wiring connections shall be silicone rubber type, as manufactured by 3M "Scotch" No. 70, Plymouth "Plysil", or equal. For application over the silicone rubber tape wrap, a woven fiberglass tape, 3M "Scotch" No. 69, Plymouth "Plyglas", or equal, shall be used.

In all other wiring connection locations, unless cable manufacturer's recommendations require otherwise, electrical insulating tape shall be plastic type, as manufactured by the 3M Company "Scotch" No. 33+, Plymouth "Premium Black", or equal.

INSTALLATION OF WIRE AND CABLE

Wires and cables shall be installed in raceways as indicated on the Drawings or required and shall provide a complete and operating system.

All wiring shall be run in rigid metal raceway systems.

Vertical lengths of wire and cable shall be supported as required by the National Electrical Code and as specified under WIRE AND CABLE SPLICES, TERMINATIONS AND SUPPORTS... hereinbefore. Cable weight shall not be unduly supported from conductor terminations.

Cable pulling tensions shall not exceed recommended values. Cable pulling lubricants may be used to facilitate cable pulling and ease pulling tension. Lubricant shall be UL Listed and approved for use on the cable jacket or insulation. Lubricant shall dry completely when exposed to air and maintain lubricity when dry to allow ease of subsequent pulls in the same conduit or duct. No soap flakes, vegetable oils, clays, or grease shall be permitted in the conduit. Lubricant shall be wax-based Ideal Industries "Yellow 77" or equal. For insulation of low density polyethylene, as is common in communication or instrumentation cable, lubricant shall be polymer based, American Polywater "Dyna-Blue," Ideal "Aqua Gel," Minerallac "Golden Glide", or equal.

TAGGING AND LACING OF WIRES AND CABLES

All wires and cables shall be tagged and laced when entering or leaving pull or junction boxes, and at each termination. Each wire and cable shall be tagged at least once as it passes through each pull or junction box and at each termination. Wires and cables shall be laced so that the wires of the individual circuits are laced together by circuit and the laced together circuit or cable shall be tagged with the circuit number and equipment served. All wiring entering and exiting electrical enclosures shall be bundled into groups and clearly labeled as to the field destination of the wiring. Power and lighting wiring shall be bundled, laced, and tagged, as specified herein.

Tags for use in manholes and handholes 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.

All wires and cables within control panels, switchgear, terminal boxes, etc. shall be tagged at each termination.

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.

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 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.

END OF SECTION

APPENDIX:

1. SOIL BORINGS AND GEOTECHNICAL REPORT (Dated 9/22/23)
2. TEMPEST ENTERPRISES SCOPE OF SERVICES (TO BE PROVIDED IN AN ADDENDUM)
3. VIBRATION MONITORING CONSULTANT – SOILS AND STRUCTURES SCOPE OF SERVICES (Scope dated 2/12/24)

REPORT OF
GEOTECHNICAL INVESTIGATION
FOR
ALPENA WATER PRODUCTION PLANT

ALPENA
ALPENA COUNTY
MICHIGAN

SEPTEMBER 22, 2023



*Hubbel, Roth & Clark, Inc.
555 Hulet Drive
Bloomfield Township, Michigan 48302*

Project No. 2023.1089



September 22, 2023

Hubbel, Roth & Clark, Inc.
555 Hulet Drive
Bloomfield Township, Michigan 48302

Attention: Ms. Jane Graham

Regarding: Alpena Water Production Plant
Alpena, Alpena County, Michigan
Project No. 2023.1089

Dear Ms. Graham:

Soils & Structures is pleased to present this geotechnical investigation report for the Alpena Water Production Plant project in Alpena, Alpena County, Michigan.

The investigation included eleven (11) test borings drilled to depths of 4.8 to 31.4 feet in accordance with ASTM D 1586 procedures.

The report, test boring location plan and test boring logs are enclosed. The report provides recommendations for site preparation, foundations, fill, floors and pavement.

We appreciate the opportunity to provide engineering services to Hubbel, Roth & Clark, Inc. If you have any questions regarding this report, please contact our office.

Sincerely,
Soils & Structures, Inc.

A handwritten signature in black ink that reads "Malcolm P. Thompson".

Malcolm P. Thompson, P.E.
MPT/mt

Reviewed by:

A handwritten signature in black ink that reads "David W. Hohmeyer".

David W. Hohmeyer, P.E.



Table of Contents

Location of Soil Investigation	1
Purpose of Investigation.....	1
Design Information	1
Tests Performed	2
Description of Soil	3
Description of Groundwater Conditions	4
Description of Site.....	4
Settlement.....	5
Recommendations	6
Site & Subgrade Preparation	6
Foundations.....	7
Floors	8
Lateral Earth Pressure	8
Excavations.....	8
Fill	9
Groundwater Management.....	9
Hot Mix Asphalt (HMA) Pavement.....	10
Portland Cement Concrete (PCC) Pavement.....	11
Quality Control Testing	12
General Conditions & Reliance	12

Appendix

- Test Boring Location Plan
- General Soil Profile
- Test Boring Logs
- Laboratory Tests
- General Soil Information



Location of Soil Investigation

The soil investigation was located at 1300 South State Avenue in Alpena, Alpena County, Michigan. The parcel number is 093-427-000-066-00.

Purpose of Investigation

The purpose of this investigation is to provide geotechnical engineering recommendations for the proposed water production plant improvements.

Design Information

The project consists of a new clearwell tank, pipes, retaining walls, and access roads. The proposed clearwell tank will be a rectangular cast in place concrete tank. The proposed footprint of the clearwell tank is approximately 14,100 square feet.

The maximum column load is anticipated to be less than 250,000 pounds. The maximum wall loads are anticipated to be less than 12,000 pounds per foot. Allowable settlements of 0.6 inches for total settlement and 0.4 inches for differential settlement are assumed. If the actual loads are significantly greater than the anticipated loads listed in this report, then Soils & Structures should be contacted so that the recommendations included in this report may be reviewed and revised if necessary.

The clearwell slab elevation is anticipated to be near the slab elevation of the existing clearwell. The clearwell slab elevation is assumed to be 578.0 feet. Fill and excavation will be required to achieve the required grade in the construction area. The thickness of fill required to raise the grade is anticipated to be less than 10.0 feet. Fill for this project will also include backfill over foundations and utilities.

The greatest depth of excavation is anticipated to be less than 16.0 feet which will be required for the construction of foundations and utilities. Control of surface water and groundwater will be necessary. Dewatering with well points may be required for excavations which extend below the water table.

The standard-duty pavement areas are assumed to be subjected to passenger vehicle traffic, with occasional commercial truck traffic. An estimate of 250,000 lifetime Equivalent Single-Axle Loads (ESALs) over a service life of twenty years was assumed for the standard-duty pavement recommendations. The subgrade is assumed to be prepared as recommended in this report. The final pavement section should be designed based on actual traffic volumes and the owner-specific performance requirements.

Tests Performed

The investigation included eleven (11) test borings drilled to depths of 4.8 to 31.4 feet. The test borings are designated as Test Boring One through Test Boring Eleven. The locations were determined by Hubbel, Roth & Clark, Inc. The test borings were conducted in accordance with ASTM D 1586 procedures. The ASTM D 1586 standard describes the procedure for sampling and testing soil using the Standard Penetration Test. An automatic hammer was used to obtain the soil samples. Test Boring Three and Test Boring Six utilized a rock core bit to obtain core samples through bedrock. The remaining test borings were terminated at the depth bedrock was encountered.

The surface elevations at the test boring locations and additional points of reference were obtained with a Global Navigation Satellite System (GNSS) Receiver. The receiver was connected to the local MDOT CORS base station. Through this system, vertical measurements are obtained and referenced to the North American Vertical Datum (NAVD88). Horizontal measurements are also obtained at the test boring locations which are referenced to the Michigan State Plane Coordinate System. Both the vertical and horizontal measurements typically have an accuracy of approximately 0.5 inches. The measured test boring locations and surface elevations are represented in Table 1.

Table 1: Measured Test Boring and Points of Reference Locations and Surface Elevations

Test Boring / Location	Elevation Measured (feet)	Northing (feet)	Easting (feet)	Surface Cover
Test Boring One	583.8	631884.8	19922896.4	Topsoil
Test Boring Two	583.2	631850.8	19922920.2	Topsoil
Test Boring Three	585.0	631847.9	19922870.6	Topsoil
Test Boring Four	584.4	631814.4	19922855.0	Topsoil
Test Boring Five	583.5	631778.5	19922843.2	Topsoil
Test Boring Six	586.6	631793.0	19922762.8	Topsoil
Test Boring Seven	586.9	631819.9	19922682.3	Topsoil
Test Boring Eight	586.3	631817.0	19922645.0	Topsoil
Test Boring Nine	586.7	631783.0	19922660.2	Topsoil
Test Boring Ten	583.8	631711.8	19922780.0	Topsoil
Test Boring Eleven	584.6	631684.5	19922662.6	Topsoil
Water Level of Thunder Bay	579.7	631627.3	19922911.4	-
Base Setup VRS1	695.3	639701.3	19891168.9	-
Base Setup VRS2	624.0	768959.2	19825659.5	-

*Potential Error: GNSS Signal Interrupted

Soil samples were classified according to the Unified Soil Classification System. This method is a standardized system for classifying soil according to its engineering properties. Please refer to the appendix of this report for the Unified Classification System Chart. The classification is shown in the "Material Description" column of the test boring logs.

The soil strength and the allowable soil bearing value were evaluated using the "N" value. The "N" value is the number of blows required to drive a soil sampler one foot with a standard 140 pound drop hammer. The sampler is driven a distance of 18.0 inches. The number of blows for each 6.0 inch increment is recorded. The sum of the second and third intervals is the "N" value. The number of blows for each 6.0 inch interval is shown on the test boring logs under the column labeled "Penetration." The "N" value for each sample is shown in the adjacent column.

Laboratory testing consisted of natural moisture content (ASTM D 2216) and sieve analysis (ASTM D 6913). The tests were performed on representative soil samples. The tests were performed in accordance with the ASTM standards listed above. The water content documents the presence of groundwater in the soil. The sieve test determines the particle distribution which is used to classify the soil and estimate its properties.

The U.S. Geological Survey Topographic map and the Quaternary Geology map of Michigan were reviewed. These maps provide general geological information about the region.

Description of Soil

The general soil profile consists of a layer of sand over bedrock. The thickness of the sand layer ranges from 1.5 to 5.0 feet. Occasional pockets of gravel and silt are present in the sand layer. Some of the sand layer may consist of fill placed for construction of the existing structures. The natural soils are lacustrine and eolian deposits. Bedrock is present at depths between 4.5 and 7.5 feet, and may be present at shallower depths outside of the test boring locations.

Topsoil is present at the surface. The topsoil thickness ranges from 4.0 to 36.0 inches. The average topsoil thickness is 19.2 inches.

Pockets of dark brown silt with gravel are present below the topsoil in the areas of Test Boring Six and Test Boring Ten. The pocket thickness ranges from 2.5 to 4.5 feet. The "N" values of the silt pockets are over 50, indicating the silt is in an extremely stiff state. Some of the silt is probably residual soil, or decomposed bedrock.

The sand layer consists of brown fine to coarse sand with varying amounts of silt and gravel. Debris including wood, brick, rubble, and slag is present in the sand layer in the areas of Test Boring One through Test Boring Five, indicating some of the sand layer may consist of fill. Some of the sand layer is probably residual soil, or decomposed bedrock. The "N" values of the sand layer range from 8 to 20, indicating the sand is in a compact state. The "N" values correspond to an internal friction angle in the range of 30 to 34 degrees.

Bedrock is present at depths between 4.5 and 7.5 feet. The bedrock consists of gray to dark gray limestone. The upper portion of bedrock is moderately to heavily weathered and the rock quality designation is in the range of 8 to 22 percent. The rock quality generally improves with depth. An intermediate layer of soft black shale is present between depths of 21.0 and 27.5 feet in the area of Test Boring Three and between depths of 24.0 and 26.5 feet in the area of Test Boring Six.

Description of Groundwater Conditions

The water table is present at depths between 4.5 and 6.0 feet. These depths correspond to elevations between 577.8 and 581.9 feet. Seasonal precipitation will influence the water table elevation and the presence of perched groundwater, and the amount of change may be significant due to the confining nature of the bedrock. A long-term groundwater monitoring well was established in Test Boring Three.

Description of Site

The site is located at 1300 South State Avenue in Alpena, Alpena County, Michigan. The site is a water production plant. The north side of the site is bordered by a parking lot and Starlite Beach. The east side of the site is bordered by Thunder Bay. The south side of the site is bordered by Starlite Beach City Park. The west side of the site is bordered by South State Avenue. Photographs #1 and #2 show the site at the time the test borings were performed.



Photograph #1: View of the existing clearwater tank. The view is to the northeast. (Project No. 2023.1089 Alpena Water Production Plant, Alpena, Alpena County, Michigan, March, 2023)



Photograph #2: View of the water production plant from the Thunder Bay shoreline. (Project No. 2023.1089, Alpena Water Production Plant, Alpena, Alpena County, Michigan, March, 2023)

Settlement

The maximum settlement of the clearwater tank is anticipated to be less than 0.5 inches provided the recommendations in this report are observed including subgrade preparation. Differential settlement will be approximately one half of the maximum value. These levels of settlement are within the recommended acceptable limits of 0.6 inches of total settlement and 0.4 inches of differential settlement.

Recommendations

Site & Subgrade Preparation

Existing pavement, trees and vegetation in the construction area should be cleared and removed as part of subgrade preparation. The topsoil should be removed to the extent that all soil with an organic content of 3.0 percent or greater is removed. Soil containing roots should be removed to the extent that the root content by volume is 5.0 percent or less. All roots over 0.5 inches in diameter should be removed. The anticipated thickness of topsoil to be removed is 36.0 inches or less. Uncontrolled fill material should also be removed and replaced with compacted fill placed in accordance with the "Fill" section of this report.

The construction area should initially be excavated to the required subgrade level. The subgrade should be inspected and tested to determine if soft or wet soil is present before fill is placed. Soft soil should be removed and replaced with sand meeting MDOT Class II specifications. For this project soft soil is defined as cohesive soil with a shear strength of less than 1500 pounds per square foot as measured with a hand penetrometer. Excavations should extend a minimum of 4.0 inches below pipes to allow for the placement of bedding material.

In situ sand below foundations and fill should be compacted to 95.0 percent of its maximum capacity to a minimum depth of 4.0 feet. Sand not meeting this requirement should be recompacted or removed and replaced with MDOT Class II fill.

Excavations in the construction area may encounter bedrock. Equipment typically used for excavating soils may not be practical for excavations that extend into bedrock. Rock excavation methods such as drilling, hammering, or blasting may be necessary to excavate bedrock. Vibration monitoring is recommended. The presence of bedrock may create irregular bearing surfaces. Maintaining a buffer of sand between the bottom of the foundation and the limestone may alleviate these issues.

The contractor should be prepared to perform temporary dewatering in excavations to accommodate groundwater and accumulated precipitation. The subgrade should be graded to establish positive drainage.

Soil brought to the site for fill should be clean sand meeting MDOT Class II specifications. Fill should be placed in accordance with the "Fill" section of this report. The fill should be compacted to 95.0 percent of its maximum density to its full depth, as determined by the modified proctor method per the ASTM D 1557 standard. The soil which will be used for fill should be kept free of topsoil and other organic materials. Compaction tests are recommended to check the compaction of the new fill.

Pavement subgrade, subbase, and aggregate base should be proof rolled using a fully-loaded tri-axle dump truck. The proof roll should consist of single, overlapping passes. Areas that experience yielding during the proof roll should be recompacted or stabilized.

Foundations

Spread foundations are recommended to support the buildings provided the subgrade is prepared as discussed in this section as well as the “Site & Subgrade Preparation” and “Fill” sections of this report. The foundations are anticipated to be supported on limestone, compacted fill or the in situ sand following site preparation.

In situ sand below foundations should be compacted to 95.0 percent of its maximum capacity to a minimum depth of 4.0 feet. Sand not meeting this requirement should be recompacted or removed and replaced with MDOT Class II fill. Fill below foundations should be compacted to a density of 95.0 percent of the soil’s maximum density to its full depth. Compaction tests should be performed in the foundation subgrade to verify these levels of compaction. Soils not meeting or exceeding the minimum density should be recompacted.

The recommended minimum cover over exterior foundations is 42.0 inches for protection against frost heave. Where the foundations bear on limestone the foundation depth may be less than 42.0 inches.

Foundations should not be constructed on frozen soil. During cold weather construction, the foundation subgrade and foundations should be protected from freezing with insulated blankets until backfill is placed over both sides of the foundation. Foundations that are damaged by frost heave should be replaced.

The site classification for seismic design is “C” based on the Michigan Building Code provided the recommendations in this report are observed. The site has a peak ground acceleration of 0.064g with a 2.0 percent probability of exceedance in 50 years. The mapped spectral accelerations are 0.059 for the short-term response (S_s) and 0.032 for the one second response (S_1). The corresponding numeric seismic design values for the spectral response acceleration parameters above are 0.047g (S_{DS}) and 0.036g (S_{D1}) respectively.

Foundations may be designed using an allowable soil bearing value of 4,000 pounds per square foot for isolated column foundations and wall foundations provided the recommendations in this report are observed. A minimum width of 16.0 inches is recommended for new foundations. The allowable bearing values may be increased 25.0 percent when considering transient loads such as earthquakes and wind.

The allowable bearing value may be increased to 10,000 pounds per square foot if the foundations bear on limestone in sound condition. Residual soil and highly weathered limestone should be removed in its entirety below foundations. All foundations for the structure should bear directly on sound limestone to mitigate differential settlement. Minimum foundation widths may control the foundation size.

Foundations should be designed to resist uplift from hydrostatic pressure cause by the high groundwater table.

Floors

A slab on grade is recommended for the floors. The subgrade should be prepared as described in the "Site & Subgrade Preparation" section of this report.

A base of 6.0 inches of clean sand is recommended under the floors. The sand should meet MDOT Class II specifications. Fill under floors should be compacted as described in the "Fill" section of this report.

A vapor barrier is recommended under the floor. The vapor barrier should consist of a 10 mil polyethylene sheet and should be located immediately below the floor slab. Waterproofing will be required for floors present below the high groundwater table. The floor should be designed to resist uplift from hydrostatic pressure caused by the high groundwater table.

A modulus of subgrade reaction of 150 pounds per cubic inch is recommended for the design of slabs on grade.

Lateral Earth Pressure

Foundation walls with different soil levels on either side should be designed as retaining walls. Sand should be used as backfill behind retaining and foundation walls. The sand should meet MDOT Class II specifications. The cantilevered walls should be designed using a total soil density of 120 pounds per cubic foot, a buoyant density of 65 pounds per cubic foot, and a coefficient of active earth pressure of 0.30 for level sand backfill. Braced excavations and foundation walls that will be braced against lateral movement at the top of the wall should be designed using a soil density of 120 pounds per cubic foot, a buoyant density of 65 pounds per cubic foot, and a coefficient of at rest earth pressure of 0.45 for level sand backfill. The effects of any surcharge, sloping backfill and unbalanced hydraulic pressure should also be included in the design.

A friction coefficient of 0.40 may be used for evaluating sliding. A soil density of 120 pounds per cubic foot, a buoyant density of 65 pounds per cubic foot, and a coefficient of passive earth pressure of 3.0 may be used for level sand backfill. Reducing the passive pressure coefficient by 50.0 percent is recommended for the design of gravity retaining walls. Drains should be included in the retaining wall design to prevent the buildup of hydrostatic forces. The drains should prevent the passage of soil particles through the drains. The effect of drainage failure should be included in the design.

Excavations

The in-situ sand is an OSHA type "C" soil. Excavations which will be entered by personnel should be based on OSHA requirements for a type "C" soil. Based on OSHA requirements, a maximum allowable side slope of 34 degrees (1.5H:1V) is recommended for excavations 4.0 to 15.0 feet deep. Excavations less than 4.0 feet deep may have vertical side slopes.

Excavations in the construction area may encounter bedrock. Equipment typically used for excavating soils may not be practical for excavations that extend into bedrock. Drilling, hammering, or blasting may be necessary to excavate bedrock. Excavations less than 15.0 feet deep which extend into stable rock may have vertical side slopes. If the side walls display signs of distress the side slope should be cut back to (0.5H:1V).

Excavations adjacent to the existing clearwell tank will reduce passive pressures acting on the sidewalls. The effect of reduced passive pressure should be considered and a structural engineer should design additional supports if necessary. Vibration monitoring is recommended to verify the vibrations caused by bedrock excavations are below thresholds which may cause damage to the existing clearwell tanks.

Fill

Fill, including the aggregate layers under pavement, should be compacted to a density of 95.0 percent of its maximum density to its full depth. The maximum density should be determined in accordance with the ASTM D 1557 standard. A maximum thickness per layer of 6.0 inches is recommended. In sand, the lift thickness may be increased to 12.0 inches if a vibratory roller or loader is used for compaction.

Where free draining porous fill is required the fill should be sand meeting MDOT Class II requirements or ASTM requirements for a SP or SW which are the designations for clean sand.

Compaction tests are recommended to confirm that the fill is compacted to the required density.

Fill should not be placed over frozen ground, snow or ice. Soil which contains frozen material should not be used as fill. During winter construction, removal of frozen ground may be necessary prior to placing fill.

Groundwater Management

Dewatering with well points to control groundwater may be necessary to construct foundations and utilities. Temporary ditches, sumps and ditch pumps should be adequate to control most perched groundwater and surface water. Dewatered using closely-spaced well points may be necessary for excavations which extend significantly below the water table. The exposed subgrade should be graded to accommodate proposed site grades and establish positive drainage. If excavations encounter groundwater, the excavation bottom may be stabilized by placing a 6.0 to 8.0 inch layer of porous stone over the bottom of the excavation. The stone will stabilize the bottom of the excavation.

Infiltration rates for the in-situ soils will probably not be suitable for internal drainage of the site due to the presence of silt and silty sand near the surface. Sand meeting MDOT Class II specifications is recommended in areas where increased drainage is required. A waterproof membrane is recommended under the slab floor and outside of the tank walls.

Due to the silt content in the upper portion of the soil profile, the soil does not meet the exception for drains in Section 1805.4 of the Michigan Building Code. Drains around the exterior foundations and under the pavement are recommended. The drain system should be designed to permanently lower the water table below the tank slab.

Pavement areas should be properly drained to minimize the effects of frost heaving and the loss of subgrade due to water infiltration. Underdrains will be a critical component to extending the life of the pavement due to the poor drainage properties of the existing soils. Underdrain should be installed along concrete hardscapes, at any location where the adjacent ground surface slopes down toward the pavement, and below the pavement at a maximum spacing of 30.0 feet center to center.

Hot Mix Asphalt (HMA) Pavement

The recommended pavement section materials listed in Table 2 refer to and should comply with the standard material designations included in applicable MDOT specifications and guidelines, including the 2012 MDOT “Standard Specifications for Construction.” These recommendations were developed based on the discussions and assumptions included in this report and the design procedures outlined in the “AASHTO Guide for Design of Pavement Structures - 1993.” The subgrade should be prepared as described in the “Site and Subgrade Preparation” section of this report. The final pavement section should be designed based on actual traffic volumes and the owner-specific performance requirements.

The design life assumes that maintenance repairs such as joint sealing, patching, and overlays are regularly performed throughout the life of the pavement. The design life also assumes that proper drainage has been established throughout the site. Proper drainage includes the installation of a storm system and structures and establishing positive drainage in the subgrade and the pavement cross-section layers.

Table 2: Recommended Pavement Section

Pavement Cross Section Materials	Standard Duty	
	Material	Thickness (in)
HMA Wearing Coarse	4E1	2.0
HMA Base Coarse	4E1	2.0
Aggregate Base	21AA Crushed Limestone	8.0
Sand Subbase	Class II	12.0

Note 1: If necessary, geogrid used to mechanically stabilize subgrade should be placed between the subbase and the proposed aggregate base. It should consist of a tri-axial configuration [such as Tensar TX-140 or similar].

The recommended asphaltic binders are PG64-28 for the wearing and leveling course. A softer binder may be necessary to achieve desired performance characteristics when utilizing Tier II RAP contents, per the MDOT Special Provision for Recycled Asphalt Pavement.

Target void content should be 3.5 percent. The paving contractor should submit the proposed mix design to the owner for review and approval prior to placement. The asphalt pavement should be compacted to 94 to 97 percent of the theoretical maximum density, determined via the Superpave "Rice" Method. Additionally, a tack coat of SS-1h emulsion should be applied between each asphalt layer at a rate of 0.1 gallon/square yard.

The paving contractor should submit the proposed mix design to the owner for review and approval prior to placement. The HMA pavement should be placed in at least two lifts. The pavement section should be constructed in accordance with MDOT guidelines and specifications as well as applicable state and local requirements.

Paved areas that display poor workmanship, which may include segregation, "cold screed scrapes", wearing courses not flush with curbs or rims, roller marks, shoving, smearing or tearing of the mat, flushing, or excessive cold joints should be repaired or replaced by the contractor immediately.

The pavement section should be constructed in accordance with MDOT guidelines and specifications as well as applicable state and local requirements. Support conditions and compaction should be assessed during construction in accordance with the "Quality Control and Testing" section of this report. This assessment should occur prior to installation of individual pavement layers.

Portland Cement Concrete (PCC) Pavement

The subgrade should be prepared in accordance with the "Site & Subgrade Preparation" and "Fill" sections of this report and applicable MDOT guidelines and specifications.

A base of 12.0 inches of clean sand is recommended under concrete pavement. The sand should meet MDOT Class II specifications. A minimum slab on grade concrete pavement thickness of 4.0 to 6.0 inches is recommended for standard and heavy duty concrete pavement. The recommended minimum concrete thickness in the area of loading docks and dumpster pads is 8.0 inches. A structural engineer should design any reinforcing steel used to promote load transfer between slabs.

A base of at least 6.0 inches of MDOT Class II sand or 21AA crushed limestone aggregate is recommended for underneath sidewalk slabs. Soil that contains organic materials or has a high clay or silt content should be replaced. The recommended minimum concrete pavement thickness is 4.0 inches for sidewalks hemmed in by greenbelt, or 6.0 inches for revealed-face.

A modulus of subgrade reaction of 150 pounds per cubic inch is recommended for the design of concrete pavement provided the recommendations in this report are observed. The paving contractor should submit the proposed mix design to the owner for review and approval prior to concrete placement.

Quality Control Testing

The subgrade should be examined and tested after the topsoil is removed and before fill is placed. A density gauge and probe rod should be used to verify that the subgrade possesses the required compaction.

Compaction tests in accordance with ASTM D 6938 specifications are recommended to confirm that fill in the construction area is compacted to the specified density. While fill is being placed, compaction tests should be performed at the rate of one test per 400 cubic yards of fill and throughout the depth of the fill with a minimum of five tests at each 1.0 foot elevation interval. Compaction tests should be performed under foundations at the rate of one test per 50 linear feet for wall foundations and one test per column foundation. The recommended testing frequency in the floor and pavement subgrade is one test per 2500 square feet. Tests should also be performed in the backfill over foundations and utilities. The maximum density should be determined in accordance with ASTM D 1557 or ASTM D 4253 procedures.

The shear strength of cohesive soil should be checked with a hand penetrometer or torvane. The tests should be performed at the same frequency as compaction tests.

A smooth 0.5 to 0.75 inch diameter rod should be used in conjunction with compaction tests to probe for loose areas under foundations, in fill and under floors.

A dynamic cone should not be substituted for compaction tests for evaluating backfill.

Asphalt quality control testing should adhere to the 2012 MDOT Standards for Construction. Asphalt temperatures during placement should be at least 275 degrees Fahrenheit; material that arrives at temperatures below 250 degrees Fahrenheit shall be rejected. Asphalt density testing should be performed with a nuclear density gauge at a minimum rate of one test per 500 square feet of pavement. At least five total verification cores in each course should be taken to assess relative compaction, calibrate the nuclear density gauge, and evaluate thickness. A minimum of two loose mix samples per mix per day should be taken at the plant and delivered to the quality-assurance firm's laboratory for vacuum extraction-gradations. The asphalt contractor should provide a minimum of two (2) theoretical maximum density verifications per day.

Testing should be performed by technicians supervised by a registered geotechnical engineer.

General Conditions & Reliance

The report was prepared in accordance with generally accepted practices of the geotechnical engineering profession. The scope of work consisted of performing eleven test borings and providing soil related recommendations for the design and construction of the proposed water production plant improvements. The scope of work did not include an environmental study or wetland determination.



The report and the associated test borings were prepared specifically for the previously described project and site. Soils & Structures should be consulted if a significant change in the scope of the project is made.

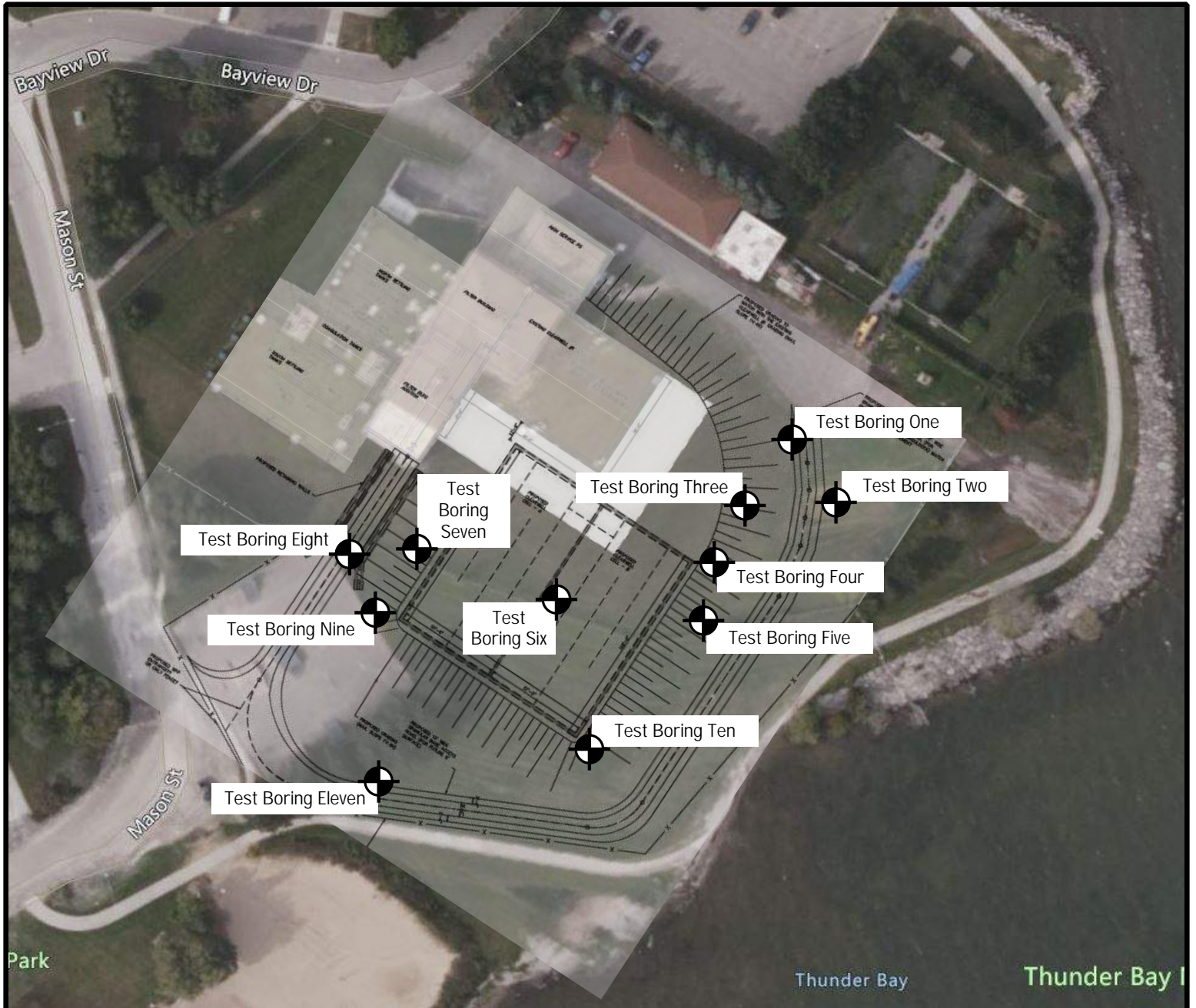
The test borings represent point information and may not have encountered all of the soil types and materials present on this site. This report does not constitute a guarantee of the soil or groundwater conditions or that the test boring is an exact representation of the soil or groundwater conditions at all points on this site.

The descriptions and recommendations contained in this report are based on an interpretation of the test borings and laboratory tests. The test borings should not be used independently of the report. If soil conditions are encountered which are significantly different from the test borings, Soils & Structures should be consulted for additional recommendations.

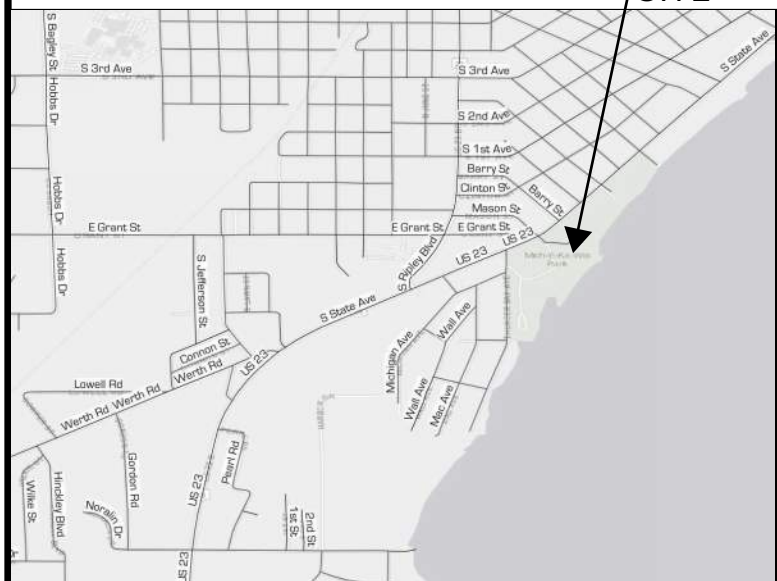
The report and test borings may be relied upon by Hubbel, Roth & Clark, Inc. for the design, construction, permitting and financing associated with the construction of the Alpena Water Production Plant project in Alpena, Alpena County, Michigan. The use of the report and test borings by third parties not associated with this project or for other sites has not been agreed upon by Soils & Structures. Soils & Structures does not recommend or consent to third party use or reliance of the report or test borings unless allowed to review the proposed use of these materials. Unless obtained in writing, consent to third party use should not be assumed. Third parties using the report or test boring logs do so at their own risk and are offered no guarantee or promise of indemnity.

Appendix

Test Boring Location Plan
General Soil Profile
Test Boring Logs
Laboratory Tests
General Soil Information



VICINITY MAP



SITE

TEST BORING LOCATION PLAN
NTS



Note: The background of the test boring plan is a portion of a site plan by HRC over a portion of an aerial photograph from Bing.

Alpena Water Production Plant

Alpena, Alpena County, Michigan

Soils & Structures, Inc.
6480 Grand Haven Road
Muskegon, Michigan 49441

JOB NO.: 2023.1089

DATE: 8-9-2023

Project Id: 2023.1089

Project Title: Alpena Water Production Plant

Location: Alpena, Michigan

Client: Hubbel, Roth & Clark, Inc.

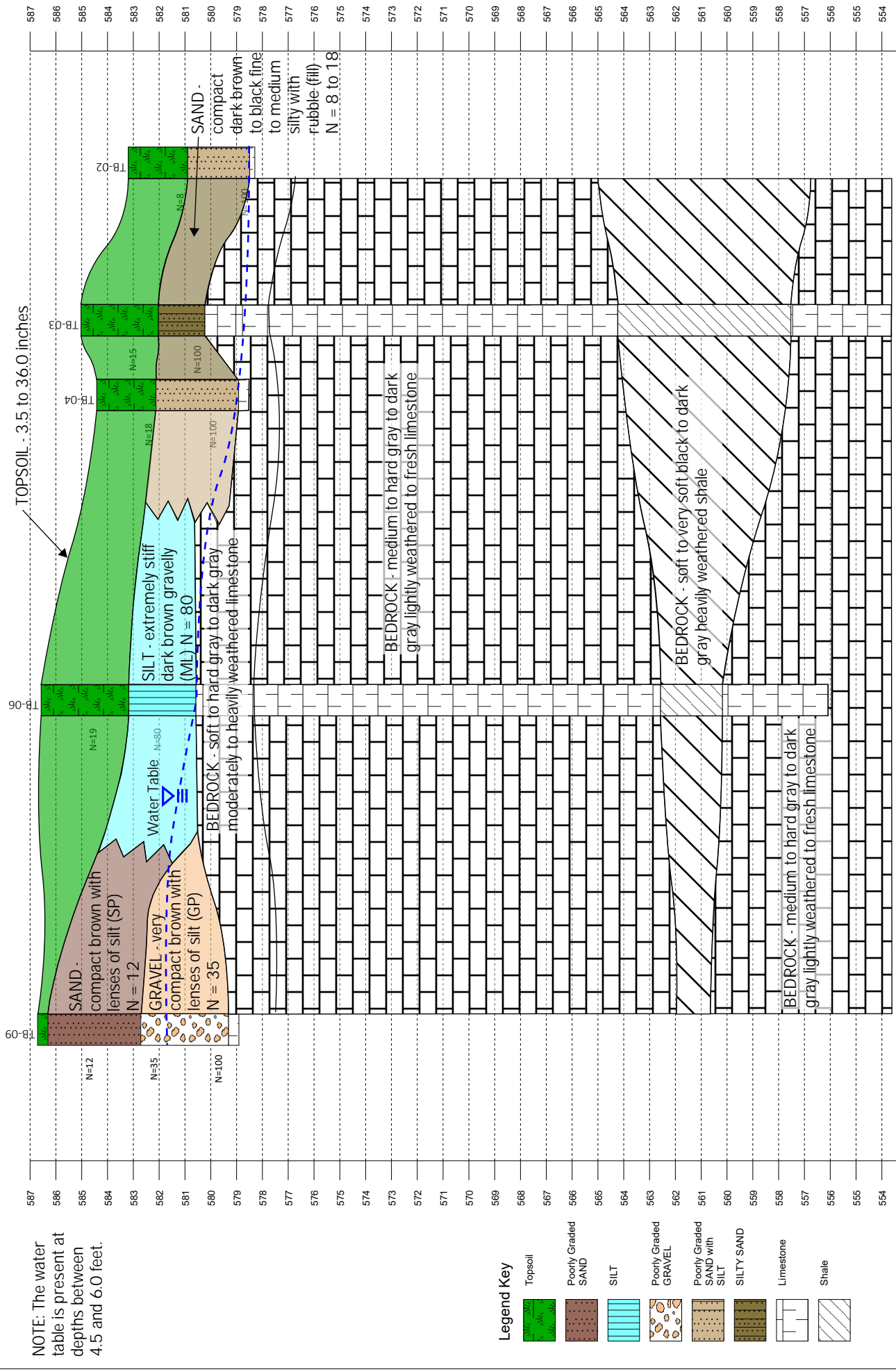
Title: Section line 1

Vertical Scale: 1:62

Horizontal Scale: 1:496

Engineer: Malcolm Thompson, P.E.

GENERAL SOIL PROFILE



NOTE: The water table is present at depths between 4.5 and 6.0 feet.






Legend Key

- Topsoil
- Poorly Graded SAND
- SILT
- Poorly Graded GRAVEL
- Poorly Graded SAND with SILT
- SILTY SAND
- Limestone
- Shale































Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H. Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 4.90
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631884.8 Easting: 19922896.4 Elevation: 583.84
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 4.50' on Jun 20 2023
Notes:	

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
1	S/S	TOPSOIL - compact dark brown sandy with silt with a trace of gravel (32.0")												
2	S/S													
3	S/S		▲	SPT-A	100	8-7-5	12			21.2				SP
4	S/S	SAND - compact dark brown fine to medium with a trace of wood with lenses of silt (fill)	▲											
5	S/S	LIMESTONE - Wackestone, gray to dark gray medium to hard very to moderately weathered fine to very coarse	▲	SPT-B	24	50/0.42'	50/5"							Lime stone
6														
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Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H. Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 4.90
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631850.8 Easting: 19922920.2 Elevation: 583.19
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 4.90' on Jun 20 2023
Notes:	▼


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											Liquid Limit	Plastic Limit	Plasticity Index	
1		TOPSOIL - compact dark brown sandy with silt (27.0")												
2		SAND - compact gray fine to coarse gravelly with silt with a trace of brick, rubble, and slag (fill)	SPT-A	80	7-5-3	8				11.6				SP-SM
3														
4		LIMESTONE - Wackestone, gray to dark gray medium to hard very to moderately weathered fine to very coarse	SPT-B	0	50/0.42'	50/5"								SP-SM
5														
6														
7														
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Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R.Roda Reviewed By: H.Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 31.40
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631847.9 Easting: 19922870.6 Elevation: 585.03
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth
Equipment:	Ground Water Levels
Hammer Type: Automatic Hammer	▼
Notes:	▼ End of Drilling Jun 21 2023 - Groundwater Not Encountered







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											Liquid Limit	Plastic Limit	Plasticity Index	
1		TOPSOIL - compact dark brown to black sandy with silt with a trace of gravel (36.0")												
2														
3			▲	SPT-A	80	9-8-7	15			6.6				AATo psoil
4		SAND - compact dark brown to black fine to medium silty with a trace of gravel and wood (fill)	▲	SPT-B	0	5-50/0...	50/2	2.00						SM
5		LIMESTONE - Wackestone, gray to dark gray soft to hard moderately weathered fine to very coarse	■											
6		LIMESTONE - Wackestone, gray to dark gray hard to medium, lightly weathered, fine to very coarse with thin beds of soft to very soft black shale and dark gray siltstone	■	RC-01	100									Lime ston e
7			■		8									
8			■											
9			■	RC-02	84									Lime ston e
10			■		43									
11			■											
12			■	RC-03	94									Lime ston e
13			■		57									
14			■											
15			■	RC-04	84									Shal e
16		SHALE - black to dark gray, soft to very soft, very to highly weathered, finely laminated with very thin beds of hard dark gray limestone	■		42									
17			■											
18			■	RC-05	98									Shal e
19		LIMESTONE - Wackestone, gray to dark gray medium to hard lightly to un-weathered fine to very coarse	■		80									
20			■											
21			■											
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29			■											
30			■											

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Project Name: <u>Alpena Water Production Plant</u>	Project Number: <u>2023.1089</u>
Project Location: <u>Alpena, Michigan</u>	Logged By: <u>R Roda</u> Reviewed By: <u>H. Barton</u>
Client: <u>Hubbel, Roth & Clark, Inc.</u>	Survey Datum: <u>NAD 1983 StatePlane Michigan Central</u> Hole Depth: <u>31.40</u>
Date Started: <u>Jun 20 2023</u> Completed: <u>Jun 23 2023</u>	Northing: <u>631847.9</u> Easting: <u>19922870.6</u> Elevation: <u>585.03</u>
Drilling Method: <u>3.25" Hollow Stem Auger</u>	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: <u>Automatic Hammer</u>	▼
Notes:	▼ End of Drilling <u>Jun 21 2023 - Groundwater Not Encountered</u>

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
31		LIMESTONE - Wackestone, gray to dark gray medium to hard lightly to un-weathered fine to very coarse												
32														
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38														
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Project Name: <u>Alpena Water Production Plant</u>	Project Number: <u>2023.1089</u>
Project Location: <u>Alpena, Michigan</u>	Logged By: <u>R Roda</u> Reviewed By: <u>H. Barton</u>
Client: <u>Hubbel, Roth & Clark, Inc.</u>	Survey Datum: <u>NAD 1983 StatePlane Michigan Central</u> Hole Depth: <u>5.90</u>
Date Started: <u>Jun 20 2023</u> Completed: <u>Jun 23 2023</u>	Northing: <u>631814.4</u> Easting: <u>19922855.0</u> Elevation: <u>584.42</u>
Drilling Method: <u>3.25" Hollow Stem Auger</u>	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: <u>Automatic Hammer</u>	<input checked="" type="checkbox"/> At Time of Drilling <u>5.70' on Jun 20 2023</u>
Notes:	<input type="checkbox"/>

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits					USCS	
											Liquid Limit	Plastic Limit	Plasticity Index				
1		TOPSOIL - compact dark brown sandy with silt (27.0")															
2																	
3		SAND - compact gray fine to coarse gravelly with silt with a trace of rubble (fill)	▲	SPT-A	53	7-11-7	18			10.7							AATo psoil
4			▲														
5			▲	SPT-B	49	7-9-50/...	50/5										
6		LIMESTONE - Wackestone, gray to dark gray soft to medium heavily to moderately weathered fine to very coarse	▲				"										SP- SM
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
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23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H. Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 5.80
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631778.5 Easting: 19922843.2 Elevation: 583.47
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 5.70' on Jun 20 2023
Notes:	

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits					USCS	
											Liquid Limit	Plastic Limit	Plasticity Index				
1	[Graphic]	TOPSOIL - compact dark brown sandy with silt with a trace of gravel (27.0")															
2	[Graphic]																
3	[Graphic]	SAND - compact light brown to gray fine to medium with lenses of wood (fill)	▲	SPT-A	100	6-6-9	15			35.4							AATo psoil
4	[Graphic]																
5	[Graphic]		▲	SPT-B	53	12-6-50...	50/4										SP
6	[Graphic]	LIMESTONE - Wackestone, gray to dark gray soft to medium heavily to moderately weathered fine to very coarse															
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
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27																	
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29																	
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


Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R.Roda Reviewed By: H.Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 30.50
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631793.0 Easting: 19922762.8 Elevation: 586.57
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth
Equipment:	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 6.00' on Jun 20 2023
Notes:	

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
1		TOPSOIL - compact dark brown to black sandy with silt with a trace of gravel (34.0")												
2														
3			SPT-A	80		7-8-11	19			13.1				AATo poil
4		SILT - stiff to extremely stiff dark brown to black gravelly with clay with sand												
5			SPT-B	87		12-30-50	80			12.9				ML
6		LIMESTONE - Wackestone, gray to dark gray medium to hard moderately weathered fine to very coarse												
7														
8		LIMESTONE - Wackestone, gray to dark gray hard lightly to un-weathered fine to very coarse												
9			RC-01	100	22									Lime stone
10														
11														
12														
13														
14			RC-02	94	26									Lime stone
15														
16														
17														
18														
19			RC-03	100	74									Lime stone
20														
21														
22														
23		LIMESTONE - Wackestone, gray to dark gray hard lightly to un-weathered fine to very coarse with thin beds of soft to very soft black shale												
24			RC-04	78	32									Lime stone
25		SHALE - black, soft to very soft, thinly laminated, with very thin lenses of hard dark gray limestone												
26														
27		LIMESTONE - Wackestone, gray to dark gray hard lightly to un-weathered fine to very coarse												
28			RC-05	95	55									
29														
30														

Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H.Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 30.50
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631793.0 Easting: 19922762.8 Elevation: 586.57
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 6.00' on Jun 20 2023
Notes:	▼

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits				USCS
											Liquid Limit	Plastic Limit	Plasticity Index		
31		LIMESTONE - Wackestone, gray to dark gray hard lightly to un-weathered fine to very coarse													Lime stone
32															
33															
34															
35															
36															
37															
38															
39															
40															
41															
42															
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54															
55															
56															
57															
58															
59															
60															

Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H.Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 7.80
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631819.9 Easting: 19922682.3 Elevation: 586.94
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 5.00' on Jun 20 2023
Notes:	▼

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits					USCS		
											Liquid Limit	Plastic Limit	Plasticity Index	Plasticity Index	Plasticity Index			
1		TOPSOIL - dark brown silty with sand (12.0")																
2		SAND- compact to very compact brown fine to coarse gravelly with silt (possible fill)	▼	SPT-A	73	12-11-9	20			8.1							SP-SM	
3			▼															
4			▼															
5		GRAVEL - very compact dark brown fine to coarse silty with lenses of silt	▼	SPT-B	100	18-26-23	49			17.2							SP-SM	
6			▼															
7			▼															
8		LIMESTONE - Wackestone, gray to dark gray soft to medium heavily to moderately weathered fine to very coarse	▼	SPT-C	84	38-50/0...	50/4"											GM
9																		
10																		
11																		
12																		
13																		
14																		
15																		
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28																		
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30																		

Project Name: <u>Alpena Water Production Plant</u>	Project Number: <u>2023.1089</u>
Project Location: <u>Alpena, Michigan</u>	Logged By: <u>R Roda</u> Reviewed By: <u>H. Barton</u>
Client: <u>Hubbel, Roth & Clark, Inc.</u>	Survey Datum: <u>NAD 1983 StatePlane Michigan Central</u> Hole Depth: <u>4.90</u>
Date Started: <u>Jun 20 2023</u> Completed: <u>Jun 23 2023</u>	Northing: <u>631817.0</u> Easting: <u>19922645.0</u> Elevation: <u>586.32</u>
Drilling Method: <u>3.25" Hollow Stem Auger</u>	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: <u>Automatic Hammer</u>	▼
Notes:	▼ End of Drilling <u>Jun 20 2023 - Groundwater Not Encountered</u>

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
1	TOPSOIL - dark brown silty with sand (5.0") SAND - compact brown fine to coarse gravelly with lenses of silt													
2														
3				SPT-A	67	8-9-11	20			9.8				SP
4														
5				SPT-B	95	50/0.42'	50/5"							SP
6	LIMESTONE - Wackestone, gray to dark gray soft to medium moderately weathered fine to very coarse													
7														
8														
9														
10														
11														
12														
13														
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29														
30														

Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H.Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 7.80
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631783.0 Easting: 19922660.2 Elevation: 586.71
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	<input checked="" type="checkbox"/> At Time of Drilling 5.00' on Jun 20 2023
Notes:	

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits					USCS	
											Liquid Limit	Plastic Limit	Plasticity Index				
1		TOPSOIL - dark brown silty with sand (4.0")															
2		SAND - compact brown fine to coarse gravelly with lenses of silt (possible fill)															
3			▲	SPT-A	53	14-6-6	12			3.0							SP
4			▲														
5		GRAVEL - very compact to extremely compact brown fine to coarse with sand with lenses of silt		SPT-B	47	22-13-22	35			5.8							GP
6			▲														
7		LIMESTONE - Wackestone, gray to dark gray soft to medium heavily to moderately weathered fine to very coarse		SPT-C	40	21-50/0...	50/3										GP
8			▲														
9																	
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29																	
30																	

Project Name: Alpena Water Production Plant	Project Number: 2023.1089
Project Location: Alpena, Michigan	Logged By: R Roda Reviewed By: H. Barton
Client: Hubbel, Roth & Clark, Inc.	Survey Datum: NAD 1983 StatePlane Michigan Central Hole Depth: 4.80
Date Started: Jun 20 2023 Completed: Jun 23 2023	Northing: 631711.8 Easting: 19922780.0 Elevation: 583.81
Drilling Method: 3.25" Hollow Stem Auger	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: Automatic Hammer	▼
Notes:	▼ End of Drilling Jun 20 2023 - Groundwater Not Encountered

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
1		TOPSOIL - dark brown silty with sand (3.5")												
2		SILT - very stiff dark brown with lenses of sand and gravel												
3			▼	SPT-A	80	3-10-31	41	1.50		14.3				ML
4			▼											
5		LIMESTONE - Wackestone, gray to dark gray soft to medium moderately weathered fine to very coarse	✕	SPT-B	61	50/0.33'	50/4"							ML
6														
7														
8														
9														
10														
11														
12														
13														
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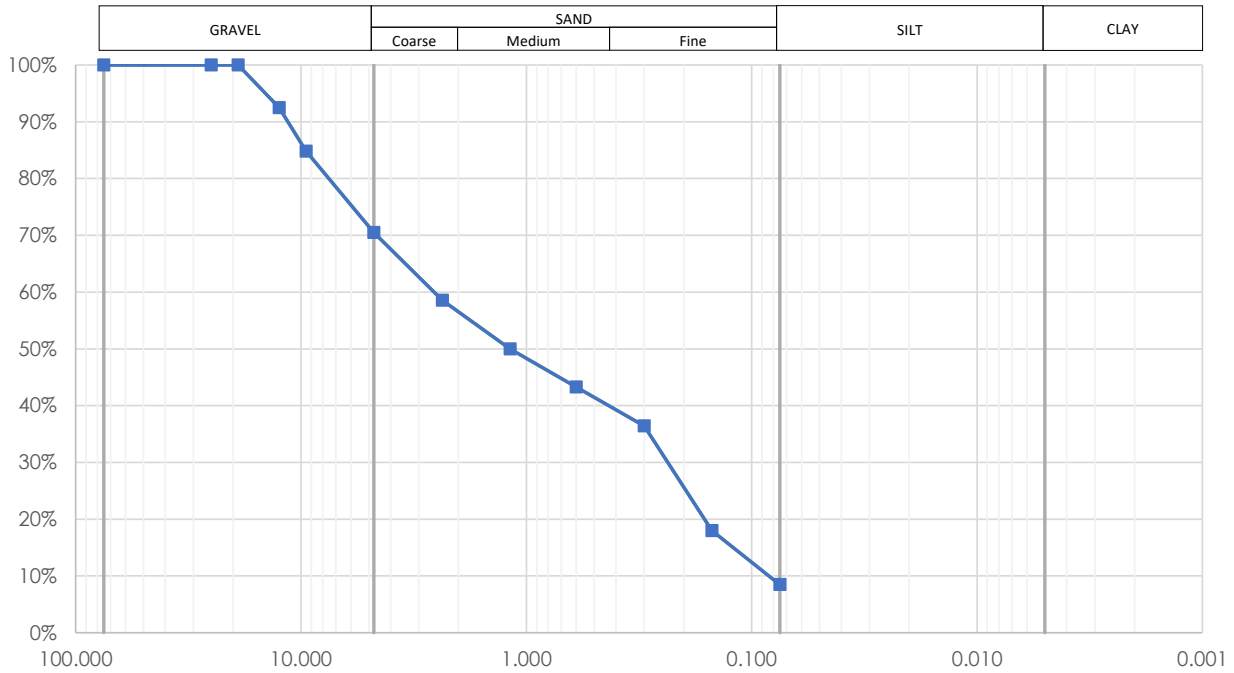
Project Name: <u>Alpena Water Production Plant</u>	Project Number: <u>2023.1089</u>
Project Location: <u>Alpena, Michigan</u>	Logged By: <u>R Roda</u> Reviewed By: <u>H. Barton</u>
Client: <u>Hubbel, Roth & Clark, Inc.</u>	Survey Datum: <u>NAD 1983 StatePlane Michigan Central</u> Hole Depth: <u>5.40</u>
Date Started: <u>Jun 20 2023</u> Completed: <u>Jun 23 2023</u>	Northing: <u>631684.5</u> Easting: <u>19922662.6</u> Elevation: <u>584.61</u>
Drilling Method: <u>3.25" Hollow Stem Auger</u>	Frost Depth _____
Equipment: _____	Ground Water Levels
Hammer Type: <u>Automatic Hammer</u>	▼
Notes:	▼ End of Drilling <u>Jun 20 2023 - Groundwater Not Encountered</u>

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits			USCS
											Liquid Limit	Plastic Limit	Plasticity Index	
1		TOPSOIL - dark brown silty with sand (3.5")												
2		SAND - extremely compact brown fine to coarse silty gravelly with cobbles	▲											
3			SPT-A	64	12-15-5...	50/3				8.2				SM
4		LIMESTONE - Wackestone, gray to dark gray medium to hard moderately to lightly weathered fine to very coarse	▲											
5			SPT-B	22	47-50/0...	50/5								SM
6														
7														
8														
9														
10														
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12														
13														
14														
15														
16														
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27														
28														
29														
30														



Particle Size Distribution Report

Project Name Alpena Waste Water Production Plant
 Project Number 2023.1089
 Client Hubbel, Roth & Clark, Inc.
 Date 7/27/2023
 Sample Location TB-02 Sample ID A Depth (ft) 2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	0.0%	29.5%	14.5%	16.7%	30.8%	0.0%	0.0%
D85	D60	D50	D30	D15	D10	Loss By Wash	
9.5754	2.6475	1.1829	0.2477	0.1265	0.0871	8.5%	

Particle Size	
Sieve	% Passing
3 in.	100%
1 in.	100%
3/4 in.	100%
1/2 in.	92%
3/8 in.	85%
No. 4	70%
No. 8	59%
No. 16	50%
No. 30	43%
No. 50	36%
No. 100	18%
No. 200	8.5%

Hydrometer	
Particle Size (mm)	% Passing

Material Description

SAND - gray fine to coarse gravelly with silt and a trace of brick, rubble and slag (SP-SM)

Remarks

Technician
rroda

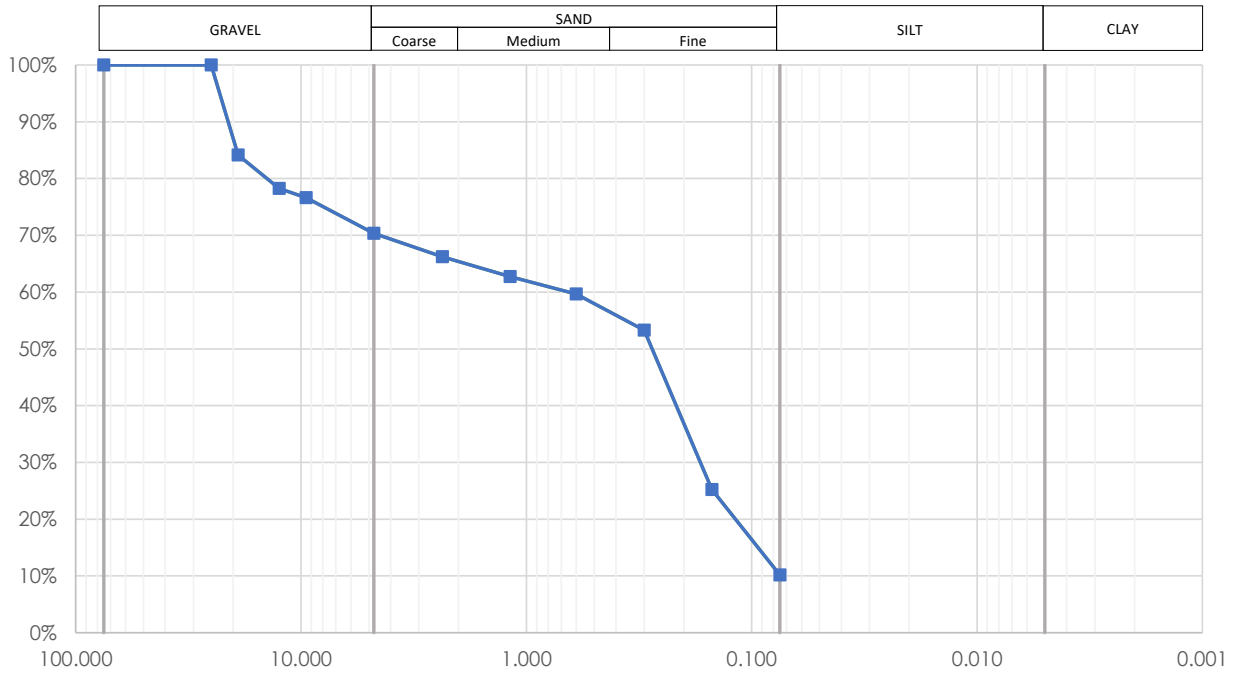
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Approved
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Particle Size Distribution Report

Project Name Alpena Waste Water Production Plant
 Project Number 2023.1089
 Client Hubbel, Roth & Clark, Inc.
 Date 7/27/2023
 Sample Location TB-04 Sample ID A Depth (ft) 2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	15.8%	13.8%	5.2%	9.2%	45.8%	0.0%	0.0%
D85	D60	D50	D30	D15	D10	Loss By Wash	
19.3184	0.6663	0.2825	0.1756	0.0990	0.0737	10.2%	

Particle Size	
Sieve	% Passing
3 in.	100%
1 in.	100%
3/4 in.	84%
1/2 in.	78%
3/8 in.	77%
No. 4	70%
No. 8	66%
No. 16	63%
No. 30	60%
No. 50	53%
No. 100	25%
No. 200	10.2%

Hydrometer	
Particle Size (mm)	% Passing

Material Description

SAND - gray fine to coarse gravelly with silt and a trace of rubble (SP-SM)

Remarks

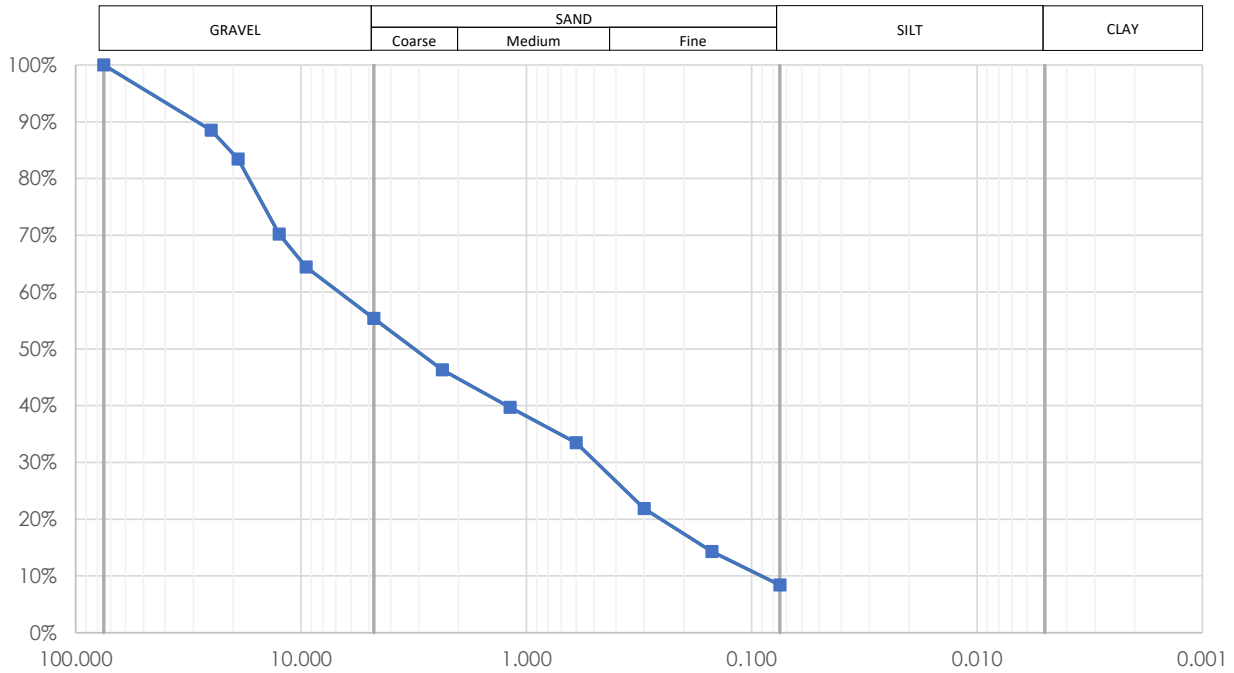
Technician
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rroda

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Project Name Alpena Waste Water Production Plant
 Project Number 2023.1089
 Client Hubbel, Roth & Clark, Inc.
 Date 7/27/2023
 Sample Location TB-07 Sample ID A Depth (ft) 2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	16.6%	28.1%	11.1%	17.6%	18.3%	0.0%	0.0%
D85	D60	D50	D30	D15	D10	Loss By Wash	
20.8842	7.1996	3.3444	0.5113	0.1639	0.0953	8.4%	

Particle Size	
Sieve	% Passing
3 in.	100%
1 in.	88%
3/4 in.	83%
1/2 in.	70%
3/8 in.	64%
No. 4	55%
No. 8	46%
No. 16	40%
No. 30	33%
No. 50	22%
No. 100	14%
No. 200	8.4%

Hydrometer	
Particle Size (mm)	% Passing

Material Description

SAND - brown fine to coarse gravelly with silt (SP-SM)

Remarks

Technician
rroda

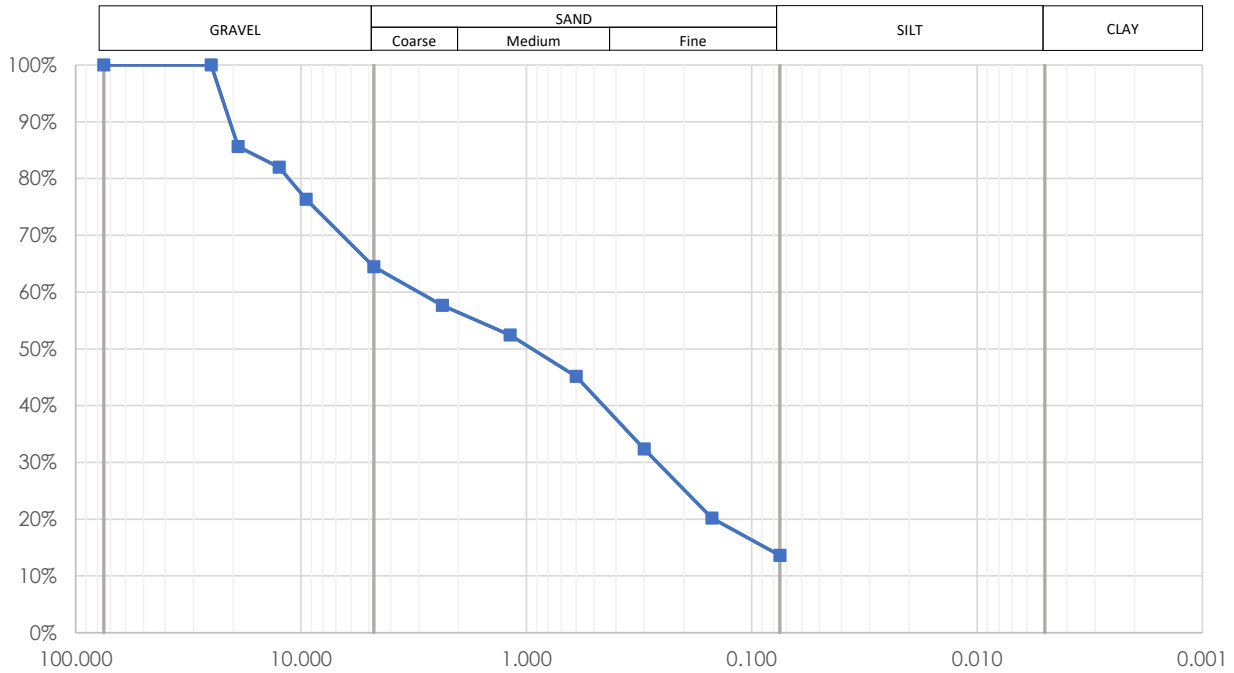
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Particle Size Distribution Report

Project Name Alpena Waste Water Production Plant
 Project Number 2023.1089
 Client Hubbel, Roth & Clark, Inc.
 Date 7/27/2023
 Sample Location TB-08 Sample ID A Depth (ft) 2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	14.4%	21.2%	8.4%	18.4%	24.1%	0.0%	0.0%
D85	D60	D50	D30	D15	D10	Loss By Wash	
17.8912	3.1867	0.9867	0.2712	0.0908	0.0551	13.6%	

Particle Size	
Sieve	% Passing
3 in.	100%
1 in.	100%
3/4 in.	86%
1/2 in.	82%
3/8 in.	76%
No. 4	64%
No. 8	58%
No. 16	52%
No. 30	45%
No. 50	32%
No. 100	20%
No. 200	13.6%

Hydrometer	
Particle Size (mm)	% Passing

Material Description

SAND - brown fine to coarse gravelly with lenses of silt (SP)

Remarks

Technician
rroda

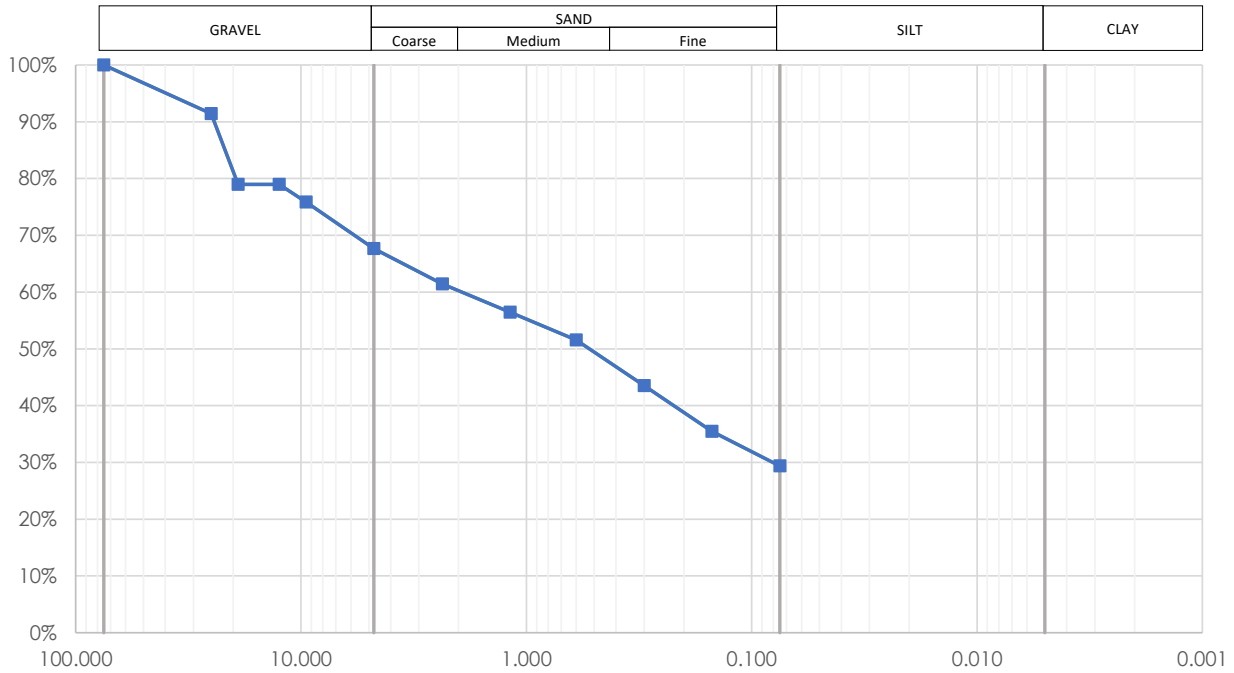
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Approved
rroda



Particle Size Distribution Report

Project Name Alpena Waste Water Production Plant
 Project Number 2023.1089
 Client Hubbel, Roth & Clark, Inc.
 Date 7/27/2023
 Sample Location TB-11 Sample ID A Depth (ft) 2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	21.0%	11.3%	7.8%	13.0%	17.5%	0.0%	0.0%
D85	D60	D50	D30	D15	D10	Loss By Wash	
21.9052	2.0231	0.5415	0.0828	0.0383	0.0255	29.4%	

Particle Size	
Sieve	% Passing
3 in.	100%
1 in.	91%
3/4 in.	79%
1/2 in.	79%
3/8 in.	76%
No. 4	68%
No. 8	61%
No. 16	56%
No. 30	52%
No. 50	44%
No. 100	35%
No. 200	29.4%

Hydrometer	
Particle Size (mm)	% Passing

Material Description

SAND - brown fine to coarse silty gravelly with cobbles (SM)

Remarks

Technician
rroda

Checked
rroda

Approved
rroda

General Information for Method of Field Investigation

The soil investigation was performed in accordance with the American Society of Testing and Materials method ASTM D 1586, which is the "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". Samples of compressible clays or organic soils are obtained in accordance with ASTM D 1587, which is the "Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes." Rock may be cored in conjunction with the above methods as specified in ASTM D 2113 which is the "Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation."

Field Testing

Standard Penetration Tests (SPT) in accordance with ASTM D 1586 were generally performed at depths of 2.0', 4.5', 7.0', 9.5' and 5.0' intervals thereafter.

Laboratory Testing

Samples obtained from the Standard Penetration Test, ASTM D 1586 or thin walled tube method, ASTM D 1587, were tested in the laboratory for the moisture content and density and/or particle size, where applicable. When soils sampled possessed sufficient cohesive properties, it was tested for its compressive strength in the unconfined state.

Natural Percent Moisture content (N.P.M.) of the soil is the percentage by weight of water contained in the soil sample compared to the dry weight of the solids of which the soil is composed. The NPM of select samples is determined in accordance with ASTM D 2216.

Natural Density (N.D.) of soil as reported on the appended boring logs is the natural wet density of the soils expressed in pounds per cubic foot.

The unconfined compressive strength of cohesive soils is determined in the laboratory on "undisturbed" select samples in accordance with ASTM D 2166. This test determines the maximum load required at a specified rate to deform the cohesive soil specimen length twenty (20%) percent. The primary purpose of the unconfined compression test is to obtain approximate quantitative values of the compressive strength of soils possessing sufficient coherence to permit testing in the unconfined state. The shear strength of the cohesive soil can be calculated from the results of the unconfined compressive strength test.

Color

When the color of the soils is uniform throughout, the color recorded will be such as brown, gray, and black and may be modified by adjectives such as light and dark. If the soils predominant color is shaded by secondary color, the secondary color precedes the primary color, such as gray-brown, or yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled; such as mottled brown and gray.

Water Observations

Depth of water recorded in the test boring is measured from the ground surface to the water surface. Initial depth indicates water level during boring, completing depth indicates water level immediately after boring, and depth after "X" number of hours indicates water level after allowing the groundwater rise or fall over a period of time. Water observations in pervious soils are considered reliable groundwater levels for accurate groundwater measurements at the time the test borings were performed unless records are made over several days' time. Factors such as weather, soils porosity, etc., will cause the groundwater level to fluctuate for both pervious and impervious soils.

Sample Type

If not otherwise indicated, the sample is a split-barrel liner sample ASTM D 1586.

"S.T." – Shelby tube sample, ASTM D 1587
"A" – disturbed augered sample
"C" – rock core sampled ASTM D 2113
N.P.M. – Natural Percent Moisture of in-situ soils sample
N.D. – Natural Density of in-situ soils sample in pcf.
S.S. – Shear Strength of cohesive soils samples as determined by the Unconfined Compression tests in ksf.

Classification Data – Laboratory data to assist in classification of soils and classification of soils characteristics; i.e., plastic limit or liquid limit

Test Boring Logs

Particle Size	Visual
Boulders	Larger than 12" (300 mm)
Cobbles	12" to 3" (300 to 75 mm)
Gravel - Coarse	3" to ¾" (75 to 19 mm)
Gravel - Fine	19.0 to 4.75 mm
Sand- Coarse	4.75 to 2.0 mm
Sand - Medium	2.0 to 0.425 mm
Sand - Fine	0.425 to 0.075 mm
Silt	0.075 to 0.002 mm
Clay	0.002 mm and smaller

Soils Components

Major Component	Minor Component
Gravel	Trace (1 - 10%)
Sand	Some (11 - 35%)
Silt/Clay	And (36 - 50%)

Condition of Soil Relative to Compactness

Granular Material	"N" Value
Loose	0 - 4
Slightly Compact	5 - 7
Compact	8 - 20
Very Compact	21 - 50
Extremely Compact	51 and above

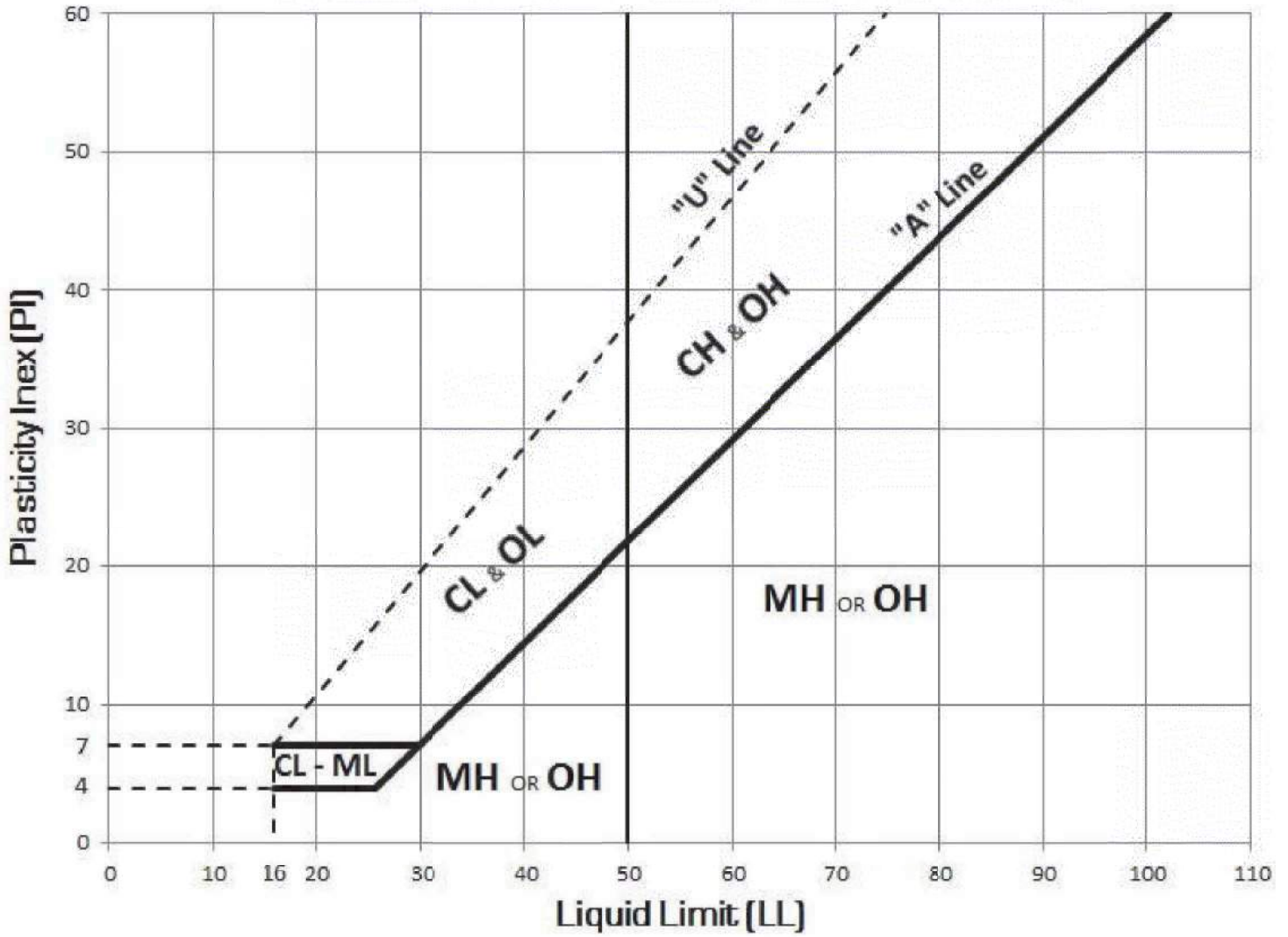
Cohesive Material	"N" Value
Soft	0 - 4
Firm	5 - 7
Stiff	8 - 20
Very Stiff	21 - 50
Extremely Stiff	51 and above

"N" values in clay soils are not to be used as a measure of shear strength. However, they may be used as a general indication of strength.

Unified Soil Classification System Chart

Major Divisions			Letter Symbol	Typical Descriptions
Coarse Grained Soils	Gravel – Gravelly Soils	Clean gravels (little or no fines)	GW	Well-Graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-Graded gravels, gravel-sand mixtures, little or no fines
		Gravel with Fines (appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-Graded sands, gravelly sands, little or no fines
			SP	Poorly-Graded sands, gravelly sands, little or no fines
		Sand with Fines (appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine Grained Soils	Silts and Clays	Liquid limit less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays or low plasticity
	Silts and Clays	Liquid limit greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays or medium to high plasticity, organic silts
	Highly organic soils		PT	Peat, humus, swamp soils with high organic contents

For Laboratory Classification of Fine Grained Soil
Plasticity Chart





February 12, 2024

Hubbell, Roth, & Clark, Inc.
555 Hulet Drive
Bloomfield Hills, MI 48302

Attention: Ms. Jane Graham

Regarding: Alpena WPP Clearwell Replacement & Infrastructure Improvements
Vibration Monitoring Proposal
Alpena, Michigan

Dear Ms. Graham:

Soils & Structures, Inc. is pleased to present our proposal for the above-mentioned project. The scope will include vibration monitoring as stated in Section 02201 of the bid documents for the Alpena WPP Clearwell Replacement in Alpena, Michigan.

A vibration monitoring plan will be developed in accordance with AASHTO R8-96. All equipment, travel, and reporting costs are included.

The following table breaks down our proposal:

Vibration Monitoring - Monthly			
Item	Units	Unit Price	Total
Monthly Vibration Monitoring	2	\$ 2,500.00/Month	\$ 5,000.00
Vibration Monitoring Plan	1	No Charge	No Charge
Monthly Total			\$ 5,000.00

The vibration monitoring total is for full-time remote monitoring with two (2) InstanTel seismograph placed at a pre-determined location. If additional monitors are required, each will incur an additional charge of \$2,500.00 per month. The costs for installation and removal of the equipment is included.

With an estimated duration of twenty four (24) months, the total estimate for vibration monitoring is **One Hundred Twenty Thousand Dollars (\$120,000.00)**.

We appreciate the opportunity to be of service to you. Please feel free to contact our office with any questions you may have.

Sincerely,
Soils & Structures, Inc.

Chris Johnson
Laboratory Manager
CRJ/cj