PUBLIC IMPROVEMENT REQUEST FOR PROPOSAL

RFP# 25-38

SCREW PUMP REPLACEMENT PROJECT

City of Ann Arbor
WATER RESOURCES RECOVERY FACILITY

Due Date: September 30, 2025 by 2:00 p.m. (local time)

Issued By:

City of Ann Arbor
Procurement Unit
301 E. Huron Street
Ann Arbor, MI 48104

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SECTION I - GENERAL INFORMATION

A. OBJECTIVE

The purpose of this Request for Proposal (RFP) is to select a firm to install new screw pumps and gates at the City's Water Resource's Recovery Facility (WRRF) in accordance with detailed specifications and plans included in this RFP. A total of six screw pumps, along with associated motors, drives and appurtenances, will be demolished and replaced with similar equipment. Several slide gates and actuators will also be demolished and replaced.

B. BID SECURITY

Each bid must be accompanied by a certified check or Bid Bond by a surety licensed and authorized to do business within the State of Michigan, in the amount of 5% of the total of the bid price.

Proposals that fail to provide a bid security upon proposal opening will be deemed non-responsive and will not be considered for award.

C. QUESTIONS AND CLARIFICATIONS / DESIGNATED CITY CONTACTS

All questions regarding this Request for Proposal (RFP) shall be submitted via e-mail. Questions will be accepted and answered in accordance with the terms and conditions of this RFP.

All questions shall be submitted on or before September 8, 2025 at 5:00 p.m. (local time), and should be addressed as follows:

> Scope of Work/Proposal Content questions shall be e-mailed to **Anne Warrow, P.E., Senior Engineer, awarrow@a2gov.org**
>
> RFP Process and Compliance questions shall be e-mailed to **Colin Spencer, Buyer - CSpencer@a2gov.org**

Should any prospective bidder be in doubt as to the true meaning of any portion of this RFP, or should the prospective bidder find any ambiguity, inconsistency, or omission therein, the prospective bidder shall make a written request for an official interpretation or correction by the due date for questions above.

All interpretations, corrections, or additions to this RFP will be made only as an official addendum that will be posted to a2gov.org and MITN.info and it shall be the prospective bidder's responsibility to ensure they have received all addenda before submitting a proposal. Any addendum issued by the City shall become part of the RFP, and must be incorporated in the proposal where applicable.

D. PRE-PROPOSAL MEETING

A **mandatory** pre-proposal conference for this project will be held on **September 4, 2025** at **1:00 p.m. at the City's Water Resource Recovery Facility, 49 South Dixboro Road, Ann Arbor, MI 48105**. **Failure to attend the meeting and sign the RFP sign-in sheet at the pre-proposal meeting will automatically disqualify a bidder from submitting a valid proposal.** Any proposal submitted by a party not attending and signing the roster at the pre-proposal meeting will not be opened or considered. Administrative and technical questions regarding this project will be answered at this time. The pre-proposal meeting is for information only. Any answers furnished will not be official until verified in writing by the Financial Service Area, Procurement Unit. Answers that change or substantially clarify the proposal will be affirmed in an addendum.

E. PROPOSAL FORMAT

To be considered, each firm must submit a response to this RFP using the format provided in Section III. No other distribution of proposals is to be made by the prospective bidder. An official authorized to bind the bidder to its provisions must sign the proposal. Each proposal must remain valid for at least one hundred and twenty (120) days from the due date of this RFP.

Proposals should be prepared simply and economically providing a straightforward, concise description of the bidder's ability to meet the requirements of the RFP. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed in ink by the person signing the proposal.

F. SELECTION CRITERIA

Responses to this RFP will be evaluated using a point system as shown in Section III. A selection committee comprised primarily of staff from the City will complete the evaluation.

If interviews are desired by the City, the selected firms will be given the opportunity to discuss their proposal, qualifications, past experience, and their fee proposal in more detail. The City further reserves the right to interview the key personnel assigned by the selected bidder to this project.

All proposals submitted may be subject to clarifications and further negotiation. All agreements resulting from negotiations that differ from what is represented within the RFP or in the proposal response shall be documented and included as part of the final contract.

G. SEALED PROPOSAL SUBMISSION

All proposals are due and must be delivered to the City on or before September 30, 2025 by 2:00 p.m. (local time). Proposals submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

Each respondent should submit in a sealed envelope

- **one (1) original proposal**
- **one (1) additional proposal copy**
- **one (1) digital copy of the proposal preferably on a USB/flash drive as one file in PDF format**

Proposals submitted should be clearly marked: **"RFP No. 25-38 –Screw Pump Replacement Project"** and list the bidder's name and address.

Proposals must be addressed and delivered to:

City of Ann Arbor
c/o Customer Service
301 East Huron Street
Ann Arbor, MI 48107

All proposals received on or before the due date will be publicly opened and recorded on the due date. No immediate decisions will be rendered.

Hand delivered proposals may be dropped off in the Purchasing drop box located in the Ann Street (north) vestibule/entrance of City Hall which is open to the public Monday through Friday from 8am to 5pm (except holidays). The City will not be liable to any prospective bidder for any unforeseen circumstances, delivery, or postal delays. Postmarking on the due date will not substitute for receipt of the proposal.

Bidders are responsible for submission of their proposal. Additional time will not be granted to a single prospective bidder. However, additional time may be granted to all prospective bidders at the discretion of the City.

A proposal may be disqualified if the following required forms are not included with the proposal:

- **Attachment B – General Declarations**
- **Attachment D - Prevailing Wage Declaration of Compliance**
- **Attachment E - Living Wage Declaration of Compliance**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Declaration of Compliance**

Proposals that fail to provide these forms listed above upon proposal opening may be deemed non-responsive and may not be considered for award.

H. DISCLOSURES

Under the Freedom of Information Act (Public Act 442), the City is obligated to permit review of its files, if requested by others. All information in a proposal is subject to disclosure under this provision. This act also provides for a complete disclosure of contracts and attachments thereto.

I. TYPE OF CONTRACT

A sample of the Construction Agreement is included as Attachment A. Those who wish to submit a proposal to the City are required to review this sample agreement carefully. **The City will not entertain changes to its Construction Agreement.**

For all construction work, the respondent must further adhere to the City of Ann Arbor General Conditions. The General Conditions are included herein. Retainage will be held as necessary based on individual tasks and not on the total contract value. The Contractor shall provide the required bonds included in the Contract Documents for the duration of the Contract.

The City reserves the right to award the total proposal, to reject any or all proposals in whole or in part, and to waive any informality or technical defects if, in the City's sole judgment, the best interests of the City will be so served.

This RFP and the selected bidder's response thereto, shall constitute the basis of the scope of services in the contract by reference.

J. NONDISCRIMINATION

All bidders proposing to do business with the City shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Attachment G shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

K. WAGE REQUIREMENTS

The Attachments provided herein outline the requirements for payment of prevailing wages or of a "living wage" to employees providing service to the City under this contract. The successful bidder must comply with all applicable requirements and provide documentary proof of compliance when requested.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. Use of Michigan Department of Transportation Prevailing Wage Forms (sample attached hereto) or a City-approved equivalent will be required along with wage rate interviews.

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based upon the work including within this contract. **The wage determination(s) current on the date 10 days before proposals are due shall apply to this contract.** The U.S. Department of

Labor (DOL) has provided explanations to assist with classification in the following resource link: www.sam.gov.

For the purposes of this RFP the Construction Type of Heavy will apply.

L. CONFLICT OF INTEREST DISCLOSURE

The City of Ann Arbor Purchasing Policy requires that the consultant complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected bidder unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Conflict of Interest Disclosure Form is attached.

M. COST LIABILITY

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the bidder prior to the execution of an Agreement. The liability of the City is limited to the terms and conditions outlined in the Agreement. By submitting a proposal, bidder agrees to bear all costs incurred or related to the preparation, submission, and selection process for the proposal.

N. DEBARMENT

Submission of a proposal in response to this RFP is certification that the Respondent is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the City will be notified of any changes in this status.

O. PROPOSAL PROTEST

All proposal protests must be in writing and filed with the Purchasing Manager within five (5) business days of any notices of intent, including, but not exclusively, divisions on prequalification of bidders, shortlisting of bidders, or a notice of intent to award. Only bidders who responded to the solicitation may file a bid protest. The bidder must clearly state the reasons for the protest. If any bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Manager. The Purchasing Manager will provide the bidder with the appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee, whose decision shall be final.

Any inquiries or requests regarding this procurement should be only submitted in writing to the Designated City Contacts provided herein. Attempts by the bidder to initiate contact with anyone other than the Designated City Contacts provided herein that the bidder believes can influence the procurement decision, e.g., Elected Officials, City Administrator, Selection Committee Members, Appointed Committee Members, etc., may lead to immediate elimination from further consideration.

P. SCHEDULE

The following is the schedule for this RFP process.

Activity/Event	**Anticipated Date**
Mandatory Pre-Proposal Conference	September 4, 2025, 1:00 p.m. (Local Time)
Written Question Deadline	September 8, 2025, 5:00 p.m. (Local Time)
Addenda Published (if needed)	Week of September 15, 2025
Proposal Due Date	September 30, 2025, 2:00 p.m. (Local Time)
Selection/Negotiations	October, 2025
Expected City Council Authorizations	November, 2025

The above schedule is for information purposes only and is subject to change at the City's discretion.

Q. IRS FORM W-9

The selected bidder will be required to provide the City of Ann Arbor an IRS form W-9.

R. RESERVATION OF RIGHTS

1. The City reserves the right in its sole and absolute discretion to accept or reject any or all proposals, or alternative proposals, in whole or in part, with or without cause.
2. The City reserves the right to waive, or not waive, informalities or irregularities in terms or conditions of any proposal if determined by the City to be in its best interest.
3. The City reserves the right to request additional information from any or all bidders.
4. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested within RFP.
5. The City reserves the right to determine whether the scope of the project will be entirely as described in the RFP, a portion of the scope, or a revised scope be implemented.
6. The City reserves the right to select one or more contractors or service providers to perform services.
7. The City reserves the right to retain all proposals submitted and to use any ideas in a proposal regardless of whether that proposal is selected. Submission of a proposal indicates acceptance by the firm of the conditions

contained in this RFP, unless clearly and specifically noted in the proposal submitted.

8. The City reserves the right to disqualify proposals that fail to respond to any requirements outlined in the RFP, or failure to enclose copies of the required documents outlined within the RFP.

S. IDLEFREE ORDINANCE

The City of Ann Arbor adopted an idling reduction Ordinance that went into effect July 1, 2017. The full text of the ordinance (including exemptions) can be found at: www.a2gov.org/idlefree.

Under the ordinance, No Operator of a Commercial Vehicle shall cause or permit the Commercial Vehicle to Idle:

(a) For any period of time while the Commercial Vehicle is unoccupied; or

(b) For more than 5 minutes in any 60-minute period while the Commercial Vehicle is occupied.

In addition, generators and other internal combustion engines are covered

1) Excluding Motor Vehicle engines, no internal combustion engine shall be operated except when it is providing power or electrical energy to equipment or a tool that is actively in use.

T. ENVIRONMENTAL COMMITMENT

The City of Ann Arbor recognizes its responsibility to minimize negative impacts on human health and the environment while supporting a vibrant community and economy. The City further recognizes that the products and services the City buys have inherent environmental and economic impacts and that the City should make procurement decisions that embody, promote and encourage the City's commitment to the environment.

The City strongly encourages potential vendors to bring forward tested, emerging, innovative, and environmentally preferable products and services that are best suited to the City's environmental principles. This includes products and services such as those with lower greenhouse gas emissions, high recycled content, without toxic substances, those with high reusability or recyclability, those that reduce the consumption of virgin materials, and those with low energy intensity.

As part of its environmental commitment, the City reserves the right to award a contract to the most responsive and responsible bidder, which includes bids that bring forward products or services that help advance the City's environmental commitment. In addition, the City reserves the right to request that all vendors report their annual greenhouse gas emissions, energy consumption, miles traveled, or other relevant criteria in order to help the City more fully understand the environmental impact of its procurement decisions.

U. MAJOR SUBCONTRACTORS

The Bidder shall identify each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the City.

V. LIQUIDATED DAMAGES

A liquidated damages clause, as given on page C-2, Article III of the Contract, provides that the Contractor shall pay the City as liquidated damages, and not as a penalty, a sum certain per day for each and every day that the Contractor may be in default of completion of the specified work, within the time(s) stated in the Contract, or written extensions.

Liquidated damages clauses, as given in the General Conditions, provide further that the City shall be entitled to impose and recover liquidated damages for breach of the obligations under Chapter 112 of the City Code.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

SECTION II - SCOPE OF WORK

Please see the plan set and detailed specifications for more details.

SECTION III - MINIMUM INFORMATION REQUIRED

PROPOSAL FORMAT

The following describes the elements that should be included in each of the proposal sections and the weighted point system that will be used for evaluation of the proposals.

Bidders should organize Proposals into the following Sections:

A. Qualifications, Experience and Accountability
B. Workplace Safety
C. Workforce Development
D. Social Equity and Sustainability
E. Schedule of Pricing/Cost
F. Authorized Negotiator
G. Attachments

Bidders are strongly encouraged to provided details for all of the information requested below within initial proposals. Backup documentation may be requested at the sole discretion of the City to validate all of the responses provided herein by bidders. False statements by bidders to any of the criteria provided herein will result in the proposal being considered non-responsive and will not be considered for award.

Pursuant to Sec 1:325 of the City Code which sets forth requirements for evaluating public improvement bids, Bidders should submit the following:

A. Qualifications, Experience and Accountability - 20 Points

1. Qualifications and experience of the bidder and of key persons, management, and supervisory personnel to be assigned by the bidder.

2. References from individuals or entities the bidder has worked for within the last five (5) years including information regarding records of performance and job site cooperation.

3. A statement from the bidder as to any major subcontractors it expects to engage including the name, work, and amount.

B. Workplace Safety – 20 Points

1. Provide evidence of a bidder's safety program (link to information on bidder's publicly available web-site preferred) and evidence of a safety-training program for employees addressing potential hazards of the proposed job site. Bidders must identify a designated qualified safety

representative responsible for bidder's safety program who serves as a contact for safety related matters.

2. Provide the bidder's Experience Modification Rating ("EMR") for the last three consecutive years. Preference within this criterion will be given to an EMR of 1.0 or less based on a three-year average.

3. Evidence that all craft labor that will be employed by the bidder for the project has, or will have prior to project commencement, completed at least an authorized 10-hour OSHA Construction Safety Course.

4. For the last three years provide a copy of any documented violations and the bidder's corrective actions as a result of inspections conducted by the Michigan Occupational Safety & Health Administration (MIOSHA), U.S. Department of Labor – Occupational Safety and Health Administration (OSHA), or any other applicable safety agency.

C. Workforce Development – 20 Points

1. Documentation as to bidder's pay rates, health insurance, pension or other retirement benefits, paid leave, or other fringe benefits to its employees.

2.. Documentation that the bidder participates in a Registered Apprenticeship Program that is registered with the United States Department of Labor Office of Apprenticeship or by a State Apprenticeship Agency recognized by the USDOL Office of Apprenticeship. USDOL apprenticeship agreements shall be disclosed to the City in the solicitation response.

3. Bidders shall disclose the number of non-craft employees who will work on the project on a 1099 basis, and the bidders shall be awarded points based on their relative reliance on 1099 work arrangements with more points assigned to companies with fewer 1099 arrangements. Bidders will acknowledge that the City may ask them to produce payroll records at points during the project to verify compliance with this section.

D. Social Equity and Sustainability – 20 Points

1. A statement from the bidder as to what percentage of its workforce resides in the in Washtenaw County, Michigan. The City will consider in evaluating which bids best serve its interests, the extent to which responsible and qualified bidders employ individuals in either the city of the county.

2. Evidence of Equal Employment Opportunity Programs for minorities, women, veterans, returning citizens, and small businesses.

3. Evidence that the bidder is an equal opportunity employer and does not discriminate on the basis of race, sex, pregnancy, age, religion, national origin, marital status, sexual orientation, gender identity or expression, height, weight, or disability.

4. The bidder's environmental record, including findings of violations and penalties imposed by government agencies.

E. Schedule of Pricing/Cost – 20 Points

Company Name: _____

Unit Price Bid –

Item #	Item Description	Quan-tity	Unit Price	Total Price
1A.	Spaans Babcock Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and all related work (re-use existing motors and drives.)	3 EA		
1B.	Epic International Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and all related work (re-use existing motors and drives.)	3 EA		
1C.	Lakeside Equipment Corporation Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and all related work (re-use existing motors and drives.)	3 EA		
1D.	Spaans Babcock Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and all related work, and remove and replace existing motors and drives.	3 EA		
1E.	Epic International Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and all related work, and remove and replace existing motors and drives.	3 EA		
1F.	Lakeside Equipment Corporation Screw Pumps, Remove and Replace, Pump Nos. 1, 2, and 3 and , and remove and replace existing motors and drives.	3 EA		
2A.	Spaans Babcock Screw Pumps, Remove and Replace, Pump Nos. 6, 7, and 8 and all related work, and remove and replace existing motors and drives.	3 EA		
2B.	Epic International Screw Pumps, Remove and Replace, Pump Nos. 6, 7, and 8 and all related work, and remove and replace existing motors and drives.	3 EA		
2C.	Lakeside Equipment Corporation Screw Pumps, Remove and Replace, Pump Nos. 6, 7, and 8 and all related work, and remove and replace existing motors and drives.	3 EA		
3.	Slide Gate Nos. RSLS SG-1, -2 & -3; Remove and Replace	3 EA		
4.	Slide Gate Nos. RSLS SG-4, &-5; Re-Coat Gates	2 EA		
5.	Slide Gate S-1-1, Re-Coat Gate	1 EA		
6.	Slide Gate NR-2, Remove & Replace	1 EA		
7.	Slide Gate NR-3, Re-Coat Gate	1 EA		
8.	Slide Gate Nos. S-12-1, -2 & -3; Demolish	3 EA		
9.	Slide Gate Nos. S-11-1 & -2, Remove & Replace	2 EA		
10.	Mobilization (Maximum 5% of Total Bid)	1 LS		
11.	Contractor Overhead, General Conditions and All Other Work	1 LS		

ESTIMATED PROJECT TOTAL FOR LOWEST PRICE OPTION $_____
(Include lowest option for each of Item Nos. 1 and 2, and costs for all remaining items.)

Notes:
1. See Specification Section 01950 for additional information related to pricing/costs.
2. The Owner will select the Screw Pump Manufacturer and other options during bid evaluation. A single option for Item #1 and a single option for Item #2 will be selected. The Bidder is required to provide bids from all three (3) screw pump manufacturers. Bids will be determined by the Owner as described in the Proposal Evaluation Section.

F. AUTHORIZED NEGOTIATOR / NEGOTIABLE ELEMENTS (ALTERNATES)

Include the name, phone number, and e-mail address of persons(s) in your organization authorized to negotiate the agreement with the City.

The proposal price shall include materials and equipment selected from the designated items and manufacturers listed in the bidding documents. This is done to establish uniformity in bidding and to establish standards of quality for the items named.

If the bidder wishes to quote alternate items for consideration by the City, it may do so under this Section. A complete description of the item and the proposed price differential must be provided. Unless approved at the time of award, substitutions where items are specifically named will be considered only as a negotiated change in Contract Sum.

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page C-2, it is requested to stipulate its proposed time for performance of the work.

Consideration for any proposed alternative items or time may be negotiated at the discretion of the City.

G. ATTACHMENTS

General Declaration, Legal Status of Bidder, Conflict of Interest Form, Living Wage Compliance Form, Prevailing Wage Compliance Form and the Non-Discrimination Form should be completed and returned with the proposal. These elements should be included as attachments to the proposal submission.

PROPOSAL EVALUATION

1. The selection committee will evaluate each proposal by the above-described criteria and point system. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested for evaluation. A proposal with all the requested information does not guarantee the proposing firm to be a candidate for an interview if interviews are selected to be held by the City. The committee may contact references to verify material submitted by the bidder.

2. The committee then will schedule interviews with the selected firms if necessary. The selected firms will be given the opportunity to discuss in more detail their qualifications, past experience, proposed work plan (if applicable) and pricing.

3. The interview should include the project team members expected to work on the project, but no more than six members total. The interview shall consist of a presentation of up to thirty minutes (or the length provided by the committee) by the bidder, including the person who will be the project manager on this contract, followed by approximately thirty minutes of questions and answers. Audiovisual aids may be used during the oral interviews. The committee may record the oral interviews.

4. The firms interviewed will then be re-evaluated by the above criteria and adjustments to scoring will be made as appropriate. After evaluation of the proposals, further negotiation with the selected firm may be pursued leading to the award of a contract by City Council, if suitable proposals are received.

The City reserves the right to waive the interview process and evaluate the bidder based on their proposal and pricing schedules alone.

The City will determine whether the final scope of the project to be negotiated will be entirely as described in this RFP, a portion of the scope, or a revised scope.

Work to be done under this contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents.

Any proposal that does not conform fully to these instructions may be rejected.

PREPARATION OF PROPOSALS

Proposals should have no plastic bindings but will not be rejected as non-responsive for being bound. Staples or binder clips are acceptable. Proposals should be printed double sided on recycled paper.

Each person signing the proposal certifies that they are a person in the bidder's firm/organization responsible for the decisions regarding the fees being offered in the Proposal and has not and will not participate in any action contrary to the terms of this provision.

ADDENDA

If it becomes necessary to revise any part of the RFP, notice of the addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or the City of Ann Arbor web site www.A2gov.org for all parties to download.

Each bidder should acknowledge in its proposal all addenda it has received on the General Declarations form provided in the Attachments section herein. The failure of a bidder to receive or acknowledge receipt of any addenda shall not relieve the bidder of the responsibility for complying with the terms thereof. The City will not be bound by oral responses to inquiries or written responses other than official written addenda.

SECTION IV - ATTACHMENTS

Attachment A – Sample Standard Contract

Attachment B – General Declarations

Attachment C - Legal Status of Bidder

Attachment D – Prevailing Wage Declaration of Compliance Form

Attachment E – Living Wage Declaration of Compliance Form

Attachment F – Living Wage Ordinance Poster

Attachment G – Vendor Conflict of Interest Disclosure Form

Attachment H – Non-Discrimination Ordinance Declaration of Compliance Form

Attachment I – Non-Discrimination Ordinance Poster

Sample Certified Payroll Report Template

ATTACHMENT A
SAMPLE STANDARD CONTRACT

If a contract is awarded, the selected contractor will be required to adhere to a set of general contract provisions which will become a part of any formal agreement. These provisions are general principles which apply to all contractors of service to the City of Ann Arbor such as the following:

CONTRACT

THIS CONTRACT is between the CITY OF ANN ARBOR, a Michigan Municipal Corporation, 301 East Huron Street, Ann Arbor, Michigan 48104 ("City") and _____ _____("Contractor")

_____

(An individual/partnership/corporation, include state of incorporation) (Address)

Based upon the mutual promises below, the Contractor and the City agree as follows:

ARTICLE I - Scope of Work

The Contractor agrees to furnish all of the materials, equipment and labor necessary; and to abide by all the duties and responsibilities applicable to it for the project titled **[Insert Title of Bid and Bid Number**] in accordance with the requirements and provisions of the following documents, including all written modifications incorporated into any of the documents, all of which are incorporated as part of this Contract:

Non-discrimination and Living Wage Declaration of Compliance Forms (if applicable)
Vendor Conflict of Interest Form
Prevailing Wage Declaration of Compliance Form (if applicable)
Bid Forms
Contract and Exhibits
Bonds
General Conditions
Standard Specifications
Detailed Specifications
Plans
Addenda

ARTICLE II - Definitions

Administering Service Area/Unit means **Water Resource Recovery Facility.**

Project means **Screw Pump Replacement Project – RFP No. 25-38.**

Supervising Professional means the person acting under the authorization of the manager of the Administering Service Area/Unit. At the time this Contract is executed, the Supervising Professional is **Anne M. Warrow, P.E.** whose job title is **Senior Engineer**. If there is any question concerning who the Supervising Professional is, Contractor shall confirm with the manager of the Administering Service Area/Unit.

Contractor's Representative means _____ [**Insert name**] whose job title is [**Insert job title**].

ARTICLE III - Time of Completion

(A) The work to be completed under this Contract shall begin immediately on the date specified in the Notice to Proceed issued by the City.

(B) The entire work for this Contract shall be completed within three-hundred and sixty-five (365) consecutive calendar days.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the City, as liquidated damages and not as a penalty, an amount equal to $1,000.00 for each calendar day of delay in the completion of all the work. If any liquidated damages are unpaid by the Contractor, the City shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

ARTICLE IV - The Contract Sum

(A) The City shall pay to the Contractor for the performance of the Contract, the unit prices as given in the Bid Form for the estimated bid total of:

_____Dollars ($_____)

(B) The amount paid shall be equitably adjusted to cover changes in the work ordered by the Supervising Professional but not required by the Contract Documents. Increases or decreases shall be determined only by written agreement between the City and Contractor.

ARTICLE V - Assignment

This Contract may not be assigned or subcontracted any portion of any right or obligation under this contract without the written consent of the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under this contract unless specifically released from the requirement, in writing, by the City.

ARTICLE VI - Choice of Law

This Contract shall be construed, governed, and enforced in accordance with the laws of the State of Michigan. By executing this Contract, the Contractor and the City agree to venue in a court of

appropriate jurisdiction sitting within Washtenaw County for purposes of any action arising under this Contract. The parties stipulate that the venue referenced in this Contract is for convenience and waive any claim of non-convenience.

Whenever possible, each provision of the Contract will be interpreted in a manner as to be effective and valid under applicable law. The prohibition or invalidity, under applicable law, of any provision will not invalidate the remainder of the Contract.

ARTICLE VII - Relationship of the Parties

The parties of the Contract agree that it is not a Contract of employment but is a Contract to accomplish a specific result. Contractor is an independent Contractor performing services for the City. Nothing contained in this Contract shall be deemed to constitute any other relationship between the City and the Contractor.

Contractor certifies that it has no personal or financial interest in the project other than the compensation it is to receive under the Contract. Contractor certifies that it is not, and shall not become, overdue or in default to the City for any Contract, debt, or any other obligation to the City including real or personal property taxes. City shall have the right to set off any such debt against compensation awarded for services under this Contract.

ARTICLE VIII - Notice

All notices given under this Contract shall be in writing, and shall be by personal delivery or by certified mail with return receipt requested to the parties at their respective addresses as specified in the Contract Documents or other address the Contractor may specify in writing. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; or (2) three days after mailing certified U.S. mail.

ARTICLE IX - Indemnification

To the fullest extent permitted by law, Contractor shall indemnify, defend and hold the City, its officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney's fees resulting or alleged to result, in whole or in part, from any act or omission, which is in any way connected or associated with this Contract, by the Contractor or anyone acting on the Contractor's behalf under this Contract. Contractor shall not be responsible to indemnify the City for losses or damages caused by or resulting from the City's sole negligence. The provisions of this Article shall survive the expiration or earlier termination of this contract for any reason.

ARTICLE X - Entire Agreement

This Contract represents the entire understanding between the City and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party's failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties to this Contract and their permitted successors and permitted assigns and nothing in this Contract, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract.

This Contract may be altered, amended or modified only by written amendment signed by the City and the Contractor.

ARTICLE XI – Electronic Transactions

The City and Contractor agree that signatures on this Contract may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this Contract. This Contract may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

[Signatures on next page]

[INSERT CONTRACTOR NAME HERE].

By: _____

Name: _____

Title: _____

Date: _____

CITY OF ANN ARBOR

By: _____

Name: Milton Dohoney Jr.

Title: City Administrator

Date: _____

Approved as to substance:

By: _____

Name: Jordan Roberts

Title: Public Services Area Administrator

Date: _____

Approved as to form:

By: _____

Name: Atleen Kaur

Title: City Attorney

Date: _____

(Signatures continue on following page)

CITY OF ANN ARBOR

By: _____

Name: Christopher Taylor

Title: Mayor

Date: _____

By: _____

Name: Jacqueline Beaudry

Title: Clerk

Date: _____

PERFORMANCE BOND

(1) _____ of _____(referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for $, the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City entitled **Screw Pump Replacement Project - RFP No. 25-38** and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

(3) Whenever the Principal is declared by the City to be in default under the Contract, the Surety may promptly remedy the default or shall promptly:
(a) complete the Contract in accordance with its terms and conditions; or
(b) obtain a bid or bids for submission to the City for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, arrange for a Contract between such bidder and the City, and make available, as work progresses, sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in paragraph 1.

(4) Surety shall have no obligation to the City if the Principal fully and promptly performs under the Contract.

(5) Surety agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying it shall in any way affect its obligations on this bond, and waives notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work, or to the specifications.

(6) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

SIGNED AND SEALED this _____ day of _____, 2025.

_____	_____
(Name of Surety Company)	(Name of Principal)
By _____	By _____
(Signature)	(Signature)
Its_____	Its _____
(Title of Office)	(Title of Office)
Approved as to form:	Name and address of agent:
_____	_____
Atleen Kaur, City Attorney	_____
	_____

LABOR AND MATERIAL BOND

(1) _____

of _____(referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of

$ _____, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City entitled **Screw Pump Replacement Project - RFP No. 25-38;** and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

(3) If the Principal fails to promptly and fully repay claimants for labor and material reasonably required under the Contract, the Surety shall pay those claimants.

(4) Surety's obligations shall not exceed the amount stated in paragraph 1, and Surety shall have no obligation if the Principal promptly and fully pays the claimants.

(5) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

SIGNED AND SEALED this _____ day of _____, 2025

_____
(Name of Surety Company)

By _____
(Signature)

Its_____
(Title of Office)

Approved as to form:

_____
Atleen Kaur, City Attorney

_____
(Name of Principal)

By _____
(Signature)

Its _____
(Title of Office)

Name and address of agent:

_____

_____

_____

GENERAL CONDITIONS

Section 1 - Execution, Correlation and Intent of Documents

The contract documents shall be signed in 2 copies by the City and the Contractor.

The contract documents are complementary and what is called for by any one shall be binding. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words which so applied have a well-known technical or trade meaning have the meaning of those recognized standards.

In case of a conflict among the contract documents listed below in any requirement(s), the requirement(s) of the document listed first shall prevail over any conflicting requirement(s) of a document listed later.

(1) Addenda in reverse chronological order; (2) Detailed Specifications; (3) Standard Specifications; (4) Plans; (5) General Conditions; (6) Contract; (7) Bid Forms; (8) Bond Forms; (9) Bid.

Section 2 - Order of Completion

The Contractor shall submit with each invoice, and at other times reasonably requested by the Supervising Professional, schedules showing the order in which the Contractor proposes to carry on the work. They shall include the dates at which the Contractor will start the several parts of the work, the estimated dates of completion of the several parts, and important milestones within the several parts.

Section 3 - Familiarity with Work

The Bidder or its representative shall make personal investigations of the site of the work and of existing structures and shall determine to its own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved, and all other factors affecting the work proposed under this Contract. The Bidder to whom this Contract is awarded will not be entitled to any additional compensation unless conditions are clearly different from those which could reasonably have been anticipated by a person making diligent and thorough investigation of the site.

The Bidder shall immediately notify the City upon discovery, and in every case prior to submitting its Bid, of every error or omission in the bidding documents that would be identified by a reasonably competent, diligent Bidder. In no case will a Bidder be allowed the benefit of extra compensation or time to complete the work under this Contract for extra expenses or time spent as a result of the error or omission.

Section 4 - Wage Requirements

Under this Contract, the Contractor shall conform to Chapter 14 of Title I of the Code of the City of Ann Arbor as amended; which in part states "...that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of

subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. At the request of the City, any contractor or subcontractor shall provide satisfactory proof of compliance with the contract provisions required by the Section.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. A sample Prevailing Wage Form is provided in the Appendix herein for reference as to what will be expected from contractors. Use of the Prevailing Wage Form provided in the Appendix section or a City-approved equivalent will be required along with wage rate interviews.

Where the Contract and the Ann Arbor City Ordinance are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used.

If the Contractor is a “covered employer” as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Contract a “living wage,” as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Contract are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision covering subcontractor’s employees who perform work on this contract.

Section 5 - Non-Discrimination

The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of Title IX of the Ann Arbor City Code, and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

Section 6 - Materials, Appliances, Employees

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary or used for the execution and completion of the work. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and materials shall be of the highest quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among its employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned.

Adequate sanitary facilities shall be provided by the Contractor.

Section 7 - Qualifications for Employment

The Contractor shall employ competent laborers and mechanics for the work under this Contract. For work performed under this Contract, employment preference shall be given to qualified local residents.

Section 8 - Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringements of any patent rights and shall hold the City harmless from loss on account of infringement except that the City shall be responsible for all infringement loss when a particular process or the product of a particular manufacturer or manufacturers is specified, unless the City has notified the Contractor prior to the signing of the Contract that the particular process or product is patented or is believed to be patented.

Section 9 - Permits and Regulations

The Contractor must secure and pay for all permits, permit or plan review fees and licenses necessary for the prosecution of the work. These include but are not limited to City building permits, right-of-way permits, lane closure permits, right-of-way occupancy permits, and the like. The City shall secure and pay for easements shown on the plans unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance with those requirements, it shall promptly notify the Supervising Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

Section 10 - Protection of the Public and of Work and Property

The Contractor is responsible for the means, methods, sequences, techniques and procedures of construction and safety programs associated with the work contemplated by this contract. The Contractor, its agents or sub-contractors, shall comply with the "General Rules and Regulations for the Construction Industry" as published by the Construction Safety Commission of the State of Michigan and to all other local, State and National laws, ordinances, rules and regulations pertaining to safety of persons and property.

The Contractor shall take all necessary and reasonable precautions to protect the safety of the public. It shall continuously maintain adequate protection of all work from damage, and shall take all necessary and reasonable precautions to adequately protect all public and private property from injury or loss arising in connection with this Contract. It shall make good any damage, injury or loss to its work and to public and private property resulting from lack of reasonable protective precautions, except as may be due to errors in the contract documents, or caused by agents or

employees of the City. The Contractor shall obtain and maintain sufficient insurance to cover damage to any City property at the site by any cause.

In an emergency affecting the safety of life, or the work, or of adjoining property, the Contractor is, without special instructions or authorization from the Supervising Professional, permitted to act at its discretion to prevent the threatened loss or injury. It shall also so act, without appeal, if authorized or instructed by the Supervising Professional.

Any compensation claimed by the Contractor for emergency work shall be determined by agreement or in accordance with the terms of Claims for Extra Cost - Section 15.

Section 11 - Inspection of Work

The City shall provide sufficient competent personnel for the inspection of the work.

The Supervising Professional shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection.

If the specifications, the Supervising Professional's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Supervising Professional timely notice of its readiness for inspection, and if the inspection is by an authority other than the Supervising Professional, of the date fixed for the inspection. Inspections by the Supervising Professional shall be made promptly, and where practicable at the source of supply. If any work should be covered up without approval or consent of the Supervising Professional, it must, if required by the Supervising Professional, be uncovered for examination and properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Supervising Professional, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to be in accordance with the contract documents, the City shall pay the cost of re-examination and replacement. If the work is not in accordance with the contract documents, the Contractor shall pay the cost.

Section 12 - Superintendence

The Contractor shall keep on the work site, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Supervising Professional. The superintendent will be responsible to perform all on-site project management for the Contractor. The superintendent shall be experienced in the work required for this Contract. The superintendent shall represent the Contractor and all direction given to the superintendent shall be binding as if given to the Contractor. Important directions shall immediately be confirmed in writing to the Contractor. Other directions will be confirmed on written request. The Contractor shall give efficient superintendence to the work, using its best skill and attention.

Section 13 - Changes in the Work

The City may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be

executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

In giving instructions, the Supervising Professional shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Supervising Professional, and no claim for an addition to the Contract Sum shall be valid unless the additional work was ordered in writing.

The Contractor shall proceed with the work as changed and the value of the work shall be determined as provided in Claims for Extra Cost - Section 15.

Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the Supervising Professional may deem proper under any of the following circumstances:

(1) When work under an extra work order is added to the work under this Contract;

(2) When the work is suspended as provided in Section 20;

(3) When the work of the Contractor is delayed on account of conditions which could not have been foreseen, or which were beyond the control of the Contractor, and which were not the result of its fault or negligence;

(4) Delays in the progress of the work caused by any act or neglect of the City or of its employees or by other Contractors employed by the City;

(5) Delay due to an act of Government;

(6) Delay by the Supervising Professional in the furnishing of plans and necessary information;

(7) Other cause which in the opinion of the Supervising Professional entitles the Contractor to an extension of time.

The Contractor shall notify the Supervising Professional within 7 days of an occurrence or conditions which, in the Contractor's opinion, entitle it to an extension of time. The notice shall be in writing and submitted in ample time to permit full investigation and evaluation of the Contractor's claim. The Supervising Professional shall acknowledge receipt of the Contractor's notice within 7 days of its receipt. Failure to timely provide the written notice shall constitute a waiver by the Contractor of any claim.

In situations where an extension of time in contract completion is appropriate under this or any other section of the contract, the Contractor understands and agrees that the only available adjustment for events that cause any delays in contract completion shall be extension of the required time for contract completion and that there shall be no adjustments in the money due the Contractor on account of the delay.

Section 15 - Claims for Extra Cost

If the Contractor claims that any instructions by drawings or other media issued after the date of the Contract involved extra cost under this Contract, it shall give the Supervising Professional written notice within 7 days after the receipt of the instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property. The procedure shall then be as provided for Changes in the Work-Section l3. No claim shall be valid unless so made.

If the Supervising Professional orders, in writing, the performance of any work not covered by the contract documents, and for which no item of work is provided in the Contract, and for which no unit price or lump sum basis can be agreed upon, then the extra work shall be done on a Cost-Plus-Percentage basis of payment as follows:

(1) The Contractor shall be reimbursed for all reasonable costs incurred in doing the work, and shall receive an additional payment of 15% of all the reasonable costs to cover both its indirect overhead costs and profit;

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same; the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

(3) If the extra is performed under subcontract, the subcontractor shall be allowed to compute its charges as described above. The Contractor shall be permitted to add an additional charge of 5% percent to that of the subcontractor for the Contractor's supervision and contractual responsibility;

(4) The quantities and items of work done each day shall be submitted to the Supervising Professional in a satisfactory form on the succeeding day, and shall be approved by the Supervising Professional and the Contractor or adjusted at once;

(5) Payments of all charges for work under this Section in any one month shall be made along with normal progress payments. Retainage shall be in accordance with Progress Payments-Section 16.

No additional compensation will be provided for additional equipment, materials, personnel, overtime or special charges required to perform the work within the time requirements of the Contract.

When extra work is required and no suitable price for machinery and equipment can be determined in accordance with this Section, the hourly rate paid shall be 1/40 of the basic weekly rate listed in the Rental Rate Blue Book published by Dataquest Incorporated and applicable to the time period the equipment was first used for the extra work. The hourly rate will be deemed to include all costs of operation such as bucket or blade, fuel, maintenance, "regional factors", insurance, taxes, and the like, but not the costs of the operator.

Section 16 - Progress Payments

The Contractor shall submit each month, or at longer intervals, if it so desires, an invoice covering work performed for which it believes payment, under the Contract terms, is due. The submission shall be to the City's Finance Department - Accounting Division. The Supervising Professional will, within 10 days following submission of the invoice, prepare a certificate for payment for the work in an amount to be determined by the Supervising Professional as fairly representing the acceptable work performed during the period covered by the Contractor's invoice. To insure the proper performance of this Contract, the City will retain a percentage of the estimate in accordance with Act 524, Public Acts of 1980. The City will then, following the receipt of the Supervising Professional's Certificate, make payment to the Contractor as soon as feasible, which is anticipated will be within 15 days.

An allowance may be made in progress payments if substantial quantities of permanent material have been delivered to the site but not incorporated in the completed work if the Contractor, in the opinion of the Supervising Professional, is diligently pursuing the work under this Contract. Such materials shall be properly stored and adequately protected. Allowance in the estimate shall be at the invoice price value of the items. Notwithstanding any payment of any allowance, all risk of loss due to vandalism or any damages to the stored materials remains with the Contractor.

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than l80 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

With each invoice for periodic payment, the Contractor shall enclose a Contractor's Declaration - Section 43, and an updated project schedule per Order of Completion - Section 2.

Section 17 - Deductions for Uncorrected Work

If the Supervising Professional decides it is inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

Section 18 - Correction of Work Before Final Payment

The Contractor shall promptly remove from the premises all materials condemned by the Supervising Professional as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the City and shall bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement.

If the Contractor does not remove the condemned work and materials within l0 days after written notice, the City may remove them and, if the removed material has value, may store the material

at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the City may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the City the expenses for disposal within 10 days of invoice for the disposal costs.

The inspection or lack of inspection of any material or work pertaining to this Contract shall not relieve the Contractor of its obligation to fulfill this Contract and defective work shall be made good. Unsuitable materials may be rejected by the Supervising Professional notwithstanding that the work and materials have been previously overlooked by the Supervising Professional and accepted or estimated for payment or paid for. If the work or any part shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good the defect in a manner satisfactory to the Supervising Professional. The judgment and the decision of the Supervising Professional as to whether the materials supplied and the work done under this Contract comply with the requirements of the Contract shall be conclusive and final.

Section 19 - Acceptance and Final Payment

Upon receipt of written notice that the work is ready for final inspection and acceptance, the Supervising Professional will promptly make the inspection. When the Supervising Professional finds the work acceptable under the Contract and the Contract fully performed, the Supervising Professional will promptly sign and issue a final certificate stating that the work required by this Contract has been completed and is accepted by the City under the terms and conditions of the Contract. The entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor by the City within 30 days after the date of the final certificate.

Before issuance of final certificates, the Contractor shall file with the City:

(1) The consent of the surety to payment of the final estimate;
(2) The Contractor's Affidavit in the form required by Section 44.

In case the Affidavit or consent is not furnished, the City may retain out of any amount due the Contractor, sums sufficient to cover all lienable claims.

The making and acceptance of the final payment shall constitute a waiver of all claims by the City except those arising from:

(1) unsettled liens;
(2) faulty work appearing within 12 months after final payment;
(3) hidden defects in meeting the requirements of the plans and specifications;
(4) manufacturer's guarantees.

It shall also constitute a waiver of all claims by the Contractor, except those previously made and still unsettled.

Section 20 - Suspension of Work

The City may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the

written notice from the City to the Contractor to do so. The City shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

If the work, or any part, shall be stopped by the notice in writing, and if the City does not give notice in writing to the Contractor to resume work at a date within 90 days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work suspended and will be entitled to the estimates and payments for all work done on the portions abandoned, if any, plus 10% of the value of the work abandoned, to compensate for loss of overhead, plant expense, and anticipated profit.

Section 21 - Delays and the City's Right to Terminate Contract

If the Contractor refuses or fails to prosecute the work, or any separate part of it, with the diligence required to insure completion, ready for operation, within the allowable number of consecutive calendar days specified plus extensions, or fails to complete the work within the required time, the City may, by written notice to the Contractor, terminate its right to proceed with the work or any part of the work as to which there has been delay. After providing the notice the City may take over the work and prosecute it to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any excess cost to the City. If the Contractor's right to proceed is terminated, the City may take possession of and utilize in completing the work, any materials, appliances and plant as may be on the site of the work and useful for completing the work. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages where an extension of time is granted under Extension of Time - Section 14.

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the City, upon the certificate of the Supervising Professional that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The City may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the Contractor and its surety are liable to the City for any excess cost incurred. The expense incurred by the City, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

Section 22 - Contractor's Right to Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of 3 months, through no act or fault of the Contractor or of anyone employed by it, then the Contractor may, upon 7 days written notice to the City, terminate this Contract and recover from the City payment for all acceptable work executed plus reasonable profit.

Section 23 - City's Right To Do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the City, 3 days after giving written notice to the Contractor and its surety may, without prejudice to any other remedy the City may have, make good the deficiencies and may deduct the cost from the payment due to the Contractor.

Section 24 - Removal of Equipment and Supplies

In case of termination of this Contract before completion, from any or no cause, the Contractor, if notified to do so by the City, shall promptly remove any part or all of its equipment and supplies from the property of the City, failing which the City shall have the right to remove the equipment and supplies at the expense of the Contractor.

The removed equipment and supplies may be stored by the City and, if all costs of removal and storage are not paid by the Contractor within 10 days of invoicing, the City upon 10 days written notice may sell the equipment and supplies at auction or private sale, and shall pay the Contractor the net proceeds after deducting all costs and expenses that should have been borne by the Contractor and after deducting all amounts claimed due by any lien holder of the equipment or supplies.

Section 25 - Responsibility for Work and Warranties

The Contractor assumes full responsibility for any and all materials and equipment used in the construction of the work and may not make claims against the City for damages to materials and equipment from any cause except negligence or willful act of the City. Until its final acceptance, the Contractor shall be responsible for damage to or destruction of the project (except for any part covered by Partial Completion and Acceptance - Section 26). The Contractor shall make good all work damaged or destroyed before acceptance. All risk of loss remains with the Contractor until final acceptance of the work (Section 19) or partial acceptance (Section 26). The Contractor is advised to investigate obtaining its own builders risk insurance.

The Contractor shall guarantee the quality of the work for a period of one year. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. The Contractor shall assign all manufacturer or material supplier warranties to the City prior to final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

Section 26 - Partial Completion and Acceptance

If at any time prior to the issuance of the final certificate referred to in Acceptance and Final Payment - Section 19, any portion of the permanent construction has been satisfactorily completed, and if the Supervising Professional determines that portion of the permanent construction is not required for the operations of the Contractor but is needed by the City, the Supervising Professional shall issue to the Contractor a certificate of partial completion, and immediately the City may take over and use the portion of the permanent construction described in the certificate, and exclude the Contractor from that portion.

The issuance of a certificate of partial completion shall not constitute an extension of the Contractor's time to complete the portion of the permanent construction to which it relates if the Contractor has failed to complete it in accordance with the terms of this Contract. The issuance of the certificate shall not release the Contractor or its sureties from any obligations under this Contract including bonds.

If prior use increases the cost of, or delays the work, the Contractor shall be entitled to extra compensation, or extension of time, or both, as the Supervising Professional may determine.

Section 27 - Payments Withheld Prior to Final Acceptance of Work

The City may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to the extent reasonably appropriate to protect the City from loss on account of:

(1) Defective work not remedied;

(2) Claims filed or reasonable evidence indicating probable filing of claims by other parties against the Contractor;

(3) Failure of the Contractor to make payments properly to subcontractors or for material or labor;

(4) Damage to another Contractor.

When the above grounds are removed or the Contractor provides a Surety Bond satisfactory to the City which will protect the City in the amount withheld, payment shall be made for amounts withheld under this section.

Section 28 - Contractor's Insurance

(1) The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself and the City from all claims for bodily injuries, death or property damage that may arise under this Contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor, any subcontractor, or anyone employed by them directly or indirectly. Prior to commencement of any work under this contract, Contractor shall provide to the City documentation satisfactory to the City, through City-approved means (currently myCOI), demonstrating it has obtained the required policies and endorsements. The certificates of insurance endorsements and/or copies of

policy language shall document that the Contractor satisfies the following minimum requirements. Contractor shall add registration@mycoitracking.com to its safe sender's list so that it will receive necessary communication from myCOI. When requested, Contractor shall provide the same documentation for its subcontractor(s) (if any).

Required insurance policies include:

(a) Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

Bodily Injury by Accident - $500,000 each accident
Bodily Injury by Disease - $500,000 each employee
Bodily Injury by Disease - $500,000 each policy limit

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 04 13 or current equivalent. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. The following minimum limits of liability are required:

$1,000,000	Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined.
$2,000,000	Per Project General Aggregate
$1,000,000	Personal and Advertising Injury
$2,000,000	Products and Completed Operations Aggregate, which, notwithstanding anything to the contrary herein, shall be maintained for three years from the date the Project is completed.

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 10 13 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

(d) Umbrella/Excess Liability Insurance shall be provided to apply excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $1,000,000.

(2) Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute

with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City for any insurance listed herein.

(3) Insurance companies and policy forms are subject to approval of the City Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional and un-qualified 30-day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number(s); name of insurance company(s); name and address of the agent(s) or authorized representative(s); name(s), email address(es), and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which may be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified Contractor shall furnish the City with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) and all required endorsements to the City. If any of the above coverages expire by their terms during the term of this Contract, the Contractor shall deliver proof of renewal and/or new policies and endorsements to the Administering Service Area/Unit at least ten days prior to the expiration date.

(4) Any Insurance provider of Contractor shall be authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-authorized insurance companies are not acceptable unless approved in writing by the City.

(5) City reserves the right to require additional coverage and/or coverage amounts as may be included from time to time in the Detailed Specifications for the Project.

(6) The provisions of General Condition 28 shall survive the expiration or earlier termination of this contract for any reason.

Section 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

(1) A Performance Bond to the City of Ann Arbor for the amount of the bid(s) accepted;
(2) A Labor and Material Bond to the City of Ann Arbor for the amount of the bid(s) accepted.

Bonds shall be executed on forms supplied by the City in a manner and by a Surety Company authorized to transact business in Michigan and satisfactory to the City Attorney.

Section 30 - Damage Claims

The Contractor shall be held responsible for all damages to property of the City or others, caused by or resulting from the negligence of the Contractor, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. The Contractor must restore all property injured including sidewalks, curbing, sodding, pipes, conduit, sewers or other public or private property to not less than its original condition with new work.

Section 31 - Refusal to Obey Instructions

If the Contractor refuses to obey the instructions of the Supervising Professional, the Supervising Professional shall withdraw inspection from the work, and no payments will be made for work performed thereafter nor may work be performed thereafter until the Supervising Professional shall have again authorized the work to proceed.

Section 32 - Assignment

Neither party to the Contract shall assign the Contract without the written consent of the other. The Contractor may assign any monies due to it to a third party acceptable to the City.

Section 33 - Rights of Various Interests

Whenever work being done by the City's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Supervising Professional, to secure the completion of the various portions of the work in general harmony.

The Contractor is responsible to coordinate all aspects of the work, including coordination of, and with, utility companies and other contractors whose work impacts this project.

Section 34 - Subcontracts

The Contractor shall not award any work to any subcontractor without prior written approval of the City. The approval will not be given until the Contractor submits to the City a written statement concerning the proposed award to the subcontractor. The statement shall contain all information the City may require.

The Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and all other contract documents applicable to the work of the subcontractors and to give the Contractor the same power to terminate any subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the City.

Section 35 - Supervising Professional's Status

The Supervising Professional has the right to inspect any or all work. The Supervising Professional has authority to stop the work whenever stoppage may be appropriate to insure the proper execution of the Contract. The Supervising Professional has the authority to reject all work and materials which do not conform to the Contract and to decide questions which arise in the execution of the work.

The Supervising Professional shall make all measurements and determinations of quantities. Those measurements and determinations are final and conclusive between the parties.

Section 36 - Supervising Professional's Decisions

The Supervising Professional shall, within a reasonable time after their presentation to the Supervising Professional, make decisions in writing on all claims of the City or the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the contract documents.

Section 37 - Storing Materials and Supplies

Materials and supplies may be stored at the site of the work at locations agreeable to the City unless specific exception is listed elsewhere in these documents. Ample way for foot traffic and drainage must be provided, and gutters must, at all times, be kept free from obstruction. Traffic on streets shall be interfered with as little as possible. The Contractor may not enter or occupy with agents, employees, tools, or material any private property without first obtaining written permission from its owner. A copy of the permission shall be furnished to the Supervising Professional.

Section 38 - Lands for Work

The Contractor shall provide, at its own expense and without liability to the City, any additional land and access that may be required for temporary construction facilities or for storage of materials.

Section 39 - Cleaning Up

The Contractor shall, as directed by the Supervising Professional, remove at its own expense from the City's property and from all public and private property all temporary structures, rubbish and waste materials resulting from its operations unless otherwise specifically approved, in writing, by the Supervising Professional.

Section 40 - Salvage

The Supervising Professional may designate for salvage any materials from existing structures or underground services. Materials so designated remain City property and shall be transported or stored at a location as the Supervising Professional may direct.

Section 41 - Night, Saturday or Sunday Work

No night or Sunday work (without prior written City approval) will be permitted except in the case of an emergency and then only to the extent absolutely necessary. The City may allow night work which, in the opinion of the Supervising Professional, can be satisfactorily performed at night. Night work is any work between 8:00 p.m. and 7:00 a.m. No Saturday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours but not more than 5 days notice of the Contractor's intention to work the upcoming Saturday.

Section 42 - Sales Taxes

Under State law the City is exempt from the assessment of State Sales Tax on its direct purchases. Contractors who acquire materials, equipment, supplies, etc. for incorporation in City projects are not likewise exempt. State Law shall prevail. The Bidder shall familiarize itself with the State Law and prepare its Bid accordingly. No extra payment will be allowed under this Contract for failure of the Contractor to make proper allowance in this bid for taxes it must pay.

Section 43

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period _____, 20___, to _____, 20 , performed any work, furnished any materials, sustained any loss, damage or delay, or otherwise done anything in addition to the regular items (or executed change orders) set forth in the Contract titled _____, for which I shall ask, demand, sue for, or claim compensation or extension of time from the City, except as I hereby make claim for additional compensation or extension of time as set forth on the attached itemized statement. I further declare that I have paid all payroll obligations related to this Contract that have become due during the above period and that all invoices related to this Contract received more than 30 days prior to this declaration have been paid in full except as listed below.

There is/is not (Contractor please circle one and strike one as appropriate) an itemized statement attached regarding a request for additional compensation or extension of time.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Past due invoices, if any, are listed below.

Section 44

CONTRACTOR'S AFFIDAVIT

The undersigned Contractor,_____, represents that on _____, 20___, it was awarded a contract by the City of Ann Arbor, Michigan to_____ under the terms and conditions of a Contract titled _____. The Contractor represents that all work has now been accomplished and the Contract is complete.

The Contractor warrants and certifies that all of its indebtedness arising by reason of the Contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the project, as well as all other claims arising from the performance of the Contract, have been fully paid or satisfactorily settled. The Contractor agrees that, if any claim should hereafter arise, it shall assume responsibility for it immediately upon request to do so by the City of Ann Arbor.

The Contractor, for valuable consideration received, does further waive, release and relinquish any and all claims or right of lien which the Contractor now has or may acquire upon the subject premises for labor and material used in the project owned by the City of Ann Arbor.

This affidavit is freely and voluntarily given with full knowledge of the facts.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Subscribed and sworn to before me, on this _____ day of _____, 20__
_____ , _____ County, Michigan
Notary Public
_____ County, MI
My commission expires on:

STANDARD SPECIFICATIONS

All work under this contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Bid. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications included in these contract documents.

Standard Specifications are available online:

http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

DETAILED SPECIFICATIONS

SECTION 01000

GENERAL SPECIFICATIONS

1.1 WORKING SPACE

A. The contractor shall interfere as little as possible with traffic and in all cases shall confine the work operations to the minimum space possible.

B. Stockpiling of construction material and equipment will be permitted as necessary, but in no case shall traveled roadways, driveways, or entrances be unduly obstructed.

C. Should storage areas be desired on private property, the Contractor may obtain such space on privately owned property at his own expense, by agreement with the property owner thereof. The Contractor shall provide the Owner with a copy of the written permission from the private property owner prior to occupying the property.

D. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

E. Provide and maintain access to fire hydrants, free of obstructions.

F. Provide means of removing mud from vehicle wheels before entering streets.

1.2 LOCATING WORK

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

1.3 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.

C. The Owner and Engineer may have been involved in the design, construction observation, and/or construction of other underground projects in the area of the proposed construction. The observation field reports, soil reports, and any soil information connected with these projects are available for review by the prospective bidders.

D. See Appendix I for geotechnical report

1.4 ROAD PERMITS

A. The contractor shall obtain any necessary construction permits required of contractors for work within public streets, highways, roads, or alleys. 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. Construction operations shall be conducted in accordance with provisions of such permits, including tunneling of pavements where required. The cost of any required bonds shall be included in the cost of the work as bid.

1.5 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.

1.6 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.

1.7 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.

1.8 FENCING

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

1.9 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.

1.10 TRAFFIC REGULATION

A. The Contractor's trucks and equipment operations shall be governed by all applicable ordinances; the rules and regulations of the Fire, Police, Transportation Departments; and the requirements of any other authority having jurisdiction. Flagman, warning lights, traffic signs, cones, and barricades shall be provided by the Contractor as necessary to direct and protect vehicular and pedestrian traffic at all locations of construction operations.

B. The Contractor shall be responsible for obtaining approvals and securing permits from all authorities having jurisdiction over work in rights-of-way.

C. The Contractor shall notify the Engineer, the local police and fire departments, all other interested local authorities, and the residents of all affected streets five days prior to any street closures.

D. The Contractor shall provide and maintain all temporary facilities required. These shall include but not be limited to facilities necessary to maintain pedestrian and vehicular traffic access through the area or to adjacent properties and to provide unobstructed access to fire hydrants and water and gas valves. The Contractor shall provide all barriers, lights, warning flags and signals, and the like that the Engineer or other authorities may require to accommodate and protect the public.

E. Should the Contractor fail to promptly provide or neglect to maintain the required temporary facilities or be dilatory in carrying out specific instruction to the Engineer, the Owner may with or without notice to the Contractor take such remedial measures deemed necessary and charge the Contractor with any costs incurred therefor. Any such action, however, shall in no way serve to release the Contractor from his general or particular liability for the safety of the traveling public or the protection of property.

F.

1.11 PRESERVATION OF TREES

A. The contractor shall protect and preserve all trees along the line of work, and will be held responsible for any damage to trees. Where necessary to preserve a tree and its main roots, the contractor shall tunnel under such tree. Where specifically called for on the drawings, the contractor shall remove trees completely, including stumps and main roots.

B. Where tunneling is not required for trees close to the trench and root trimming is necessary, the contractor shall hand trench ahead of the machine digging and cut all roots cleanly to minimize damage to the roots.

C. Tree branches shall be tied back to protect them from the contractor's machinery.

D. When a tree is removed by the contractor for his convenience and with the permission of the Owner and the adjacent property owner (where required), the contractor shall furnish one three (3) inch dia. tree for every six (6) inches of diameter of the tree removed. The species shall be as directed by the Owner. All trees installed shall be guaranteed to grow for a period of one (1) year.

E. The contractor will receive no extra compensation for preservation of trees or for their removal and replacement where called for, and the cost of all work involved shall be included in the unit price bid or at no extra cost to the owner.

1.12 REPLACEMENT OF SHRUBBERY

A. The contractor shall protect and/or replace all shrubbery damaged or destroyed by operations under this contract at no extra cost to the owner.

1.13 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.

1.14 PROTECTION OF PROPERTY AND SURVEY MONUMENTS

A. Before any monuments or stakes marking the boundaries of property along or near the work are removed or disturbed, notify the Engineer in sufficient time so that they can be properly located and reset. Contractor shall pay all costs incurred in connection therewith.

B. All precautions shall be taken to avoid disturbance of permanent survey monuments of any city, county, state, or federal authority; and when any of these are disturbed or destroyed, the Contractor shall restore them to the satisfaction of such authority and shall pay all costs incurred by such authority in connection therewith.

1.15 PUBLIC AND PRIVATE UTILITIES

A. Utilities

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

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

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

1.16 PUMPING, BAILING AND DRAINING

A. The contractor shall provide and maintain adequate pumping and drainage facilities for removal and disposal of water from trenches or other excavations.

B. Where the work is in ground containing an excessive amount of water, the contractor shall provide, install, maintain, and operate suitable deep wells or well points, connecting manifolds and reliable pumping equipment to operate same to insure proper construction of the work. Alternate dewatering methods may be implemented if approved by the Owner.

C. Drainage or discharge lines shall be connected to adjacent public storm water drains or extended to nearby water courses wherever possible. In any event, all pumping and drainage shall be done without damage to any highway or other property, public or private, and without interference with the rights of the public or private property owners and in accordance with the MDEQ and local requirements for soil erosion and sedimentation control.

D. The contractor shall receive no extra compensation for providing, maintaining or operating any dewatering or drainage facilities.

1.17 GROUND AND SURFACE WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. All water from whatever sources entering the work during any stage of construction shall be promptly removed and disposed.

B. All pumping and drainage shall be done without damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians or vehicular traffic, or the work of other contractors. Dewatering shall be done in such a manner that soil under or adjacent to existing structures shall not be disturbed, removed, or displaced.

1.18 SHEETING, SHORING AND BRACING

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

1.19 DISPOSAL OF EXCAVATED MATERIAL

A. With the exception of an amount of excavated materials sufficient for backfilling and construction of fills, as called for on the drawings, all broken concrete, stone, and excess excavated materials shall be disposed of from the 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.

1.20 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.

1.21 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.23 TUNNELING

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

1.24 COMPRESSED AIR

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

1.25 FIRST AID FACILITIES

A. Provide complete first aid kit fully stocked at all times. Replenish as needed.

B. Post safety related phone numbers (Police, fire, EMS, hospital, etc.)

1.26 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.

1.27 SCHEDULE OF OPERATIONS

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

1.28 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 000_ITB pages IB-1 thru 6 – 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.

1.29 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.

1.30 DUST CONTROL

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

1.31 INCONVENIENCES

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

1.32 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

G. Prohibit construction traffic from utilizing permanent site access bridge.

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Coordination.

C. Pre-Bid Meeting.

D. Preconstruction Meeting.

E. Progress Meetings.

F. Preinstallation Meetings.

1.2 RELATED SECTIONS

A. Section 000 – ITB (Instructions for Bidders).

B. Section 01005 - Administration Provisions.

C. Section 01300 - Submittals.

D. Section 01310 - Progress Schedules.

1.3 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.

E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 PRE-BID MEETING

A. Engineer will schedule a meeting as noted in the Information for Bidders.

B. Attendance Required: Owner, Engineer, and Bidders.

C. Attendance Requested: Regulatory Agencies, Utility Representatives.

D. Agenda:
1. Review of Permits Required.
2. Review of Special Project Requirements.
3. Regulatory requirements affecting the project.
4. Review of Contract Documents.
5. Critical work sequencing.
6. Use of premises by Owner and Contractors
7. Construction facilities and controls provided by Owner.
8. Temporary utilities provided by Contractor and by Owner.
9. Survey and layout.
10. Security and housekeeping procedures.
11. Responsibility for testing.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to all participants, and those affected by decisions made.

1.5 PRECONSTRUCTION MEETING

A. Engineer will schedule a meeting prior to issuing Notice of Award.

B. Attendance Required: Owner, Engineer, major subcontractors and Contractor.

C. Agenda:
1. Review of Execution of Owner-Contractor Agreement.
2. Review of Regulatory requirements affecting the project.
3. Distribution of Control Documents.
4. Submission of progress construction schedule.
5. Designation of personnel representing the parties in Contract, and the Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Critical work sequencing.
8. Use of premises by Owner and Contractor
9. Construction facilities and controls provided by Owner.
10. Mobilization
11. Project Coordination
12. Temporary utilities provided by Contractor and Owner.
13. Survey and layout.
14. Security and housekeeping procedures.

15. Procedures for testing.
16. Procedures for maintaining record documents.

D. Record minutes and distribute copies within two days after meeting to participants, with one copy to all participants, and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. The Engineer will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of on site and off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.

1.7 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a preinstallation meeting at work site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Engineer four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Engineer, Owner, participants, and those affected by decisions made.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the cutting, coring, patching and desired surface finish of penetrations, holes and openings in concrete slabs, pre-cast roof slabs and concrete or masonry walls for existing or new construction.

1.2 RELATED REQUIREMENTS

A. Section 01300 – Submittals

B. Division 03 – Concrete

C. Section 15000 – General Mechanical

D. Section 16010 – General Electrical, Instrumentation, and Controls Requirements

1.3 SUBMITTALS

A. Submit written request for approval in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project, including cutting or coring structural members.
2. Integrity of weather exposed or moisture resistant element.
3. Visual qualities of sight exposed elements.
4. Work of Owner or separate Contractor.

B. Include in request for approval:
1. Location and description of affected Work.
2. Field measurements relevant to the cutting, coring, or alteration.
3. Description of proposed Work and Products to be used.
4. Effect on work of Owner or separate Contractor.
5. Written permission of affected separate Contractor.
6. Desired date and time for when work will be executed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete and grout for patching shall be as specified in Divisions 03 and 04.

B. Escutcheon plates are specified in Division 15.

C. Materials or coatings for finishing patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not perform Work until submittal request has been reviewed and approved by the Engineer.

B. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

C. When required by the Engineer, identify reinforcing steel with non-destructive testing methods including pachometer or ground penetrating radar (GPR) technology. These tests will be performed by an independent contractor, paid under an allowance.

D. When embedded electrical conduit is known or thought to existing in the concrete slab, contractor shall coordinate electrical shutdown with Owner and identify potential power source.

E. After uncovering existing Work, assess conditions affecting performance of work.

F. Beginning of cutting means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work, including protection from dust and water.

C. When permitted, seal electrical components (MCCs, substations, panels, etc.) from dust intrusion during cutting and patching. Shut down equipment that requires ventilation during operation.

D. Cores for segmented compressible links (link seal) shall be coordinated with pipe OD.

3.3 CUTTING

A. Plan and execute cutting and fitting to minimize area of the Work. Do not overcut openings at corners.

B. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

C. Cutting shall be performed with a concrete saw equipped with diamond saw blades of proper size. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.

D. Cutting shall be controlled to the depth required. Slabs on grade shall be cut such that any utilities buried below the slab shall not be cut.

E. Where practical as determined by the Owner, the area to be repaired shall be saw cut on a specified line and depth, without cutting existing reinforcement, to provide a shoulder for repair material and eliminate "feather-edged" repairs.

F. Adequate shoring of area to be cut shall be installed prior to start of cutting. Do not allow any concrete to fall onto adjacent surfaces or to the floor below. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

G. Saw cut concrete and masonry prior to breaking out sections.

3.4 CORING

A. All coring shall be planned and executed in such a manner as to limit the extent of patching. Where identified on the Drawings, locate the reinforcement before coring to minimize cut-throughs.

B. Coring shall be performed with an approved non-impact core drill with diamond core drill bits. All work shall be performed by specialty contractors skilled in this type of work.

C. Size of cores shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed. Size cores to minimize space to pipes, sleeves, ducts, conduit or other penetrations.

D. Protect and secure all cores. Provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.5 PATCHING

A. Patching shall be performed to match existing surfaces to its original appearance.

B. Patching material shall match the type and quality of material removed.

C. Anchors and rebar shall be sufficiently removed such that parching adequately covers the steel.

D. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.

3.6 PROTECTION AND FINISHING

A. Maintain areas free of water and/or remove slurry or tailings by containing via sand bagging the affected area, and wet vacuuming, diverting water to floor drain or other means suitable to the Owner.

B. Provide devices and methods to protect other portions of project from damage.

C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.

D. Equipment damaged during cutting and patching shall be replaced or repaired. The Contractor will be responsible for repair or replacement costs.

E. Restore the surface to match the existing conditions.

F. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer.

G. Facility equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching.

H. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Submittals are required for all items incorporated into the Work

B. Submittals for the Work include the following
1. Contractual Requirements
2. Construction Schedule
3. Schedule of Values
4. Shop Drawing Schedule
5. Progress Meeting Submittals (see Section 01039)
6. Construction Pay Applications including Certified Payroll
7. Shop Drawings, Product Data, and Samples including Manufacturer's Certificates and Test Data (when required).
8. Manufacturer's O & M Manuals
9. Shut-down Schedule and Work Plans (when required)
10. Equipment Installation Certification and Field Calibration Reports
11. Maintenance Log
12. Lists of Spare Parts
13. Facility Start-up and Commissioning Documents
14. As-Built Drawings
15. Close-Out Documents

1.2 RELATED SECTIONS

A. General – City procurement and Contract requirements

B. Section 01039 – Coordination and Meetings

C. Section 01310 - Construction Progress Schedules

D. Section 01400 - Quality Control

E. Section 01650 - Facility Start-up and Commissioning

F. Section 01700 - Contract Closeout

G. Section 01730 - Operation and Maintenance Data

1.3 SCHEDULE FOR SUBMISSION

A. Contractual Requirements such as bonds, insurance, etc., shall be submitted per the City' Contract and procurement requirements.

B. The Construction Schedule shall be submitted per Section and 01310.

C. Schedule of Values and Schedule of Submittals shall be submitted within 20 days of the Notice to Proceed.

D. Resubmit updated Schedule of Submittals, schedules, and logs at each Progress meeting. (see 01039)

E. Shop Drawings, Product Data and Samples shall be submitted with sufficient time for Engineering review, modification, re-submittal, re-review, etc. until the submittals are approved.

F. Manufacturer's Certificates and Test Data shall be submitted with the Shop Drawings or when performed but prior to shipping.

G. Pay Applications shall be submitted monthly.

H. Shut-Down Schedule Work Plan shall be submitted 10 days prior to shutdown.

I. Maintenance Log shall be submitted one month prior to the first shipment of equipment and shall be updated and submitted monthly.

J. Manufacturer's O&M Manuals shall be submitted prior to equipment shipping.

K. List of Spare Parts shall be submitted 10 days prior to turnover.

L. Facility Start-up and Commissioning documents shall be submitted in accordance with Section 01650.

M. The Construction Schedule, Schedule of Values, and Schedule of Submittals will be reviewed by the Engineer. If rejected, these submittals must be revised and re-submitted until approval. The Engineer reserves the right to withhold the first Pay Application until approval.

N. Record Drawings and Close-Out Documents shall be submitted per Section 01700.

O. 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.

P. The Submittals shall not relieve the Contractor of his obligation to comply with specification requirements for items not listed on the schedule. Nothing herein shall be construed as allowing additional time for completion of the project in the event one or more resubmittals are required.

1.4 FORMAT

A. Submit all submittals in .PDF format. In addition, provide the following:
   1. Color charts on gloss paper or color palette
   2. Samples in actual format (bricks, block, etc.)
   3. Final O&M Manuals in paper in 3-ring binder per specification 01730.

4. Layout drawings in AutoCad, when AutoCad files have been provided to the Contractor for use in shop drawing preparation
5. Photos in .jpeg format.

1.5 SCHEDULE OF VALUES

A. The Schedule of Values shall include quantities and unit prices from the Bid Form, and lump sum prices for all remaining work by the Engineer. The lump sum items shall be segregated such that no item has a value larger than two (2) percent of the Total Bid Price unless approved by the Engineer.

B. Division 00 and 01 Costs.
1. The Schedule of Values shall include Bonds and Insurance, Mobilization, Demobilization, Submittals and Job-site Superintendent. Other job-wide costs can be included.
2. Separate costs for Item 1.05 B. 1. can also be included for the major subcontractors.
3. Manufacturer's Division 00 and 01 costs are to be included in the equipment, materials or products costs.
4. Mobilization and De-mobilization costs shall be equal, and the Superintendent payments shall be prorated.

C. Other Costs:
1. Equipment and material costs can include installation and profit, however payment for stored equipment and materials will be based on invoiced costs.
2. Shop drawing preparation can be paid up to 5% of the equipment price, upon shop drawing approval.

D. If not separately identified as in 1.05 B., each item shall include its proportionate share of the Contractor's general operating charges such as profit, overhead, supervision, insurance, bond premiums, interest, equipment cost, depreciation and rental, contingencies, expendable tools, equipment and supplies.

E. The total cost of the items and quantities the Contractor lists in the schedule of values shall equal the lump sum Contract Price established in the Bid Form.

F. Where required, the Schedule of Values shall include a complete set of detailed work sheets on bid take off and bid summary covering estimated general conditions expense (field overhead, general overhead, profit mark ups and revisions leading to the final bid amount.

G. When the Schedule of Values is approved by the Engineer, it shall become part of the Agreement and shall be used as the basis for Contractor progress payments, and to establish unit prices at which extra work may be authorized or deducted from the original Agreement.

1.6 SCHEDULE OF SUBMITTALS

A. The detailed Schedule of Submittals shall include all submittal requirements, including shop drawings, Product Data, Samples, O&M Manuals, spare parts, maintenance log, training, start-up submittals (Section 01650), close-out, etc.

B. The cloud-based Project Management submittals log once approved, can take the place Schedule of Submittals

1.7 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. General

1. The contract drawings and specifications are complete in all aspects of layout, type of equipment and materials. They do not serve as detailed fabrication, materials, or installation drawings, and the preparation of such submittals required or necessary for this purpose shall be the responsibility of the Contractor.
2. Shop Drawings, Product Data, and Samples are required for all equipment, products, materials, hardware, fasteners, anchors, shims, or anything else incorporated permanently into the work, furnished or installed by the Contractor.
3. For the purposes of these documents:
   a. Shop Drawings are fabrication, assembly and/or installation drawings, diagrams, schedules or other documents specifically prepared for the Work by the Contractor, subcontractor, manufacturer, supplier and/or distributor to illustrate some portion of the Work.
   b. Product Data are illustrations, standard schedules, performance charts, instructions, catalog cuts, brochures, diagrams, materials lists and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
   c. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
4. 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.
5. The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Engineer. Such Work shall be in accordance with approved submittals.
6. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of submittal and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in the Shop Drawings, Product Data, Samples or similar submittals by the Engineer's approval thereof, as the Engineer's review in intended to cover compliance with the Contract Document and not to enter into every detail of the shop work.
7. 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.
8. 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.

1.8 SUBMITTAL PREPARATION

A. All drawings, information and documentation shall be prepared in English language and dimensions in US Customary units.

B. Identify any variations or substitutions from the Contract Documents. If none exist, state “No Variations or Substitutions to the Contract Documents” in each submittal. Submit the Shop Drawing Certificate (attached) declaring and identifying any changes.

C. When needed, clearly identify or highlighting any required field dimensions or existing elevations requests, coordination required to adjoining or related work required of the Owner or Engineer.

D. Provide room and/or Building layout drawings to scale, identifying concrete pads, equipment placement, panel locations, piping, drains, etc. Identify dimensions to adjacent equipment or work. Identify any manufacturer’s recommended space requirement for equipment access or maintenance.

E. Identify all equipment and component dimensions, materials, special service or maintenance access requirements, wiring diagrams, motor data, etc.

F. Provide space for Contractor and Engineer review stamps.

G. 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:

a. check thoroughly all such drawings, as regards measurements, sizes of members, materials, and all other details to assure himself that they conform to the intent of the drawings and the specification,

b. coordinate submittal with related work supplied by others, including electrical and instrumentation equipment, and

c. shall promptly return to the subcontractors and/or manufacturers for correction such drawings as are found inaccurate or otherwise in error.

d. When properly prepared, Contractor to affix the Contractor’s Review statement.

1.9 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer approved submittal form. Sequentially number the transmittals in accordance with the specification number. Add SD for shop drawings, OM for O&M Manuals and a brief descriptor. Re-submittals shall have original number and a sequential decimal suffix. (i.e. 15060.2 SD Pipe is the second shop drawing submittal for pipe.)

B. Identify Project, Contractor, Subcontractor and supplier; pertinent drawing and detail number, and/or specification section number on each submittal.

C. 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.

D. Revise and resubmit submittals as required and identify all changes made since previous submission. Submit the full document as a re-submittal, so the last version is complete.

E. The Engineer reserves the right to refuse to check or review any submittal of a subcontractor or manufacturer which is not presented in compliance with the foregoing requirements.

1.10 SAMPLE SUBMITTALS

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of sufficient size and representative of finishes indicating textures, and patterns for Owner selection.

C. Include identification on each sample, with full Project information.

D. Submit the number of samples specified in individual specification sections; two of which will be retained by the Engineer.

E. Reviewed samples which may be used in the work are indicated in individual specification sections.

F. 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.

1.11 SUBMITTAL REVIEW

A. The Engineer reserves the right to reject outright any submittal which is deemed incomplete or not adequately coordinated with other work elements.

B. The Engineer will review the submittals within a reasonable time after receipt thereof and will comment directly on the.PDF submittal with any notes or corrections which may be necessary to meet the Contract requirements.

C. 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 repost corrected drawings to the website for final review. The Contractor shall include a ‘cover sheet’ identifying how each comment was addressed. The entire submittal shall be resubmitted such that the final accepted submittal ins complete.

D. 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.

E. 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.

F. Manufacturer Certificates
   1. When specified in individual sections, submit manufacturer’s certification to the Engineer.
   2. Indicate material or Product meets or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   3. Certificates may be recent or previous test results on material or Product, but must be acceptable to the Engineer.

1.12 SHUT-DOWN SCHEDULE AND WORK PLANS

A. The Contractor shall schedule shut-downs a minimum of 10 days in advance. Such shut-downs can include bulkhead installation and removal, pump, valve or pipe replacement, hydraulic connections and electrical and instrumentation connections.

B. The Contractor shall submit a Shut-Down Work Plan for each interruption, on a form provided by the Engineer.

1.13 EQUIPMENT INSTALLATION, CALIBRATION REPORT AND SERVICE REPORT

A. When specified, the Manufacturer shall submit a certificate to check that the equipment has been properly installed by the Contractor and calibrated or set-up by the field technician.

B. When a product or equipment must be checked or serviced, a service report shall be submitted identifying what was served or if any parts were replaced.

C. Additional demonstration submittals are detailed in Section 01650.

1.14 START-UP AND COMMISSIONING DOCUMENTS

A. Submit documents in accordance with Section 01650.

1.15 CONTRACT CLOSE-OUT DOCUMENTS

A. Submit Contract Close-out Documents per Section 01700.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Project Construction Schedule and look-ahead schedules

B. Format, content, revisions and submittals

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Shop drawings, product data, and samples

B. Section 01950 – Sequence of Construction and Special Project Requirements

1.3 QUALITY ASSURANCE

A. Any and all construction schedule float shall not be used exclusively by Contractor but shall be available to both the Owner and Contractor alike.

B. Any schedule showing completion of the Work prior to the contractual Substantial and/or Final Completion dates, nor the review of such schedule shall signify agreement and acceptance of early completion, nor shall it be a means on which to base delay claims.

C. The Contractor shall obtain input from all sub contractors when compiling and updating the schedules.

D. The schedule shall be prepared using Primavera, Microsoft Project or approved software.

1.4 CONSTRUCTION SCHEDULE FORMAT

A. Identify each work element with a task ID.

B. Prepare schedule as a horizontal bar chart with separate bar for each major portion of work or operation, identifying first workday of each week.

C. Sequence of Listings: The chronological order of the start of each item of work.

D. Show link to interdependent tasks as a dashed or phantom line

E. Critical path: Denote Work in red.

F. Scale and Spacing: To provide space for notations and revisions.

G. Sheet Size: 11 x 17 inches

1.5 CONSTRUCTION SCHEDULE CONTENT

A. Identify Notice to Proceed, intermediate Substantial Completion (See Section 01950, 3.15), Project Substantial Completion and Final Completion dates.

B. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

C. Identify the dates and duration when processes or major equipment are taken out of service.

D. The schedule will include submittal preparation, review, re-submittal, fabrication/assembly, delivery, installation, testing and startup for all major equipment.

E. Include equipment start-up and facility commissioning

F. Identify the Project Float, defined as the time between early completion and final (contractual) completion.

G. Identify interdependent work elements.

H. Provide sub-schedules to define critical portions of the entire schedule.

I. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the last day of each month.

1.6 REVISIONS TO CONSTRUCTION SCHEDULES

A. The construction schedule shall be updated for each progress meeting, but not more often than twice a month.

B. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

C. Identify activities modified since previous submittal, including any schedule slippage, revision to Project Float, major changes in scope, and other identifiable changes.

D. 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

1.7 SUBMITTALS

A. Submit initial schedule within 30 days of the Notice to Proceed.

B. Submit initial and all revisions to the submittals website

C. Bring color paper copies to Progress Meeting when requested.

1.8 LOOK-AHEAD SCHEDULES

A. Look-Ahead Schedules are informal short-term schedules used to present the work details in a two-week or an otherwise agreed upon period, to help facilitate construction coordination.

B. Look-ahead schedule will include shutdowns, inspections, start-up, and other key dates, equipment deliveries and critical path submittals. They do not include float, critical path work, interdependencies, or other details show on the construction schedule.

C. Present Look-ahead schedules to the RPR each week as a means of coordinating work activities and at each Progress Meeting.

D. Look-ahead schedule format can be excel, word or other informal means

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 – Quality Control of installation, tolerances, references, mockup, inspecting and testing laboratory services, and manufacturers' field services and reports.

B. Quality Control (QC) Plan, to ensure an acceptable level of quality for all products, materials, equipment, and the proper coordination, installation and start-up of the same.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.

B. Section 01600 – Materials, Products and Equipment: Requirements for material and product quality.

1.3 SUBMITTALS

A. Corporate Quality program, including training, certificates, or other personnel advancements.

B. Quality Control Plan for this project, including procedures to:
1. Review and coordinate submittals prior to posting
2. Field verify key measurements
3. Monitor the quality of subcontractor’s work
4. Scheduling, coordinating and monitoring all on-site testing
5. Means to identify, track and remedy non-satisfactory work

C. Submittals shall be reviewed, signed and posted by the QC Officer.

1.4 QUALITY ASSURANCE – QUALITY CONTROL OF INSTALLATION

A. The Contractor shall maintain quality through construction, including the monitoring quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Contractor to name a Quality Control Officer, responsible for all aspects of QC. The QC Officer shall be an on-site engineer with at least 20 years of related experience.

C. Contractor shall contract with subcontractors with specific expertise in the contracted areas of work. Subcontractors field personnel shall have expertise, training and certifications in the specific areas of their work. Master millwrights, plumbers, electricians are required for key installations.

D. The installation contractor(s) shall comply with manufacturers' instructions in each step of the installation sequence, including the use of any specific tools.

E. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

F. 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.

G. Perform work by persons qualified to produce workmanship of specified quality.

H. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.5 TOLERANCES

A. Pipe, tubing, conduit, supports, etc. shall be plumb vertically and horizontally. Unless identified elsewhere, out of plumb shall be no more than ¼" in 10 feet. Where multiple runs are installed, each pipe, tube, conduit shall be directly in-line and equally spacing to the other pipes, tubes or conduits.

B. Contractor to monitor tolerance control of installed products to produce uniform quality Work. Where non-uniform or out-of-plumb work is identified, work shall be corrected to the tolerance specified or the Owner's approval.

C. Where specifications are available, comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. 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 MOCK-UP

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups are representative of the quality required for the Work.

D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.8 TESTING SERVICES

A. The Contractor to hire and provide independent third-party testing services as necessary to comply with the specification herein. Testing shall include:
1. Soil material Compaction tests
2. Concrete material air, slump and compression tests
3. Pachometer or GPR tests (01045, 3.1 C.)
4. Anchor pull-out tests
5. H&V balance tests
6. Electrical tests
7. Non-destructive examination tests for bolting and welding.
8. Discontinuity (holiday) testing of concrete protective coating systems.
9. Other tests as identified herein.

Note: Pressure tests can be performed by the Contractor, and equipment start-up tests are identified elsewhere

B. The independent firm's qualifications shall be submitted for approved by the Engineer. The testing firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Engineer or the Owner.

C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Engineer, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Contractor to cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
1. Notify Engineer and independent firm 48 hours prior to expected time for testing services.
2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing or inspecting does not relieve Contractor of performing Work to contract requirements.

G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer.

1.9 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Engineer for information.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

A. The QC Officer shall:
1. Review all product data for application requirements
2. Monitor paint surface preparation and coat mil thickness
3. Observe and access aesthetics of masonry, tile and grout work
4. Monitor ambient and substrate temperatures and production application temperature requirements
5. Monitor bolt and anchor torque
6. Coordinate the same with the on-site RPR.

B. The QC Officer shall review all work and perform a preliminary punch-list inspection for all items that do not conform to the construction documents.

C. Perform at critical junctures in the work and prior to intermediate Substantial Completion items. Provide that list as a QC Report to the Engineer.

D. Monitor correction of any deficiencies. When corrected, notify the Engineer that the facility or area is ready for the Engineer’s inspection.

E. QC Officer may be requested to attend the final inspection along with the Engineer and Owner.

END OF SECTION

SECTION 01500

UTILITIES AND TEMPORARY 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, enclosures and fencing, protection of the Work, and ground and surface water control.

C. Construction Facilities: First Aid Facilities Access roads, parking, progress cleaning, project signage, existing utilities, structures and temporary buildings.

1.2 RELATED SECTIONS

A. Section 01700 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY AND LIGHTING

A. Owner to provide and pay for the reasonable use of electrical utilities.

B. The Contractor shall provide all necessary panels, disconnects, conduit, cables and equipment required for safe, temporary service. All circuits shall be insulated, weatherproof, equipped with an equipment grounding conductor. All enclosures and devices shall be weatherproof.

C. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain temporary lighting throughout the site and provide routine repairs.

1.4 TEMPORARY HEAT AND VENTILATION

A. The Contractor shall provide heat and ventilation as required to maintain specified conditions for construction operations and to protect materials and finishes from damage due to temperature or humidity. Temporary heat and ventilation is required during mechanical H&V installation when ventilation may not meet NFPA 820 requirements or if temperatures are below normal working conditions.

B. The Contractor shall provide ventilation of enclosed areas to ensure safe atmospheres for Construction, Owner, and Engineer's staff, as well as to cure materials; to disperse humidity; and to prevent accumulations of dust, fumes, vapors, or gases.

C. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts until Substantial Completion.

1.5 TEMPORARY WATER SERVICE

A. Process Effluent Water (PEW) is available for the Contractor's use in any quantity.

B. Potable water must be purchased and metered. Any temporary extension of the facilities shall be installed by the Contractor and removed at the completion of his work. The construction of the temporary facilities shall meet all state and local codes and shall include a meter with totalizer.

C. If potable water 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. Fire hydrants shall be pumped out and left dry after each use regardless of the season of the year.

1.6 TEMPORARY SANITARY FACILITIES

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

B. The use of Owner’s facilities is prohibited.

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 building and distribute the liquids directly from the containers. Storage of flammable liquids shall not be allowed inside of any municipal or county building or structure.

1.8 TEMPORARY BARRIERS

A. The Contractor shall provide barricades, and adequate warning flags, signs, and lights in accordance with governing laws and ordinances to protect construction areas, existing facilities, and adjacent properties.

B. Provide barricades and covered walkways required by governing authorities for public right-of-way and for public access to existing building.

C. Provide protection for plant life designated to remain. Replace damaged plant life.

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

1.9 TEMPORARY ENCLOSURES

A. The Contractor shall provide a construction plan layout showing the arrangement of temporary buildings, construction equipment, and storage and work areas. The plan must be approved by the Engineer prior to erection.

B. The Contractor shall provide temporary insulated weather tight closure of all exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks. All access openings shall be approved by the Engineer.

C. Provide temporary partitions and ceilings as indicated to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

D. Provide temporary protection of electrical gear to prevent dust intrusion from construction operations. Protection shall not overheat existing gear. (Engineer to review and approve protection measures.)

E. Repair any anchor penetrations following removal.

1.10 TEMPORARY ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

1.11 TEMPORARY PARKING

A. When necessary, provide temporary gravel surface parking areas to accommodate construction personnel. Return the area to pre-construction conditions or as identified herein or on the drawings.

B. When site space is not adequate, provide additional off-site parking.

C. Do not allow vehicle parking on existing pavement that may restrict WWTP traffic flow.

D. When necessary, designate two parking spaces for the Owner and RPR.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Completely remove underground installations where shown on the drawings. Abandon in place only where shown. Compact soil per Division 02 and grade site as indicated or to existing conditions.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

END OF SECTION

SECTION 01600

MATERIALS, PRODUCTS AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. This Work includes:
1. Transportation, storage, handling, and installation of all work.
2. Maintenance of stored and installed equipment.
3. Product options and substitutions for materials and equipment supplied and installed.
4. The type of materials required relative to their environment.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals.

B. Section 01400 - Quality Control

1.3 SUBMITTALS

A. Maintenance Log, updated monthly

1.4 GENERAL PROVISIONS

A. Materials, Products and Equipment (MP&E) (including all materials, machinery, equipment, components, hardware, anchors, couplings, and ancillary equipment or systems) shall be carefully designed, manufactured and installed to ensure that all required functions are adequately performed within specified degrees of precision, performance criteria are met, 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.

B. The Contractor shall recognize and acknowledge that the Contract Documents may represent a specific product make and model even though other makes and models may be specified or accepted as substitutes. Any changes or revisions of work made necessary by the type and dimensions of furnished MP&E shall be made at no cost to the Owner, and he shall furnish detail drawings showing such changes or revisions for the approval of the Engineer.

C. 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.

D. 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.

E. Items of any one type of materials or equipment shall be the product of a single manufacturer.

1.5 TRANSPORTATION AND HANDLING

A. No equipment, materials or other products shall be shipped without O&M Manuals, or approved storage, handling and/or maintenance requirements from the manufacturer.

B. The manufacturer shall 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.

C. Transport and handle MP&E in accordance with manufacturer's instructions. Transport and handle all MP&E in such a manner to avoid breakage, inclusion of foreign materials, and/or damage by water or other causes.

D. All equipment shipments shall be identified on the Maintenance Log. Notify the Engineer at least two days in advance of the delivery of equipment. The Engineer or RPR shall be notified of the time of delivery and shall be present. The Contractor shall inspect all equipment before off-loading.

E. Equipment cannot be shipped or accepted at the site prior to 2 weeks before installation. Equipment shall not be delivered unless it can be immediately incorporated into the work or proper storage facilities are available.

F. Deliver packaged materials in original unopened shipping containers. Packages or materials showing evidence of damage or contamination regardless of cause will be rejected. The Contractor shall promptly inspect apparently undamaged shipments to ensure that MP&E comply with requirements, quantities are correct, and MP&E are undamaged.

G. The Contractor shall repair or replace all items damaged or broken as a result of the Contractor's operation at no cost to the Owner.

H. When specified in individual sections, equipment shall be tested or made available for performance witness testing by the Engineer at the factory prior to shipment.

I. Provide equipment and personnel to handle, off-load and store MP&E to prevent damage.

1.6 STORAGE AND PROTECTION

A. When MP&E cannot be immediately incorporated into the Work, store, protect and maintain MP&E in accordance with manufacturers' instructions.

B. Store sensitive MP&E in weather tight, climate controlled enclosures. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

C. For exterior storage of MP&E, place on sloped supports, above ground. Cover all openings.

D. Cover MP&E subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product. Provide temporary heat where required.

E. Provide power to all motor heaters if stored outdoors or in unheated areas. Rotate all shafts periodically as required by the manufacturer.

F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

G. Arrange storage of MP&E to permit access for inspection and maintenance. Periodically inspect to verify MP&E are undamaged and are maintained in acceptable condition.

1.7 MAINTENANCE OF STORED AND INSTALLED EQUIPMENT

A. The Contractor shall remain responsible for the care and proper maintenance of all stored and installed equipment until the Work is accepted per Section 01650 and defined as Substantially Complete.

B. The Contractor shall submit a Maintenance Log 10 days prior to the first delivery and shall update and resubmit the Log prior to accepting delivery of all new equipment. Notify the Engineer at least two days in advance of the delivery of equipment. The log shall:
   1. Identify when the shipments are scheduled to arrive.
   2. Identify the manufacturer’s requirements including the time and/or frequency of the required maintenance. Note: This must be provided by the Mfr.
   3. Identify the date, time and initials for recording when the maintenance is performed.

C. No equipment, materials, or other MP&E shall be shipped without approved O&M Manuals, or approved storage, handling and/or maintenance requirements from the manufacturer.

D. The Contractor shall rotate, lubricate, heat, and otherwise maintain all equipment in accordance with the Maintenance Log until acceptance by Owner. The Contractor shall record in the log, the maintenance performed and by whom, immediately after performance.

E. The Engineer shall review the log from time to time and may reject partial payment if the maintenance is not being performed as required. The Engineer may also, from time to time, inspect the maintenance being performed.

F. The log shall be turned over to the Owner prior to Substantial Completion. The Owner will maintain equipment following Substantial Completion.

1.8 PRODUCT OPTIONS

A. Products specified by Reference Standards or by Description Only:
   1. Any Product meeting those standards or description may be submitted for review.

B. Products specified by naming one or more manufacturers with a provision for "or Equal" or “Approved Equal”:
   1. Substitutions are allowed

2. Submit a request for substitution for any manufacturer not named in accordance with the following article.

C. Products specified by naming one or more manufacturers with the provision "No Substitutions":
   1. Provide products of named manufacturers meeting specifications,
   2. No substitutions are allowed.

1.9 "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 required and shall not be construed in such a manner as to exclude MP&E of comparable quality, design, and efficiency.

B. Comparable MP&E shall be capable of performing equal function and shall be compatible with other equipment, materials, or systems to which they connect or will become an integral part of.

C. The clause "or approved equal" which may appear elsewhere in the documents shall mean the same as "or equal".

D. Wherever a MP&E is defined by specifying a proprietary product or manufacturer, the term "or equal" is not be implied.

E. Substitutions of "or equal" MP&E are subject to the approval of the Engineer.

1.10 SUBSTITUTIONS

A. Engineer will only consider Requests for Substitutions following the Bid, provided those substitutions are in accordance with the procurement documents. There is no guaranty that any listed substitution will be approved.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. Each request shall include the credit amount for the substitution. This amount must include any and all cost adjustments to the other trades as a result of this substitution.

D. A request constitutes a representation that the Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Will provide the same warranty for the Substitution as for the specified Product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Formally submit or post the Request For Substitution (RFS) for consideration. Limit each request to one proposed Substitution.
2. Contractor shall submit for each proposed substitution sufficient details, complete descriptive literature and performance data together with samples of the materials where feasible to enable the Engineer to determine if the proposed substitution is equal to that specified.
3. Contractor shall submit certified tests where applicable by an independent laboratory, acceptable to the Owner, attesting that the proposed substitution is equal.
4. A list of installations where the proposed substitution is used.
5. 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.
6. The Engineer will prepare a Work Change Directive, which will include the hours and cost to review the substitution request. A decision will then be made by the Owner, in review of the credit amount, and savings in O&M costs and the cost to review the substitution.
7. Where the approval of a substitution requires revision or redesign of any part of the work, all such revision and redesign and all new drawings and details required, therefore, shall be provided by the Contractor at his own cost and expense and shall be subject to the approval of the Engineer.
8. In all cases, the Engineer shall be sole judge as to whether a proposed substitution is to be approved. 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 approval of the Engineer.

PART 2 - PRODUCTS

2.1 ATMOSPHERIC AND NFPA 82 DESIGNATIONS

A. Atmospheres to establish the minimum material characteristics are designated as Chemically Corrosive, Heavily Corrosive, Moderately Corrosive and Neutral. Area designations relative to these atmospheres are shown on Sheet G-02

B. Atmospheres for fire protection shall following NFPA 820 Standards for Fire Protection in Wastewater Treatment and Collection Facilities, 2008 edition. Area designations relative to NFPA 820 are show on Sheet G-02

2.2 MATERIALS

A. Unless otherwise specified, materials for miscellaneous metals, anchors, hangers and supports, Unistrut, pipe/wall sleeves, hardware (nuts, bolts, washers), segmented compressible seals (rubber and hardware), shims/spacers/plates, etc., incorporated into the work are designated in accordance with the atmosphere, location and/or condition of service.

B. The materials shall apply to all trades and subcontractors

C. Table 1 identifies the minimum material type or products to be used for each atmospheric designation. Where more stringent materials are identified on the Drawings or Details Specifications, those materials shall be used.

TABLE 1: ATMOSPHERES, AREAS AND MATERIALS

Area Designation	Process/Building Areas	Materials
Chemically Corrosive (CC)	N/A	PVC, FRP, 316 SS and Titanium. Material selection must be compatible with the product.
Heavily Corrosive (HC)	Headworks Building, including Raw Influent Pump Station, Upper and Lower Alcove Area, Influent Flow Area, Within 18" Above Exterior Grit Chambers and Channels, and Flow Splitter Area, Retention Basin	316 (L) SS.
Moderately Corrosive (MC)		Galvanized carbon steel.
Neutral (N)	N/A	Painted/coated carbon steel (See Specification 09900)

D. STAINLESS STEEL
1. Provide 316 in all areas except wet wells and inside of tanks.
2. 304L and 316 L – Low Carbon stainless steel – shall be used for all welding applications. 304/316 shall be used for all other applications.
3. Stainless steel shall meet ASTM A240, A312, A403, A774, A778, and must be pickled. 316 (L) shall be used for all applications visible without combined space entry.
4. Stainless steel shall not be used directly with chlorine related compounds; titanium must be used instead.

E. Galvanized Steel
1. Galvanizing is specified in Section 05500.

F. PVC and FRP
1. PVC and FRP materials, seals and gaskets must be appropriate for the chemical/application.

G. Where different atmospheric conditions apply to the same material, the harsher environment controls the material type, e.g., a sleeve through a pipe gallery into a tank must be 316 SS.

H. Architectural and structural product materials may be specified elsewhere and take precedence over this specification.

2.3 NEMA RATINGS AND ELECTRICAL CONDUIT AND COMPONENTS

A. Provide NEMA rated panels and conduit materials as show on G-02.

B. Electrical components relative to NFPA atmospheric conditions, including intrinsically safe components for Class 1, Divisions 1 and 2 environments, are specified in Division 16.

PART 3 - EXECUTION

3.1 Contractor shall coordinate all materials with Subcontractors, Suppliers and Vendors at the time of the Bid.

END OF SECTION

SECTION 01650

EQUIPMENT START-UP, DEMONSTRATION AND FACILITY COMMISSIONING

PART 1 PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. This section includes all work necessary to start-up and accept equipment and commission facilities to achieve Substantial Completion.

B. Contractor shall perform Equipment Start-up, Equipment Demonstration and Facility Commissioning in a planned, logical and organized manner.

C. All I/O, discrete or analog shall be field verified, including all manual and automatic controls, warnings, alarms, sequences, status, etc. Field verification will be demonstrated locally and remotely, as well as SCADA controlled operation.

D. Manufacturer's Equipment Start-up includes:
1. Anchoring, tightening, adjusting, alignment, etc.
1. Calibration
2. Limit or level settings
3. Rotation, amp draw, voltage (phase-to-phase)
4. Completion of Manufacturer's pre-demonstration check list
5. Submit check list, field report and Certificate of Proper Installation (form provided by the Engineer)

E. Equipment Demonstration includes:
1. Approval of Demonstration Work Plan, including
   a. List of all I/O, discrete and analog
   b. Functionality Checklist
   c. Performance Data Sheet
2. Witness functionality and performance tests including all automatic controls and SCADA functionality by Owner or Engineer
3. Record and submit Baseline Operating Data

F. Facility Commissioning includes the following
1. Successful demonstration and acceptance of all equipment/components.
2. Factory and Site Acceptance Tests (FATs and SATs) of all equipment operating collectively
3. System Training

G. Substantial Completion includes the following:
1. Proper off-loading, storage and maintenance of equipment
2. Approval of all submittals
3. Successful Equipment Start-up and submittals
4. Successful Equipment Demonstration and submittal of base-line operating data
5. Training

6. Turning over Spare Parts and Special Tools
7. O&M Manual
8. Project documentation

H. The cost of all work herein shall be included as part of the Work.

1.2 RELATED REQUIREMENTS

A. Section 01300 – Submittals

B. Section 01310 – Construction Schedules

C. Section 01600 – Materials and Equipment

D. Section 01700 – Contract Closeout

E. Section 01730 – O&M Data

F. Section 01950 – Sequence of Construction & Special Project Requirements

G. Section 16980 – Demonstration and Testing

1.3 SUBMITTALS

A. Equipment Start-up Work Plans (Form provide by Engineer)

B. Equipment Demonstration Work Plan (Form provide by Engineer)

C. Updated Maintenance Log (Form provide by Engineer

D. Certificate of Proper Installation and Start-up (Form provide by Engineer)

E. Equipment Start-up Report

F. Baseline operating data

G. Laser Alignment Report (when required)

H. Certificate of Proper Equipment Site Acceptance Tests (Form provide by Engineer)

I. Training package

J. Signed Training Roster sheet following training.

K. Revisions to O&M Manual (where required) following training.

L. Spare Parts list for all parts and consumables specified for the Work.

M. Video recordings of training sessions

1.4 QUALITY ASSURANCE

A. A highly qualified Start-up Technician is required to verify proper installations, perform pre-demonstration activities, place the equipment in operation, demonstrate full functionality and train Owner personnel in all O&M procedures. The Start-up Technician shall have at least 10 years related equipment experience, and 5 years specific startup experience with the make and model of the installed equipment.

B. Training materials and instructions shall be prepared and provided by the same Technician. Training materials and instructions shall be specific to the equipment and/or system installed under this Contract.

1.5 SCHEDULING

A. Identify Equipment Start-up, Demonstration Facility Commissioning and training in the Construction Schedule. Adjust as the time approaches and include on Look-Ahead Schedules.

B. The Engineer and Owner shall be notified ten working days in advance of Demonstration, Commissioning and Training.

C. Classroom and field training programs shall be conducted after satisfactory completion of Demonstration and prior to Substantial Completion.

1.6 MANUFACTURER'S EQUIPMENT START-UP

A. The purposes of these activities are to assure that the equipment is properly installed, functions properly and is capable of executing all the necessary operations and performance during Equipment Demonstration

B. Manufacturer's Equipment Start-up is generally not witnessed by the Owner / Engineer.

C. The Start-up Technician shall verify:
   1. That the equipment shipped and installed is the same as the equipment approved
   2. Proper installation which can include:
      a. Connections and pump nozzle strain
      b. Leveling, alignment and alignment report
      c. Anchors, supports and grout,
      d. Grease and lubrication
      e. warning / alarm calibration and settings
      f. rotation, voltage, grounding, etc.

D. Contractor shall notify the Engineer when any activities required to setup or calibrate newly installed equipment are outside the Contractor's direct control.

E. Where additional third-party tests are required (i.e., vibration, grounding, megger, etc.) the tests shall be performed at this time by approved specialists hired by the Contractor. [Note these test does not need to be repeated during Equipment Demonstration, provided the report is submitted and data are satisfactory.] If data are out of the specified tolerance, the Contractor shall realign/re-install or otherwise correct ths flows and repeat the tests prior to Equipment Demonstration.

F. Once complete, submit a *Certification of Proper Installation*, Equipment Start-up Field Report, baseline operating conditions and laser alignment report for rotating equipment.

1.7 EQUIPMENT DEMONSTRATION WORK PLAN

A. The Contractor shall submit an Equipment Demonstration Form 10 working days prior to equipment startup. (The Engineer will provide the form.)

B. The Equipment Demonstration Plan shall list the tests necessary to verify that the equipment and any ancillary or system components are fully functional and meets any specified performance standards. Such tests and/or data collection shall include but may not be limited to the following:
   1. Local Functionality
      a. On/Off, Open/Close, Reversing, etc.
      b. Local lights.
      c. Speed/Position Indication/Control.
   2. Local Interlocks and Alarms Functionality
      a. E-stop buttons, cables, and other safety devices.
      b. High/low position, pressure, temperature, etc.
   3. Remote Control and SCADA Indication Functionality
      a. Full automatic operation
      b. Verification of operation, performance, alarms, etc., on remote panel and SCADA terminal.
      c. All I/O shall be listed and verified.
   4. Performance data, such as:
      a. Flow, pressure, and/or through-put at duty point condition
      b. Similar performance at alternate speeds, positions, etc.
      c. Vibration, temperature and/or noise levels
      d. Electrical performance such as amp draw, voltage, ground resistance and power factor, or efficiencies.
      e. Cycle tests, internal calibration or diagnostics check.
      f. Any other tests necessary to verify compliance with the specifications

C. Functionality Checklist
   1. Submit list of equipment I/O, discrete and analog
   2. Complete Functionality Checklist

D. Performance Data Form
   1. Coordinate with Engineer on Performance Data Form to be used during Demonstration
   2. The form shall also include but is not limited to:
      a. Time of startup and completion of tests
      b. Participants
      c. Weather, temperature data
      d. Major test apparatus information

E. The Contractor shall verify in the Equipment Demonstration Form that all required submittals have been submitted and approved.

F. The Contractor shall confirm that tests for any ancillary equipment are complete and accepted prior to demonstration. Tests for ancillary equipment can include flow meter calibration, level device calibration, pressure tests for pipe, leak tests for storage tanks, compressed air system, water supply bacterial tests, MCCs and electrical gear tests such and megger and ground, etc.

1.8 EQUIPMENT DEMONSTRATION

A. Equipment Demonstration will begin following receipt of Manufacturer's Start-up report and certification.

B. The Start-up Technician shall conduct a preliminary meeting to discuss the demonstration tests, identifying data to be recorded and by whom, the role of any other technicians for ancillary equipment or confirmation of remote SCADA functionality, and a discussion of field calibration performed prior to the start-up tests.

C. The Contractor and/or Start-up Technician shall perform in the presence of the Engineer, those performance and/or functionality tests identified in the Demonstration Work Plan or any other tests required to verify system/equipment performance.

D. All data taken during Equipment Demonstration shall be verified by the Engineer and recorded by the Start-Up Technician on the Functionality Checklist and Performance Data form.

E. When testing is complete, the forms shall be initialed by the Engineer and signed by the Start-up Technician and copies provided to the Owner and Engineer before the Technician leaves the site.

F. Contractor shall be available to promptly repair or replace all defective and/or damaged work or equipment during the start-up period so as to minimize disruption to the total facility operation.

G. In the event a system, equipment, or component proves defective or is unable to meet the specified performance criteria, the Contractor shall replace the defective item and the demonstration will restart.

H. Following successful completion of Equipment Demonstration, the equipment shall run successfully in full automatic mode for a period of 30 days for final acceptance.

1.9 FACILITY COMMISSIONING

A. When the Work requires that multiple pieces of equipment operate in unison or collectively in a process area or facility, Facility Commissioning is required. The Contractor shall submit a Facility Commissioning Work Plan 10 working days prior to startup (The Engineer will provide the Facility Commissioning form).

B. Equipment demonstrations must occur prior to Facility Commissioning.

C. The Facility Commissioning Work Plan shall list the tests necessary to verify that the Facility is fully functional and meets the full intent of the plans and specifications. Facility Commissioning shall demonstrate that all equipment in the facility are functioning alternately,

collectively and/or in unison, processing the water, wastewater or solids as intended including alarms, interlocks, automatic control, sequencing, shut down, etc. Such tests shall include but may not be limited to the following:

1. All modes of remote equipment operation including SCADA and automatic.
2. I/O, alarms and interlocks to a main control panel and remote SCADA terminals.
3. Startup and shutdown sequences.
4. System Interlocks.
5. Safety provisions (such as pressure relief, chemical exposure, etc.).
6. Any other tests necessary to verify compliance with the specifications.

D. Wherever possible, a dry-run or off-line operation shall be employed prior to putting the facility on-line. A dry-run is considered to be the use of generated signals (such as 4-20mA level, pressure, flow, etc.) to determine proper operation. Off-line operation is when SFE or alternate flows are used in lieu of the actual wastewater or sludge flow.

E. A dry-run plan shall be developed and implemented jointly between the Engineer and the Contractor (more specifically, the Instrumentation supplier). When completed to the satisfaction of the Engineer, the facility can be placed on-line for live demonstration.

F. Following successful completion of Facility commissioning, the Facility shall run successfully in full automatic mode for a period of 30 days for final acceptance

1.10 TURNOVER OF SPARE PARTS AND SPECIAL TOOLS

A. Spare Parts
1. As soon as practical following Equipment Demonstration, the Contractor shall turn over all required spare parts, supplies and consumables specified in the Contract Documents. The Contractor shall also provide a list of additional items recommended by the manufacturer to assure efficient operation for a period of 1 year at the particular installation.
2. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee provisions of these Specifications.

B. Special Tools
1. As soon as practical following start-up, the Contractor shall turn over one complete set of suitably marked special tools and appliances specified in the Contract Documents which may be needed to adjust, operate, maintain, or repair the equipment.

C. Keys
1. The Contractor shall deliver four keys for each lockset and padlock installed under this Contract.
2. The keys shall be tagged with locations, room numbers, and key numbers.

D. Delivery
1. The Contractor, or Subcontractor, shall turn over all spare parts, special tools and keys to the Owner at one time in the original shipping container unopened.
2. The approved Spare Parts list shall be used to document all items being turned over to the Owner. The Contractor and Owner shall open the shipping container and inventory each spare part and tool and mark the list as received.

3. The Contractor and Owner shall initial and date the list documenting that the spare parts, tools and keys were submitted and turned over to the Owner. Copies shall be provided to the Owner and Engineer.

1.11 TRAINING – GENERAL

A. The Contractor shall provide training for all equipment where specified in Divisions 11 through 16. Training shall be a minimum of 6 hours - 2 hours for each of 3 shifts - for each equipment specification section unless otherwise noted. Training time does not include the time required for system startup/demonstration.

B. Classroom and field training programs shall be conducted for each shift, after Start-up/Demonstration but prior to Substantial Completion.

C. The Contractor shall submit resumes of the Manufacturer's representatives who will conduct the tests and training. Where additional testing consultants are required, such as vibration testing, or noise specialists, VFD technicians, etc. resumes for those representatives shall also be provided.

D. Prepare and submit a Training Package 10 days prior to training.

E. The Agenda shall include topics with durations for each topic, classroom, and field training, training materials/O&M manual, and hands-on training of all individuals requiring training.

F. Incorporate the following maintenance and operation data and training services into the training program.
   1. Shop Drawings
   2. Equipment Operation and Maintenance Manuals.
      a. Troubleshooting guides.
      b. Preventive maintenance schedule.
      c. Lubrication schedule.
      d. Loop diagrams.
      e. Control logic calibration sheets.

G. All training materials and presentations must match the O&M manual. Occasionally, the training session(s) uncover discrepancies between the O&M Manual and the installed equipment. When this occurs, the Contractor shall resubmit corrected O&M documents.

H. Where additional training is required at a later date, Contractor shall schedule a tentative future training session with the Owner.

I. The Contractor shall provide a video tape of the Training Sessions. The video shall be performed by a Subcontractor specializing in this service.

1.12 ACCEPTANCE OF EQUIPMENT AND SUBSTANTIAL COMPLETION

A. When equipment is identified for Substantial Completion, that equipment will be Substantially Complete following the successful completion of:

   1. Pre-Demonstration Procedures and Activities

2. Start-up/Demonstration
3. Spare parts turnover
4. O&M submittals
5. Training
6. Minimum run-time for equipment acceptance

B. The Contractor is required to submit the Substantial Completion form for signatures.

C. All documentation provided as a result of start-up shall be incorporated into the final O&M Manuals by the manufacturer's representative.

D. Equipment, process areas or work that will be accepted for Substantial Completion are listed in Section 01950.

1.13 FACILITY COMMISSIONING SUBSTANTIAL COMPLETION

A. Equipment is not identified for Substantial Completion and where a Facility, System or Phase of the work is identified for Substantial Completion, that facility, system or phase and all equipment therein will be Substantially Complete following the successful completion of:
1. Demonstration of all equipment (including spare parts turnover, training and final O&M Manual)
2. Minimum run-time for equipment acceptance
3. Facility Commission
4. Facility or system training
5. Minimum Facility run-time

B. All documentation provided as a result of start-up shall be incorporated into the final O&M Manuals by the manufacturer's representative.
1. Substantial Completion for facilities, systems or phases of the work is listed in Section 01950.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the necessary work and submittals necessary to close out the project.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01650 – Equipment/Facilities Start-up and Commissioning

C. Section 01730 - Operation and Maintenance Data

1.3 SUBMITTALS

A. Electronic file transfer of all project documents posted to the submittal's website. Files must be transferred before the website is discontinued

B. Record Drawing Sets, from General Contractor, and Mechanical Electrical and Systems House Subcontractors

C. Final Change Order

D. Final Application for Payment

E. Contractual Statements including:
   1. Waiver of Lien
   2. Contractor's Affidavit
   3. Contractor's Declaration
   4. Release of Surety.

F. Manufacturers' Extended Warranties, Material and Guaranty Bond (if required).

G. Copy of Occupancy Permit and any other permits from local governing authority (if required).

H. Start-Up and Commissioning Documents

I. Final O&M Manuals

J. Construction Photographs and Video(s) where specified.

1.4 CLOSEOUT PROCEDURES

A. Submit statement certifying that all submittals have been “Accepted” and Contractor requirements are “None”.

B. 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.

C. Perform satisfactory completion of Punch List.

D. Submit final Application for Payment identifying Total Adjusted Contract Sum, previous payments, and sum remaining due.

E. Provide satisfactory evidence that all claims have been settled.

1.5 FINAL CLEANING

A. Complete final cleaning and restoration prior to final project inspection.

B. Remove all temporary labels, stains, and foreign substances. Wash or clean by approved methods all surfaces on which dust and dirt has collected.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean debris from drainage systems.

E. Clean site, sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, rubbish, and construction facilities from the site.

G. Restore disturbed area. Lawn area may be seeded unless otherwise noted. Paved area shall be restored to their original condition, compatible with the surrounding area, using like materials and workmanship.

H. Touchup painted surface. Clean and repaint with matching color all scratched, marred, or otherwise damaged painted surfaces of all equipment and enclosures.

1.6 ADJUSTING

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

1.7 PROJECT RECORD DOCUMENTS

A. Maintain As-Built set on site, with regular red-line markups by the General Contractor and Mechanical, Electrical and I&C Subcontractors. Note As-Builts are drawings produced by the Contractor, and Record Drawings are produced by the Engineer.

B. As the work progresses, keep a complete and accurate record of all changes in the Contract Documents indicating the work as actually installed. All changes shall be neatly shown on prints of the drawings affected which shall be kept at the job site for inspection by the Owner and the Engineer.

C. Record the location of existing buried utilities uncovered during the course of construction. Measure the location of the utilities from permanent structures or surface features

D. Ensure entries are complete and accurate, enabling future reference by Owner. Record information concurrent with construction progress. Engineer to review progress monthly prior to approval of Pay application.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of other floors, slabs, platforms, and 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, conduits, and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension, detail, and placement.
   5. Details not on original Contract drawings.
   6. Conduit and wiring information changed, or not shown on drawings including home runs.

F. On completion of the work, prior to the Contractor's application for final payment, the Contractor shall scan and transfer the As-Built drawings and transfer them to the Engineer. The Engineer shall review these Drawings for completeness and accuracy and may require re-submittals.

G. Written approval or other evidence satisfactory to the Engineer of the final conditions of the work shall be obtained from all public authorities or agencies having jurisdiction over any portion of the work.

H. All public authorities or agencies having jurisdiction over any part of the work shall be determined, and all the requirements of these authorities or agencies with respect to but not limited to inspection, permits, fees, approval, and the like regardless of whether they are listed above or not shall be met.

I. Submit all documents to Engineer for approval prior to submittal of final Application for Payment.

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.

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

1.9 SUBSTANTIAL COMPLETION

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

B. Substantial Completion is covered under Section 01650-Equipment Start-Up and Commissioning.

1.10 WARRANTIES

A. Assemble and provide all extended warranties (more than the project warranty period) all from subcontractors, suppliers, and manufacturers, dated to the date of Substantial Completion(s). Insert warranty documents into the Warranty tab Section of the O&M Manuals.

B. Submit warranty documents prior to final Application for Payment.

C. 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. Work so repaired or remedied will receive the same warranty period, starting at the date of the accepted re-work.

D. Any service material or equipment required because of the defect shall be supplied without charge.

E. All work specified to be designed by the Contractor shall be guaranteed to perform as specified.

F. The general Warranty period is stipulated in ITB General Conditions, starting at the date of Substantial Completion unless:
   1. A greater period is specified elsewhere.
   2. Owner chooses to take over and use a portion of the Work as provided for in the Specifications; in which case the warranty shall be from agreed upon takeover and date of use.

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

1.11 FINAL PAYMENT

A. 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 approval and acceptance of the completed work herein specified.

B. 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.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01700

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Format and content of manuals.

B. Instruction of Owner's personnel.

C. Submittals.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01400 - Quality Control

C. Section 01600 – Material, Products and Equipment

D. Section 01650 – Equipment/Facilities Start-up and Commissioning

E. Section 01700 - Contract Closeout

F. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 QUALITY ASSURANCE

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

B. Annotate all figures, arrangements, tables, charts, parts list, etc. specific to this application and the supplied equipment. Delete all superfluous information.

1.4 FORMAT

A. Prepare information, data and drawings in the form of an instructional manual.

B. Prepare in PDF format until finalized, then prepare in paper binder format. Print in color, text double sided, 11”x17” drawings single sided.

C. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 3-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings. Fill binders to no more than 75% capacity.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; Owner, Operator, General Contractor and Engineer names, addresses and logos.

E. Print Project, Owner, and logo on the spine.

F. Provide tabbed indexes for each separate product and system, with typed description of product and system.

G. Text: Manufacturer's printed data on 20-pound paper.

H. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold 11" x 17" drawings to fit.

I. Arrange content by process flow under section numbers and sequence of Table of Contents of this Project Manual.

1.5 CONTENTS, GENERAL FOR EACH VOLUME

A. Table of Contents: Provide title of Projects and the names, addresses, and telephone numbers of Engineer, Subconsultants, and Contractor in the heading. Next, provide a schedule of products and systems, indexed to content of the volume.

B. Tabs: Add additional tabs for Warranty, Preventive Maintenance and Start-up and Commissioning documentation

C. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

D. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information. Identify specific model numbers, size, etc.

E. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

F. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

G. A CMMS Data Entry Form is to be completed and submitted with the manuals. Form to be provided by the Engineer.

1.6 MANUFACTURERS MANUALS FOR EQUIPMENT AND SYSTEMS

A. Provide serial number, order number or the specific ID of which the manufacturer can retrieve design files.

B. Each Item of Equipment and Each System: Include description of unit or system, and component parts with diagrams, charts, capabilities, etc. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data

and tests, complete nomenclature and model number of replaceable parts, and catalog data or literature with correct model number of equipment noted where literature covers more than one model.

C. Provide general and product specific design data

D. Provide manufacturer's detailed parts list and parts drawing, illustrations, assembly/disassembly drawings and instructions, and diagrams required for maintenance. Provide a cross reference to all individual component manuals for all parts lists and illustrations provide correct parts numbers. All bearing numbers shall be listed

E. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications, either typed or by label machine.

F. Include color coded wiring diagrams as installed.

G. Shipping, storage maintenance and handling: Include all necessary off-loading requirements, and all necessary rotation, lubrication, heating, or other provisions required during storage.

H. Include manufacturer's installation instructions including sequence, alignment, tolerances, torque settings, etc.

I. Operating Procedures, include:
   1. Start-up, break-in, and routine normal operating instructions and sequences, including:
      a. Manual Operation
      b. Automatic Operation
   2. Regulation, control, stopping, shut-down, and emergency instructions.
   3. Trouble shooting for equipment and ancillary components
   4. Summer, winter, and any special operating instructions.

J. Provide controls diagram and sequence of operation by controls manufacturer.

K. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions and drawings; and alignment, adjusting, balancing, calibration and checking instructions.

L. Provide preventive maintenance recommendations servicing and lubrication schedule, and list of lubricants required in the Preventive Maintenance tab. Provide Contractor's coordination drawings, with color coded piping diagrams as installed for equipment systems.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams for each equipment system.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage and how to obtain them.

O. Additional Requirements: As specified in individual Product specification sections.

P. Preventive Maintenance Tab, provide:
   1. PMs for all equipment, gear reducers, motors, and ancillary equipment, described throughout the O&M Manual.
   2. Reference to the page in the O&M Manual.

Q. Start-up Tab Commissioning tab: Following Start-up include into PDF and printed O&M Manuals:
   1. Start-up documentation specified in Section 01650.
   2. Functional and performance tests
   3. Equipment baseline data
   4. Any independent test agency tests and/or balancing reports as specified in Section 01400 and Divisions 11 through 16.

R. Warranties Tab: Following acceptance, include in PDF and Printed O&M Manuals warranty dated for Substantial Completion, or Owner agreed upon date.

1.7 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons.

C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

E. Refer to individual equipment specification section for instruction and training requirements.

1.8 SUBMITTALS

A. Submit Draft PDF prior to shipment for review.

B. Submit Checklist and CMMS Data Entry Sheet provided by Engineer

C. Submit Approved PDF and printed Manuals prior to equipment start-up. Approved copies will be used during training. Provide 3 printed manuals, or as required by Owner.

D. Following Training, Startup, Commissioning and Substantial Completion, Revise content of all document sets where required following training and insert Warranties and Start-Up Documentation into printed binders and PDF and repost to submittals website.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF TEXT

O&M MANUAL CHECKLIST

Note to Contractor: This form must be submitted with all O&M manuals.

_____ _____
Equipment Name Specification Number

I, _____ do hereby certify that the O&M Manual for the referenced equipment:
(Print / Type Name) _____
meets requirements and specification for 01730 as noted below:

	yes	no		yes	no
Format					
Table of Contents:	□	□	Annotated Format:	□	□
Provide 3-Ring Binder:	□	□	Tabs:	□	□
Cover/Spine					
Equip. Title:	□	□	Owner:	□	□
Project Title:	□	□	Contractor:	□	□
Date:	□	□	Engineer:	□	□
			Representative:	□	□
			Manufacturer:	□	□
General					
Design Data:	□	□	Expanded Views:	□	□
Spare Parts List:	□	□	Complete Parts List:	□	□
Equip. Drawings:	□	□			
Operations:					
Handling & Storage:	□	□	Start-Up:	□	□
Installation Procedures:	□	□	Trouble Shooting:	□	□
Maintenance					
Maintenance Procedures:	□	□	Preventive Maint. Req.:	□	□
Lubrication Specs.:	□	□	Preventive Maint. Sched.:	□	□
Electrical					
Motor Data:	□	□	Control Wiring Diagram:	□	□
Wiring Diagrams:	□	□			
Test / Field Reports					
Balance Report:	□	□	Noise (dB) Readings:	□	□
Certif. of Installation:	□	□	Pressure Tests:	□	□
Miscellaneous					
Extended Warrantee:	□	□	MSDS Sheets:	□	□

Comments:_____

_____

_____ _____
Signature Date

SECTION 01950

SEQUENCE OF CONSTRUCTION AND SPECIAL PROJECT REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. The Wastewater Treatment Plant (WWTP) treats sewage 24 hours a day / 7 days a week and must remain in-service throughout construction. Wet weather (rain or snowmelt) can cause significant increases to wastewater flow, necessitating additional equipment to be in service and City staff to be unavailable during these events. As a result, some process construction areas may be vacated, and/or start-up and/or training activities may be curtailed or postponed in the event or anticipation of a wet weather event. This is deemed normal for WWTP construction, and no additional compensation will be made for these occurrences.

B. The Contractor shall schedule and arrange his work so that each treatment and process area will remain in service, without interruption, unless stipulated herein, throughout construction. It is also imperative that access to all areas and equipment are continually provided unless otherwise stipulated herein, for the Owner to provide routine and emergency operations and maintenance.

C. The Construction Schedule shall be developed to include the sequencing description presented herein and updated monthly for each construction progress meeting. Alternate sequencing can be proposed, subject to the Owner’s and Engineer’s acceptance.

D. The Contractor shall be 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.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01310 – Construction Schedule

C. Section 01650 – Equipment Start-Up and Facility Commissioning

D. Section 02050 – Demolition

1.3 SUBMITTALS

A. System Integration Plan

B. Sequencing including shutdowns shall be clearly delineated on the 01310 Construction Schedule Submittals.

C. Shut Down Notices for all shutdowns. (Owner / Engineer to provide a form upon request.)

D. Detailed plan to keep critical loads powered during all Work at the associated Motor Control Centers (MCCs), as shown on the Drawings.

1.4 COORDINATION

A. The provisions contained herein, particularly the Sequence of Construction, shall be coordinated, and incorporated into the Construction Schedule.

B. The Owner shall be notified at least 7 days in advance of any planned pump, tank, equipment, or electrical shutdowns, switchovers, or lockouts. All shut-downs will be granted at the discretion of the Owner.

C. Other contractors are currently and will be on-site during the construction of this work. The bidding Contractor must cooperate with these other contractors. When necessary, the Contractor shall identify any cooperation activities with the Engineer or Owner.

1.5 SCHEDULE OF PRICING/COST IN SECTION III OF PROCUREMENT NOTES

A. Mobilization shall not exceed five (5) percent of the Total Amount of Bid, and shall include all demobilizations and remobilizations required, including those due to seasonal suspensions of the Work, or those due to the Contractor's preferred staging and sequencing of the Work. Payment for mobilization will be based upon the following partial payment schedule:

Percentage of Original Contract Amount Earned	Percentage of Bid Price for Mobilization Allowed
5	50%
10*	75%*
25	100%

*Contingent on the installation of the guards at Screw Pump Nos. 4 and 5 Work being complete.

B. Unit Price Bid Item "Contractor Overhead, Mobilization, General Conditions and All Other Work" shall include all remaining work not previously specified by a unit price bid line item required to complete the Contract.

C. The Owner will select a screw pump manufacturer and a single item from Bid Item #1 and Bid Item #2 following the bid opening. The Bidder is required to provide bids from all three (3) screw pump manufacturers.

1.6 EQUIPMENT OPERATION AND MAINTENANCE

A. Existing facilities and equipment which are required to be in service during their modification will be operated and maintained by the Owner.

B. New facilities and equipment which are required to be in service before they are completed and/or accepted by the Owner, will be operated and maintained by the Contractor.

C. Operation of new or modified facilities by the Owner before these facilities are completed, tested, and accepted does not imply acceptance of these facilities by the Owner.

D. New or modified facilities and equipment which have been accepted by the Owner as Substantially Complete, will be operated and maintained by the Owner as of the date of Substantial Completion.

1.7 TEMPORARY FACILITIES

A. Any and all temporary structures, pumping, piping, electrical / instrumentation and control, or other construction required to maintain wastewater treatment in the existing facilities and to operate new facilities prior to completion of construction shall be furnished and installed by the Contractor.

B. Temporary equipment and/or facilities, such as pumps, piping, flumes, valves and gates, electrical generators, etc. required for any wastewater treatment and/or conveyance will be sized, installed, operated, maintained, and removed by the Contractor.

C. The Contractor shall provide required instructions for the operation of temporary facilities in writing to the Engineer. Temporary equipment utilized in the wastewater treatment process shall be operated 24 hours per day, if required to maintain the wastewater treatment process.

D. The Contractor shall include in his bid and bear all expenses incurred, including temporary pumping and piping required to maintain wastewater treatment if such action becomes necessary during construction of new facilities.

1.8 SPECIAL PROJECT REQUIREMENTS

A. The Contractor shall note that more than one screw pump manufacturer is specified. One manufacturer will be selected following the Bid opening.
   1. Contractor shall include all costs in the Bid price required to supply and install the selected screw pump system into the existing structure and arrangement.

B. Site Access
   1. The Contractor shall comply with any daily personnel sign-in or orientation training requests by the Owner. The Contractor's site Supervisor or Superintendent is required to sign in each day at the Administration Building.
   2. Note this Water Resources Recovery Facility (WRRF) is a fenced in secure site only accessible by an electric motorized gate with call box.
   3. Trailers, material laydown and other work logistics shall be confined to the staging area shown on the Drawings. The actual trailer siting and utility hookups shall be coordinated with the Owner following the pre-construction meeting.
   4. All personal vehicles on site shall be limited in number. Construction vehicular traffic shall be confined to superintendents and/or foreman in company vehicles. All construction vehicles shall always have company logos and shall park in areas not effecting Owner vehicles or traffic. Parking along the rain gardens east of the Retention Building is not allowed as this lane is a fire lane. Additional parking may be made available on site if necessary upon request from the Contractor and acceptance by the Owner.

5. Plant traffic speed limits must be adhered to by all project personnel including deliveries.
6. The Contractor must inform suppliers and install temporary signage that all deliveries must be made to the Contractor's trailers and not to the Owner. The Owner will not be responsible for lost deliveries.
7. Owner's working hours are 7:00 am to 5:00 pm Monday through Friday. Staff will not be available after normal working hours nor weekends or holidays.

C. Material Testing
1. All concrete testing to be performed by a third-party testing company specializing in these services shall be included in the Bid price.
2. The Contractor shall arrange to have all concrete quality control including concrete compression tests and any ASR tests for aggregate performed. The material testing firm shall be approved by the Engineer.
3. Concrete cylinder tests shall be as specified in Section 03310.
4. Copies of test reports shall be promptly posted and furnished to the on-site Engineer and Owner.
5. Contractor to expressly identify non-conforming test results to the Owner / Engineer. Further work cannot proceed until the non-conforming test results are remedied.

D. Maintain Road Traffic
1. The road must remain open for Owner operations and sludge hauling traffic.
2. The Contractor shall accommodate all reasonable requests for the on-going sludge hauling contractor.

1.9 UTILITIES

A. The WRRF has potable water, Industrial Water (IW), Process Effluent Water (PEW), hot water/steam (exposed and buried), natural gas, electrical power, alarms and controls and chemicals. These utilities need to remain in service at all times unless identified herein and only with the approval of a Shut Down Notice.

1.10 USE OF THE OWNER'S OVERHEAD A-FRAME, MONORAIL OR CHAIN FALLS

A. The Contractor is permitted the use of the Owner's overhead crane in the Raw Sewage Lift Station and Retention Building for the removal of demolished equipment provided the following are satisfied:
1. The crane and all ancillary equipment are inspected with the Owner prior to use, and an Intent of Operations Plan is agreed upon between the Contractor and the Owner. This Plan shall detail what work the overhead crane will be used for.
2. The Contractor provides certification and liability insurance of the Crane Operator that he/she is proficient in the use of that particular crane.
3. The Operator shall demonstrate to the Owner that he/she is adequately trained in the operation of the crane.
4. Before completion of the work, the Contractor and Owner shall re-inspect the crane and ancillary facilities to determine that the crane is unharmed. Any damage to the overhead crane due to Contractor negligence shall be repaired by the Contractor, and repair costs incurred by the Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Demolition of key operational equipment cannot begin until replacement equipment is on-site, unless otherwise coordinated and agreed to by the Owner / Engineer.

B. All permanently installed materials and equipment including those installed for the purposes of construction sequencing, shall be in accordance with the applicable sections of these Specifications.

C. Temporary materials and equipment including demolished materials shall be selected by the Contractor and shall conform to the intent of this Section.

PART 3 – EXECUTION (SEQUENCE OF CONSTRUCTION)

3.1 GENERAL

A. Procedures and constraints set forth herein establish guidelines to construct the Work. This sequence shall not be construed as mandatory, nor shall the Contractor rely on it solely for the basis of determining sequencing as required to accomplish all of the Work as shown on the Drawings or described in the specifications.

B. The Contractor may use procedures other than those set forth herein with prior coordination and acceptance of the Owner/Engineer. Acceptance shall be only for compliance with the intent of maintaining full operation of the wastewater treatment facilities.

C. Any variance to the sequencing presented herein does not relieve the Contractor from any costs to provide and maintain any or all temporary facilities and equipment that may be required to maintain plant operation during the construction period.

D. The Contractor is responsible for the Schedule, Demolition, Staging, Sequencing, etc., required to complete the work in the time specified. Demolition meetings to discuss sequencing and demolition will be held prior to construction.

E. Contractor shall submit a written work plan that provides the overall proposed sequencing of construction and anticipated shutdowns for Owner review at preconstruction meeting.

F. Shutdown notices are required for each area of the Work requiring a utility, equipment, or process shutdown. No shutdown or demolition can begin until the replacement equipment, piping, valves, control panels, ancillary equipment etc. are stored or on-site unless otherwise coordinated and agreed upon by the Owner / Engineer. The Contractor shall schedule and sequence any shutdowns to minimize the shutdown period. Lock out / tag out measures shall be coordinated with the Owner.

3.2 CONDITIONS DURING SEQUENCING

A. Plant Flow.

1. As a means to provide Contractors with approximate historical flow rates to help gauge operations, the following is offered.

   Dry Weather Low Flow..... 14-16 MGD
   Dry Weather Average Flow ..... 18-22 MGD
   'Typical' Wet Weather Flow..... 25-35 MGD
   Peak Wet Weather Flow..... 60 MGD

2. Actual flow data will be provided to the selected Contractor if required for further assessment.
3. The City's goal is to replace all pumps at the Raw Sewage Lift Station (Nos. 1, 2 and 3) when flows are lowest during the University of Michigan's summer break (generally late May through August.)
4. Flows to the Retention Basin typically only occur during wet weather events; therefore, pump replacement at this facility is a lower priority than the Raw Sewage Lift Station. The Contractor will be required to monitor the potential for wet weather events and work with the Owner to control wet weather flows during active construction.

3.3 INSTALLATION OF GUARDS AT SCREW PUMP NOS. 4 AND 5.

A. The Owner has purchased new guards from Spaans Babcock, including the epoxy anchors, for the existing Screw Pump Nos. 4 and 5 at the Raw Sewage Lift Station (RSLS). The City desires these guards to be installed as soon as possible. These guards shall be installed at the beginning of the project prior to all other physical construction commencing.

3.4 SLUICE GATE REPLACEMENT/REHABILITATION

A. General

1. The Owner has a defined budget for the project and therefore the Project, as awarded, may not include replacement and/or rehabilitation of all sluice gates shown included in the Bid. The Owner will also select the desired screw pump manufacturer and determine if the existing screw pump gear reducers and motors will be replaced for Screw Pump Nos. 1, 2, and 3 at the Raw Sewage Lift Station. The Owner will make these determinations during the Bid Evaluation phase and include the final scope of work in the "Issued for Construction" Project Documents.
2. Therefore, the actual sequence of construction shall be reviewed and modified as necessary by the Contractor to accommodate the final scope of work selected by the Owner and submit a schedule for Owner review.
3. Some gates are currently inoperable, either because the gate cannot be opened/closed using the stem, which are deformed in some cases, or because the gate leaks due to extensive corrosion/holes, etc. or improper seating. The Owner's current understanding of operability of each gate is defined on the Drawings.
4. When the installation work at a particular gate or series of gates is complete, the Contractor must perform any associated tasks, including performance tests, training etc. before Substantial Completion of that Sluice Gate is authorized. Substantial Completion must be authorized before the next gate or series of gates can be isolated for demolition.

B. Proposed Sequence of Work

1. In all cases, the Contractor shall prepare his sequence of construction to allow for prioritization of removal and replacement of Screw Pump No. 1 first, then Screw Pump No. 3, followed by Screw Pump No. 2.
2. Contractor shall replace the Sluice Gate used to isolate Raw Sewage Lift Station Screw Pump No. 1 (Tag No. RSLS-SG-1) as a priority. This will allow the pump to be replaced first.
3. Gate NR-1 is currently operational and may be closed upon coordination with the City as described in these Specifications. Note that NR-1 does not form a perfect seal; therefore, the Contractor shall plan for bypass pumping as needed from the west half wet well to the east half wet well to achieve dry enough working conditions in the wet well. Gate NR-2 is normally closed, and City only opens it several times a year for maintenance. Contractor may coordinate keeping this gate closed with the Owner during construction.
4. Contractor shall replace other Screw Pump isolation gates ahead of the proposed screw pump replacement. Contractor may elect to leave the screw pump isolation gates in front of Screw Pump Nos. 6, 7, and 8 in place until after screw pumps have been substantially completed and then demolish gates.
5. Gates S-11-1 and S-11-2, located upstream of the screw pumps at the Retention Basin may be replaced before work on Screw Pump Nos. 6, 7 and 8 begin. This will allow better isolation of the flows to the Retention Basin for the screw pump work. The gate at S-11-2 appears to be in functional shape; however, the actuator is not operational.
6. Recoating of existing gates, as shown in the schedule on P-8 may proceed after the three screw pump replacements at the Raw Sewage Lift Station are substantially complete. Refer to Specification 09900 Painting for the coating system.
7. Gate NR-2 shall be replaced only after Screw Pump Nos. 1, 2 and 3 are substantially complete and with the work coordinated with the City. The City can isolate flow using a valve in the upstream piping.

3.5 RAW SEWAGE LIFT STATION SCREW PUMP REPLACEMENT NOS. 1 THROUGH 3 CONSTRUCTION SEQUENCING

A. The Owner will isolate one screw pump at a time, for the Contractor to then demolish existing equipment and to install the new equipment. The remaining pumps must remain fully operational. The Raw Sewage Lift Station receives flow continuously, 24 hours a day, 365 days per year. The Owner will determine if replacement of the existing screw pump motors and drives will be included in the scope of work (or if existing motors and drives are to be re-used) during Bid Evaluation.

B. In all cases, the Contractor shall prepare his sequence of construction to allow for prioritization of removal and replacement of Screw Pump No. 1 first, then Screw Pump No. 3, followed by Screw Pump No. 2. Screw Pump No. 1 is currently inoperable, and Screw Pump No. 3 is currently operating at a lower capacity.

C. When called for on the schedule and properly coordinated with the Owner, the Owner will turn a pump over to the Contractor, who shall perform proper lock-out/tag-out procedures and isolate the pump, motor controller, and any ancillary equipment for selective demolition.

D. Contractor shall isolate each screw pump by closing the associated influent sluice gate, dewater and drain the lower sump. It should be assumed that these gates allow some flow to slowly leak into the wet well.

E. Contractor shall disconnect and remove the screw pump assembly and associated grease pump lubrication system. If the Owner elects to include replacement of the existing motors and drives in the proposed scope of work, the existing equipment shall be removed and demolished. If the existing motors and drives are to be re-used, they shall remain in place and be protected during all demolition and construction activities.

F. Contractor shall install the new screw pump in accordance with the manufacturer's installation instructions and, if included in the scope of work, the new pump motor and gear reducer, as specified and shown on the Drawings.

G. When the installation work is complete, the Contractor must perform any associated tasks, including performance tests, training etc. before Substantial Completion of that pump is authorized. Substantial Completion must be authorized before the next pump can be isolated for demolition.

3.6 RETENTION BASIN SCREW PUMP REPLACEMENT NOS. 6 THROUGH 8 CONSTRUCTION SEQUENCING

A. The order of screw pump replacements at the Retention Basin is replacement of Screw Pump No. 7, then Screw Pump No. 6, followed by Screw Pump No. 8. Screw Pump No. 7 is inoperable, and Screw Pump No. 6 relies on a backup motor starter for operation.

B. The Owner will isolate one screw pump at a time for the Contractor to then demolish existing equipment and to install the new equipment. The remaining pumps must remain fully operational. The Retention Basin receives flow after wet weather periods including rainfall, snowmelt and high groundwater conditions in the collection system. Wet weather events may occur suddenly with little warning, particularly in summer months.

C. When called for on the schedule and properly coordinated with the Owner, the Owner will turn a pump over to the Contractor, who shall perform proper lock-out/tag-out procedures and isolate the pump, motor controller, and any ancillary equipment for selective demolition.

D. Contractor shall isolate each screw pump by closing the associated influent sluice gate, dewater and drain the lower sump. It should be assumed that these gates allow some flow to slowly leak into the wet well.

E. Contractor shall disconnect and remove the screw pump assembly, associated motor, gear reducer and associated grease pump lubrication system.

F. Contractor shall install the new screw pump in accordance with the manufacturer's installation instructions along with the new pump motor and gear reducer, as specified and shown on the Drawings.

G. When the installation work is complete, the Contractor must perform any associated tasks, including performance tests, training etc. before Substantial Completion of that pump is

authorized. Substantial Completion must be authorized before the next pump can be isolated for demolition.

3.7 SCADA INTEGRATION GENERAL

A. System Integration Plan is required to decommission the existing system and install and integrate the new system.

3.8 SUBSTANTIAL COMPLETION

A. Substantial Completion will occur under the following, and warranties will begin when the Substantial Completion requirements are met.
   1. Raw Sewage Lift Station Screw Pump Nos. 1 through 3 and Retention Basin Screw Pump Nos. 6, 7, and 8, including demolition, new screw pump assembly installation including grout trough, motor and gear reducer (if applicable,) and all associated power, controls, instruments, alarms and SCADA upgrades for each pumping system.
   2. Sluice gate replacement, including demolition, new gate installation including gate operator for each gate.
   3. Sluice gate coating is substantially complete after successful re-installation of gate and demonstration of operation.

END OF SECTION

SECTION 02050

DEMOLITION WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building / Concrete structure demolition.

B. Selective demolition of mechanical equipment.

C. Selective demolition of electrical equipment.

D. Salvage of existing items to be reused or delivered to Owner.

1.2 GENERAL REQUIREMENTS

A. Demolition work shall be executed in an orderly and careful manner, with due consideration for neighbors and the public.

B. All work shall be performed per all governing laws and regulations, including all current OSHA Standards.

C. The Contractor shall obtain all necessary permits for the work.

D. The cost of all permits shall be included as part of the bid.

E. It is the intent of this Section that the Demolition Work shall be complete whether or not specifically specified herein or shown on the Drawings, and all costs associated with the Demolition Work shall be included in the bid price.

1.3 RELATED REQUIREMENTS

A. Specification 01950 – Sequence of Construction

B. Division 15000 – Mechanical

C. Specification 16000 – Electrical

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

C. NFPA 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities, current edition.

1.5 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Items to remain shall be protected from damage throughout construction at no additional cost to the Owner. Protected items that damaged due to construction activities are to be replaced at no additional cost to the Owner.

1.6 SUBMITTALS

A. Submit in accordance with Section 01300 - Administrative Requirements, and the General and Supplementary Conditions.

B. Provide a demolition plan for review by the Engineer and Owner prior to commencing demolition work.

C. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of Owner's operations. Sequence shall be compatible with overall work sequence of construction.

D. Health and Safety Plan (HASP). Submit a HASP for workers exposed to sewage sludge materials or other hazards as part of this work.

E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction

1.7 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

B. The Michigan Building Code shall control the demolition, modification or alteration of the existing buildings or structures.

1.8 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. This project is in a municipal wastewater treatment plant. The work will involve contact with sewage sludge which contains pathogens and other bacteria which can affect human health. Proper care and protection for all workers coming in contact with these materials is the

responsibility of the contractor. A Health and Safety Plan shall be prepared by the CONTRACTOR for this purpose.

C. Protection. Erect and maintain barriers, lights and other protective devices to prevent access to areas under construction or within the influence of the ongoing work. Provide free and safe passage to and from adjacent structures which are being used by the Owner for ongoing operations of the lift station.

D. The Owner and ENGINEER assume no responsibility for the actual condition of the structures/equipment to be demolished or modified. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

E. Repairs to Damage. Promptly repair damage caused to adjacent facilities by demolition operation when directed by the ENGINEER at no cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.

F. The Contractor shall be responsible for the testing, handling, removal, storage and disposal of any materials suspected to contain lead or asbestos. All testing, handling, removal, storage and disposal of lead or asbestos materials shall be performed in a manner that meets all Federal, state and local laws and regulations. The cost for testing for the presence of lead or asbestos containing materials, monitoring for permissible exposure limits during construction, and abatement shall be included in the Total Contract Lump Sum Price. The Contractor shall be completely responsible for environmental mitigation and the safety and protection of all labor forces and Owner(s) personnel due to means and methods chosen that may exacerbate harmful lead or asbestos conditions, such as torch-cutting painted surfaces and other standard demolition practices.

G. The Contractor shall provide and install all necessary shoring and bracing required to support walls and other parts of existing buildings during demolition. All Contractor installed fences, barricades, shoring, etc. not essential for the further protection of property or personnel at the completion of the demolition work shall be removed by the Contractor.

H. No materials shall be dropped or chuted from any height which might endanger personnel or adjacent property. Dynamite or other explosives shall not be used at any time in performing the work described herein. No open burning of debris and rubbish will be permitted.

I. Before doing any offsite dumping, the Contractor shall make all necessary arrangements, obtain written permission, secure permits, and pay all charges and fees, as required. The Owner assumes no liabilities for offsite dumping.

1.9 CONTRACTOR'S SUPERVISION

A. Contractor's responsibility shall include a completely equipped first aid kit, provided and maintained at the site in a clean orderly condition and shall be readily accessible at all times to all the Contractor's employees.

B. The Contractor shall designate certain employees who are properly instructed to be in charge of first aid. At least one such employee shall be available whenever work is in progress at the demolition site.

C. Telephone call lists for summoning aids from outside sources, such as doctors, ambulances, pulmotor and rescue squads, shall be conspicuously posted at the site.

1.10 STORAGE OF MATERIALS

A. The Contractor shall be entirely responsible for his materials and equipment stored on the site pending disposal.

B. All materials not mentioned herein as remaining the property of the Owner, shall become the property of the Contractor, and shall be removed from the premises.

C. All rubbish and debris resulting from the demolition operations shall be removed promptly as accumulated.

D. There shall be no retailing of used materials at the site except as allowed by written permission from the Owner.

E. The schedule established shall include the removal from the site of all material, debris, and Contractor's equipment.

1.11 WARRANTY

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

PART 2 PRODUCT

NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.

9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin removal until receipt of notification to proceed from the Owner.

C. Removed and Salvaged Items:
1. Coordinate salvaged items removal with Owner for turnover.
2. Remove and clean salvaged items.
3. Transport items to Owner's storage area on-site.
4. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Coordinate salvaged items removal with Owner for turnover.
2. Remove and clean salvaged items.
3. Repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
4. Protect items from damage during transport and storage.
5. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated

E. Protect existing structures:
1. Provide bracing and shoring as needed
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.
4. No jackhammering or other destructive methods of construction shall be used in areas where adjacent facilities which are to remain, and which may be damaged by such operations exist unless approved prior by ENGINEER.

F. Partial Removal of paving, concrete structures, and curbs:
1. Neatly cut at a right angle to surface.

3.2 EXISTING UTILITIES

A. Coordinate work with Owner, utility companies and local governmental agencies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain free from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (7) days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least three (3) days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on field observation and existing record documents.
   1. Verify that construction and utility arrangements are as shown.
   2. Verify all elevations and vertical dimensions due to datum differences between existing drawings.
   3. Report discrepancies to Engineer before disturbing existing installation and indicate on record drawings.
   4. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
   5. When general items are noted for demolition, it is assumed that appurtenances and incidental items associated with the general item should also be demolished and removed.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction where required.

C. Maintain weatherproof exterior building enclosures except for interruptions required for replacement or modifications; take care to prevent water and humidity damage. Prevent freezing temperatures from occurring in areas of the Headworks which are in use while work is ongoing. Maintain a minimum temperature of 40 degrees F in all areas where are being used by the Owner for operations or higher temperatures, if necessary, to operate remaining equipment.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings. Where piping or electrical lines are removed back to a functioning point, cut/cap/properly terminate the remaining functioning component.
   2. When pipes, conduits other equipment are removed, all fasteners for that equipment shall also be removed and all holes/damage to the existing structures from which the equipment was attached shall be filled and repaired with like materials.

E. Mechanical/Electrical (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications):
   1. Remove existing systems and equipment as indicated in drawings.
   2. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and accepted for service.
4. Verify that abandoned services serve only abandoned facilities before removal.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
6. Where vents or other pipes/conduits that are to be removed pass through an existing roof/floor/wall that is to remain, the resulting hole in the roof/floor/wall shall be patched and made watertight to match the existing materials.
7. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.
8. Conduits and wires shall be abandoned or removed where shown. All wires in abandoned conduits shall be removed and disposed of off-site as required.
9. Abandoned conduits concealed in floor or ceiling slabs or in walls, shall be cut flush with the slab or wall at the point of entrance. The conduits shall be suitably plugged and the area repaired in a flush, smooth and approved manner. Exposed conduits and their supports shall be disassembled and removed from the site.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

G. Building/Structure demolition.
1. Demolish concrete in small sections.
2. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.
3. Remove structures to the lines and grades shown unless otherwise directed by the ENGINEER. Where no limits are shown, the limits shall be 4-inch outside the item to be installed. The removal of masonry beyond these limits shall be at the Contractor's expense and these excess removals shall be reconstructed to the satisfaction of the Engineer with no additional compensation to the Contractor.
4. After removal of parts of all of walls, slabs and like work which tie into new work or existing work, the point of junction wall be neatly repaired so as to leave only finished edges and surface exposed.

3.4 DEMOLITION SCHEDULE

A. Removed and Salvaged Items, Removed and Reinstalled Items, Elements to Remain and be Protected:
1. See Drawings. Demolition Notes are provided on Sheet P-0.

3.5 DEBRIS AND WASTE REMOVAL

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.

B. Do not allow demolished materials to accumulate on-site.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

E. Leave site in clean condition, ready for subsequent work.

F. Clean up spillage and wind-blown debris from public and private lands.

3.6 CLEANING

A. The Contractor shall clean existing surfaces as required to perform the Work including tanks, wells, channels, floors, walls, etc.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing before demolition operations began.

END OF SECTION

SECTION 02990

PERMITS

PART 1 GENERAL

1.1 GENERAL

A. The Permits included in this Section have been applied for by the Owner with the cost to the Contractor noted. They are provided as information for the Contractor because the requirements and regulations contained in these documents shall be adhered to by the Contractor as they pertain to the work done under this Contract.

B. Should any contradictions or discrepancies between the requirements of the Permits Section and other Sections of these Specifications be found, this sections language shall have precedence.

1.2 PERMIT

A. The following permits shall be obtained and paid for by the Contractor:
   1. EGLE - Soil Erosion and Sediment Control Permit, if required as a result of Contractor's storage and staging plan.

B. The following permits shall be obtained by the Owner at no cost to the Contractor:
   1. EGLE Part 41 Permit, if required.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03310

CONCRETE WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section includes the furnishing and mixing of all materials required for concrete, the furnishing, erection, care and removal of forms; the furnishing placement, finishing, curing and protection of all concrete, and the furnishing and placing of steel reinforcement for all concrete.

B. Concrete shall be composed of a mixture of Portland cement, fine aggregate, coarse aggregate and water. The materials and methods used shall produce a dense, homogeneous, impervious, durable and workable concrete of the highest quality and without defects of any kind.

C. 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 Owner as described herein.

1.2 APPROVAL REQUESTS

A. The following approval requests shall be submitted to the Owner for review. No such items or the materials therefore shall be ordered fabricated, delivered, or incorporated in the work until the proper approvals for the same have been received from the Owner.

Approval Requests	**Shop Drawings**
Concrete Design Mix	Steel Reinforcement
Concrete Mix Materials	
Measures for Cold Weather Protection (if necessary)	
Measures for Hot Weather Protection (if necessary)	

1.3 REFERENCES

A. Portland Cement ASTM C 150

B. Fine Aggregate ASTM C 33

C. Coarse Aggregate ASTM C 33

D. Ground Granulated Blast Furnace Slag, Grade 100, 120 ASTM C 989

1.4 SUBMITTALS

A. 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 A.S.I # as listed in the Qualified Products List from the current MDOT Materials Source Guide if applicable or by an identifiable name if not applicable.
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.

1.5 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.
1. The criteria for approval of a proposed concrete mixture for resistance to excessive expansion caused by ASR shall be as follows:
a. If a proposed concrete mixture contains cement with an alkali level of less than 0.60% expressed as equivalent sodium oxide (percent Na_2O + 0.658 x percent K_2O) the mixture shall be considered to be resistant to the potential for excessive expansion caused by ASR.
1) The determination of the alkali level of the proposed cement shall be made from the mill test reports submitted per Section 1.03.
b. If a proposed concrete mixture contains both fine and coarse aggregates for which there is testing per ASTM C 1260 that shows that both the fine and course aggregates produce expansions of less than 0.10%, the fine or coarse aggregate used to construct the mortar bar shall be considered to be “innocuous” (per Appendix X1 of ASTM C-33). Concrete mixtures that include both fine and coarse aggregates considered to be innocuous shall be considered to be resistant to excessive expansion caused by ASR.
c. If a proposed concrete mixture for which there is previous testing per ASTM C 1567, shows the proposed combination of cementitious materials and aggregates produce expansions of less than 0.10% the mixture shall be considered to be resistant to excessive expansion caused by ASR.
d. If a proposed concrete mixture for which there is previous testing per ASTM C 1293 shows that both the fine and course aggregates meets the criteria of Appendix XI of ASTM C 1293 with respect to the non-reactivity of the

aggregate, the mixtures shall be considered to be resistant to excessive expansion caused by ASR.

e. If, based on the Engineer's evaluation, additional testing of the fine and / or coarse aggregates is needed to make the evaluations as discussed herein; the Owner shall perform such testing.
   1) The Owner shall have access to all materials, including aggregate pits, in order to obtain samples for such additional testing.
   2) The Owner shall perform the following test using the fine and/or coarse aggregates proposed for each concrete mixture: ASTM C 1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar – Bar Method).
   3) All samples submitted for testing per ASTM C 1260 shall first be tested to establish conformance to the required material specification for gradation.
   4) All samples submitted shall meet the required material specification for gradation prior to being submitted for testing per ASTM C1260.

2. If, based on the Engineer's evaluation, the submitted concrete mixture does not meet any one of the criteria of 1.05A.1. the mixture shall be rejected or be mitigated by Methods 1. or 2. as follows:
   a. Method 1. Use of a cement with an alkali level of less than 0.60% expressed as equivalent sodium oxide (percent Na_2O + 0.658 x percent K_2O).
      1) The determination of the alkali level of the proposed cement shall be made from the mill test reports submitted per Section 1.03.
   b. Method 2. Substitution of a portion of the cement with Ground Granulated Blast Furnace Slag (GGBFS) Grade 100 or 120 (ASTM C 689).
      1) For Method 2, the maximum substitution of cement with the GGBFS permitted shall be 35% by weight of total cementitious material (cement plus GGBFS).
      2) For Method 2, the effectiveness of the proposed cement–GGBFS combination to resist the potential for excessive expansion caused by ASR for each aggregate that is considered to be potentially reactive shall be demonstrated.
      3) The effectiveness of the proposed cement–GGBFS combination shall be based on test mortar bars per ASTM C 1260 using each fine or coarse aggregate that has been considered to be potentially reactive and the proposed cement-GGBFS combination for the concrete mixture.
      4) The criteria for evaluating the mitigation of a proposed concrete mixture with respect to ASR by Method 2. shall be as follows:
         a) If a mortar bar constructed of an aggregate that is considered to be potentially reactive and the proposed cement-GGBFS combination produces an expansion of less than 0.10%, the aggregate and proposed cement-GGBFS combination shall be considered to be resistant to excessive expansion caused by ASR.
         b) Concrete mixtures that include both fine and coarse aggregates considered to be resistant to excessive expansion caused by ASR by mitigation Method 2. as described herein

shall be considered to have been adequately mitigated with respect to and resistant to excessive expansion caused by ASR.

c) If a mortar bar constructed of an aggregate that is considered to be potentially reactive and the proposed cement-GGBFS combination produces an expansion of 0.10% or greater, concrete mixtures containing these materials shall not be considered resistant to the potential for excessive expansion caused by ASR and the concrete mixture shall be rejected.

c. The contractor shall be responsible for all costs associated with the mitigation of a concrete mixture for ASR and any delay costs incurred from the Owner if, due to the mitigation method selected by the Contractor, it takes the Contractor beyond their completion dates.

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. The Owner will be testing the concrete that is delivered to the project site so as to ensure that the approved mix design is being followed.

1. To assist the Owner in establishing that the approved mix design is being followed, the supplier shall include on the delivery ticket for each batch of concrete delivered to the job, the identification and proportions of each material batched.

D. The cost associated with the testing of the aggregates, or aggregates with the proposed cement–GGBFS combinations as described herein shall be borne by the Owner. The price for assisting the Owner in such testing is included in the item (s) of the concrete being supplied. If, during the testing process, it is determined that alkali-silica reaction (ASR) is not a condition that requires mitigation, the Contractor will not be entitled to any compensation whatsoever, for assisting the Owner in addressing the ASR issue.

E. Prior to the commencement of concreting operations, the Contractor shall design and submit to the Engineer the concrete mix he proposes to use to obtain the specified minimum strength concrete at 28 days, when sampled in accordance with the requirements of current ASTM Specification C-31, and tested in accordance with the requirements of current ASTM specification C-39, together with a statement of the sources of the materials upon which such concrete design mix is based, and recent certified tests of all components including gradation and physical properties of fine and coarse aggregates. Submittal shall be based upon compliance with ACI 318 Sections 5.2, 5.3, and 5.4.

F. The design mix shall be proportioned by weight and shall designate: the weight in pounds of fine and coarse aggregates, in saturated surface dry condition, per sack (94 pounds) of cement; the cement content in sacks per cubic yard; the gallons of water per sack of cement; and the volume of admixtures per hundredweight of cement which will be required for the concrete design mix; gross weight and yield per cubic yard and slump of trial mixes;

compressive strength developed at 7 days and 28 days from not less than three test cylinders cast for each 7 day and 28 day test and each design mix.

G. The Concrete mix design to produce concrete of the required minimum strength shall be the sole responsibility of the Contractor, except that not less than 5 1/2 sacks of cement per cubic yard shall be used for 4000 psi concrete and the water cement ratio shall not exceed 0.45. The maximum allowable slump shall be that consistent with the proper placement of the mix and as specified herein, but in no case shall the water content exceed that specified. Air entrainment shall equal 5% ± 1%.

H. The Contractor may, at his option, substitute up to 20% of fly ash or 35% of GGBFS' by weight of cement for the specified cement content, provided that the resulting concrete meets specified requirements for strength, workability, and appearance.

I. Recent certified copies of test results of the fine and coarse aggregates proposed by the Contractor shall be provided with the mix design. Test results shall indicate aggregate grading, physical and chemical properties.

PART 2 MATERIALS

2.1 CEMENT

A. Cement shall be "Portland Cement" conforming to current ASTM Specification C-150, Type I or Type II. When authorized for use in the work by the Owner, High Early Strength Cement shall conform to current ASTM Specification C-150, Type III.

B. Only one type of cement shall be used in the same portion or element of the work. All cement shall be of the same brand and shall be produced by a single mill unless otherwise authorized. Cement salvaged by cleaning sacks or from discarded sacks of cement, shall not be used in the work. Any cement which for any reason has become partially set, contaminated or which contains lumps will be rejected and shall be immediately removed from the site.

2.2 FLY ASH

A. Fly ash shall conform to the requirements of ASTM C-618 Class F.

2.3 GROUND GRANULATED BLAST FURNACE SLAG

A. Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the requirements of Grade 100 or 120 (ASTM C 989).

2.4 AGGREGATES

A. Fine Aggregate shall be natural sand, 2NS.

B. Coarse aggregate shall conform to ASTM C-33, Class 4S and be graded in accordance with the following Michigan Department of Transportation Specifications for Construction Classifications:

Element	MDOT Class
Walls, Slabs & Other Concrete less than 8" thick	26A
All other concrete	6AA

2.5 WATER

A. Tap water of potable quality shall be used for mixing concrete and at the time of use shall be clean and free from oil, alkalis, or organic matter.

2.6 ADMIXTURES

A. An air entraining admixture conforming to the requirements of current ASTM Specification C-260 shall be used for all concrete.

B. All concrete shall contain a water reducing admixture, complying with current ASTM Specification C-494, Type A. The admixture shall be free of significant amounts of chloride, and shall be used in accordance with the manufacturer's recommendation for the type of cement to be used, except that only volumetric dispensing will be allowed.

C. The manufacturer shall certify, in writing, that the materials supplied for use under this Contract are identical in all respects, including concentration and chloride content, to the material tested in accordance with current ASTM Specification C-494. When requested by the Owner, the Contractor shall make available the services of a manufacturer's qualified field representative, to assure proper use of the admixture.

2.7 REINFORCING STEEL

A. Unless otherwise indicated, reinforcing steel shall be deformed steel bars conforming to the requirements of current ASTM Specification A-615, Grade 60. Reinforcing steel for ties and stirrups shall be new billet steel intermediate grade conforming to the requirements of the current edition of ASTM Spec. A-615 Grade 40.

B. All reinforcing steel shall be free from defects, kinks, and bends not shown on the drawings.

C. Wire mesh for reinforcement shall conform to the current requirements of ASTM Specification A-185.

D. All bars shall be of the shape, size, class, and grade of steel specified and shown on the drawings, and each bar shall have at all points a net section not less than that of a plain round bar of corresponding size.

E. The Contractor shall furnish the manufacturer's written certification to the Owner that all reinforcing steel of each shipment meets the pertinent requirements of ASTM Specifications.

F. Samples for the inspection and testing of the reinforcing steel shall be chosen by the Owner, and sampling and testing methods shall conform to the requirements of the General Conditions.

2.8 FORMS

A. Forms for structural concrete shall be of metal, plywood, first class dressed lumber, or other material approved by the Owner. The forms shall be true in every respect to the required shape, size, grade, and alignment of the finished structure and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and curing the concrete. The forms shall be mortar-tight at the time concrete is placed in them and shall be so constructed that the surface of the finished concrete will be reasonably free from ridges, fins, offsets or similar defects. Suitable molding or beveled strips shall be placed in the forms to chamfer or bevel all exterior corners of the concrete to prevent breaking and spalling at the edges when the forms are removed. Adequate and suitable means for removing the forms without injury to the surface of the finished concrete shall be provided.

B. The Contractor shall locate and provide adequate shoring to safely support the work at all times. Shoring shall be spaced to insure that no member will be excessively loaded or will be subjected to adverse stresses during construction operations.

C. Shores shall be continuous between supports and shall be aligned vertically with respect to each other. No adjustable or spliced wooden shores shall be used, unless specifically approved by the Engineer.

D. When requested by the Owner, drawings showing details of the forms and shoring proposed by the Contractor shall be submitted to the Owner for approval.

E. The forms shall be maintained at all times in good condition as to shape, strength, rigidity, water-tightness and smoothness of surface. Before each use, forms shall be thoroughly cleaned of all debris and water before concrete is placed, and shall be coated with a non-staining type mineral oil which shall not discolor or otherwise injuriously affect the concrete. The coating shall be applied before reinforcing steel is placed. Temporary openings shall be provided at the bottom of wall forms and at other points where necessary to facilitate cleaning and inspection.

F. Sectional form panels may be used throughout where practicable. When requested, designs of sectional forms shall be submitted to the Owner for approval before using in the work.

G. The Owner may at any time condemn any section or sections of forms found deficient in any respect and such forms shall be promptly corrected or removed and replaced. Form alignment tolerances shall conform to current requirements of ACI 347, latest edition.

H. Wire ties shall not be used as form ties.

I. Metal inserts for anchorage of materials or equipment to concrete construction shall be provided as required in the work.

J. The type and kind of form ties and spreaders used shall be subject to the Owner's approval. Form ties shall not project through the finished concrete, but shall be of such type that, upon removal of the forms, the ends of the ties or spreader will remain one inch or more within the face of the concrete.

2.9 NON-SHRINK GROUT

A. Non-shrink grout shall meet C.O.E. specification CRD-C621 and be equivalent to the following:
   1. Crystex (L & M)
   2. Sure-Grip
   3. High Performance (Dayton Superior)
   4. Masterflow 713 (Master Builders)

PART 3 EXECUTION

3.1 PROPORTIONING AND STRENGTH OF CONCRETE

A. The mixing proportions and water cement ratio shall be such as to produce a dense, homogeneous, workable and durable air-entrained concrete having a minimum compressive strength of 4000 psi @ 28 days for all concrete work.

B. The Contractor shall provide portland cement concrete mixtures for the project that are resistant to excessive expansion caused by alkali-silica reactivity (ASR).

C. The evaluation as to the resistance of submitted concrete mixtures to excessive expansion caused by ASR shall be by the Owner as described herein.

3.2 READY MIXED CONCRETE

A. Ready mixed concrete shall be batched, mixed and transported in accordance with "Specifications for Ready-Mixed Concrete," ASTM C-94. Full batch ticket information including all items of C-94 Section 16.2 shall be furnished. Plant equipment and facilities shall conform to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the national Ready Mixed Concrete Association.

3.3 CONSTRUCTION JOINTS

A. General

Construction joints shall be provided in the locations indicated on the Drawings, or at such locations as designated or approved by the Engineer. They shall be so designed and located as to least impair the strength, water-tightness and appearance of the structure. The distance between construction joints shall in no case be greater than 25 feet, unless otherwise indicated on the Drawings.

Keyways shall be provided in all construction joints. Unless otherwise indicated, the width of keyways shall be approximately one-third of the width of the section at that point and their depth one-third their width, except that the width of keyway shall not exceed 12 inches.

B. Location

Construction joints in the base slab, walls, and upper slab of structures shall be located in the same vertical plane.

Joints in slabs on grade shall be located at a maximum 16' spacing and shall be perpendicular to the horizontal surfaces. All joints shall be truly vertical or horizontal unless otherwise

shown on the Drawings or as ordered by the Owner. The surfaces of horizontal joints shall be screeded level.

C. Treatment of Hardened Concrete
Before depositing fresh concrete on or against hardened concrete, the surface of the hardened concrete shall be roughened, as required by the Owner, in a manner that will not leave loosened particles of aggregate or concrete at the surface. Such roughening of the surfaces may be accomplished by bush-hammering as required, or by the use of Sika Chemical Corporation Rugasol S or B, ChemMasters H, or equal, applied in accordance with the manufacturer's directions in order to produce a naturally roughened surface. Such hardened surfaces shall be thoroughly cleaned of foreign matter and laitance. Just before the fresh concrete is deposited, the cleaned surface shall be thoroughly wetted, the excess water removed, and the wetted surfaces slushed with a mortar of the same proportions as the mortar in the concrete mix. The coat of mortar on horizontal joints shall not be less than two inches in thickness. The fresh concrete shall be deposited before the mortar has attained its initial set.

3.4 PLACING CONCRETE

A. Concrete shall not be placed in water other than by tremie method and/or unless authorized by the Engineer nor shall water be allowed to rise or flow over concrete which has not attained its initial set. Concrete shall not be placed in contact with frozen earth.

B. Concrete shall be placed in the forms only after the forms, bracing, and reinforcing steel have been checked and the space within the forms has been cleaned of all debris and water. This check shall be made by the Owner's designated representative and no concrete shall be placed except with his approval.

C. When concrete is deposited directly on ground, care shall be taken to prevent loss of moisture from the concrete either by means of sprinkling the ground or by placing a waterproof membrane over the ground prior to placing the concrete.

D. Concrete shall be promptly placed with a minimum of handling so as to avoid segregation or loss of any ingredients. Each placement shall be completed in a continuous operation and the concrete shall be placed as nearly as possible in its final position to avoid rehandling.

E. Concrete shall be placed in layers not to exceed 24 inches deep and shall be compacted by mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping. Vibrators shall not be used to transport concrete inside the forms. Under no circumstances shall concrete that has partly hardened be deposited in the work.

F. During freezing weather Contractor shall take whatever steps are necessary to prevent the freezing of ground against which concrete has to be placed. This protection will not be considered provided by a mud mat or other thin membrane but shall be provided by insulation, covering and heating, or other Owner approved means.

G. Sufficient and suitable equipment and labor shall be provided so that, regardless of the method of transporting, handling, and placing the concrete when deposited in the forms shall

have the quality and consistency specified. Concrete shall not be pumped through aluminum pipe.

H. Mixing, handling and transporting equipment and tools shall be kept clean and free from lumps and incrustations of hardened concrete. Buggies, buckets, chutes, conveyors, and other devices used for the transportation of concrete shall be watertight, and their design and the method of transporting the concrete shall be subject to the approval of the Owner. Overloading of vehicles or chutes so that spillage or leakage occurs will not be permitted.

I. The Contractor shall use the least slump possible consistent with workability for proper placing of concrete. Unless otherwise specified, maximum slumps permitted are:
1. 4” slump For sections with side forms
2. 3” slump For foundation slabs poured with curb forms only

J. Slump will be determined by the Owner's designated representative by means of the slump cone test as outlined in current ASTM Designation: C-143.

3.5 BUILT IN WORK

A. All necessary ties, anchors, bolts, inserts, dowels, waterstops, sleeves for pipe of every kind, and all other work to be anchored or set in the concrete shall be accurately set and securely held in place in accordance with details shown on the Contract Drawings or in accordance with standard practice, including such anchor bolts as may be necessary for equipment furnished by the Owner, or under other contracts.

B. Sleeves of a suitable size and type shall be set in the concrete where all pipes, conduits, ducts, plumbing and other work are to pass through the concrete work, except where pipe wall castings or other devices are shown to be cast in place on the Contract Drawings.

3.6 PROTECTION AND CURING

A. General
1. Fresh concrete shall be protected from rain, and other adverse conditions by means of tarpaulins or other suitable equipment or methods. After placing and finishing operations have been completed, concrete shall not be subjected to loading or otherwise disturbed until it has attained its specified design strength.

B. Initial Curing
1. One of the following methods shall be used to initially cure freshly placed concrete. This curing shall be employed for a period not less than 24 hours.
   a. Ponding or continuous sprinkling
   b. Fogging
   c. Absorptive mat or fabric kept continuously wet
   d. Sand or other covering kept continuously wet
   e. Continuous steam (not exceeding 150 degrees F within the enclosure)
   f. Exposed surface of concrete shall be protected against premature drying by curing in a manner subject to approval by the Owner.

C. Final Curing

1. Immediately following the initial curing, for a period of not less than six days before concrete has dried, additional curing shall be accomplished by one of the following materials or methods.
   a. Continuing the method used in initial curing
   b. Waterproof paper conforming to current Specifications for Waterproof Paper for Curing concrete ASTM C-171
   c. Other moisture retaining coverings as approved by the Owner.

3.7 MEASURES FOR COLD WEATHER PROTECTION

A. When the mean daily temperature is less than 40°F the Contractor shall provide the necessary temporary heat, protection and enclosures so that newly placed concrete is kept at a temperature of not less than 50 degrees F for 7 days in accordance with ACI 306R recommendations. At the end of the curing period, artificial heating shall be discontinued and protections and enclosures removed in such a manner that the fall in temperature at any point in the concrete will not exceed 50°F in any 24 hours. Excessive heating shall be avoided to assure no undue loss of moisture from the concrete during the curing period. Fire prevention facilities shall be provided. Admixture of calcium chloride will not be allowed.

B. Concrete placed when the ambient temperature is lower than 40°F shall have a temperature of not less than 55°F and not greater than 90°F.

3.8 MEASURES FOR HOT WEATHER PROTECTION

A. When a combination of high air temperature, lower humidity and higher wind velocity tend to impair concrete quality, the Contractor shall provide the windbreaks, shading, sprinkling or other means and methods necessary to protect the concrete in accordance with ACI 305 recommendations.

B. The maximum temperature of concrete at placement shall not exceed 90°F in hot weather. Steps shall be taken to control concrete temperature and water evaporation by proper attention to ingredients mixing, placing, handling, protection and curing.

3.9 TESTING CONCRETE

A. All finished concrete testing shall be at the expense of the Owner.

B. Field cured cylinder test results will be used by the Engineer to verify the specified curing and protection, and to evaluate time intervals for removal of forms and shoring, and imposition of service loads.

C. When test results are such that there is reasonable doubt that the specified concrete strength and other characteristics have been attained in the structure, the Owner may require the Contractor to take cores from the questionable areas and conduct tests to determine the strength and other characteristics of the in-place concrete. Such tests will be paid for by the Contractor.

D. Concrete failing to meet specified requirements will be rejected, and may be required to be removed and replaced; or, additional approved construction may be required to compensate

for rejected concrete; all without additional cost to the Owner, and as required to meet Owner's approval.

E. Sampling shall be done in accordance with the methods specified in the current edition of ASTM Specification C-172.

3.10 FINISHING

A. General
1. Immediately following the removal of forms all fins, rough spots and hardened mortar shall be removed from all surfaces except those to be covered by backfill.
2. On all surfaces including those to be covered by backfill, the cavities caused by form tie cones shall be repaired with Portland Cement and sand grout. All other holes, honeycomb spots, broken corners or edges shall be thoroughly cleaned to solid concrete but of not less than a minimum depth of one inch with edges cut perpendicular to the surface. After the cuts and surrounding areas have been saturated with water for a period of not less than three hours and the surface to be repaired has been brushed with a grout of equal parts of Portland Cement and sand, they shall be carefully pointed and trued with a mortar of cement and fine aggregate mixed in the same proportion used in the concrete being repaired. Fine aggregate for mortar shall pass a No. 14 screen. The quantity of water used shall be no more than necessary for handling and placing.
3. The repair mortar shall be thoroughly mixed before using until it has reached the stiffest consistency that will permit placing.
4. Repair areas shall be kept moist for seven (7) days by a method meeting the approval of the Engineer.
5. Rough spots, stains, and hardened mortar on surfaces which will be exposed to view shall be removed by rubbing lightly with a fine abrasive stone or hone. Water shall be used freely and rubbing shall be sufficient only to remove the stains without working up a mortar lather or changing the texture of the concrete.
6. Stains caused by excessive use of form oil shall be removed by scrubbing with a 5 to 10 percent solution of muriatic acid, using a stiff bristle brush. The acid solution shall be applied to a thoroughly wetted surface and shall be rinsed off the surface with an abundance of water.

B. Floated Surface Finish
1. A fine floated surface finish shall be given to all slabs. The concrete surface shall be struck off with a straight edge which shall move on suitable guides set to the required elevation for the finished surface. After striking, the surface shall be finished without excessive working to a smooth even surface without any unevenness of more than 1/8 inch in any 10 ft. length in any direction.

3.11 REMOVAL OF LAITANCE

A. All laitance and concrete which in the opinion of the Owner is of questionable quality shall be removed completely from the top surface of all concrete walls.

3.12 SHOP FABRICATION OF REINFORCING STEEL

A. Bars shall be bent cold to the shapes and dimensions shown on the Drawings or as specified herein. Bends shall be made in accordance with the requirements of the current "Manual of Standard Practice" of the Concrete Reinforcing Steel Institute and/or current ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".

B. Steel shall not be bent or straightened in a manner injurious to the material. Bending of reinforcing steel by heating will not be permitted. Bent up bars in beams and slabs shall be bent at an angle of 45 degrees unless otherwise shown on the drawings.

3.13 SHIPPING AND STORAGE OF REINFORCING

A. Reinforcing bars shall be shipped to the site of the work in standard bundles, tagged and marked in accordance with the current Code of Standard Practice of the Concrete Reinforcing Steel Institute.

B. Reinforcing steel shall be stored above the ground on platforms, skids or other supports, and shall be protected from the weather at all times with suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate inspection and checking. Labor and other assistance shall be furnished to the Owner by the Contractor as may be required to check the steel as it is being stored or after storage on the site.

3.14 PLACING REINFORCING STEEL

A. General

1. All reinforcing steel shall be accurately placed in the position shown on the drawings, or as otherwise specified, and it shall be securely held in place before and during the placing of concrete. When placed in the forms the steel shall be free from dirt, rust, mill scale, paint, oil, or other foreign material. In case there is a delay in pouring concrete after the steel has been placed, the steel shall be reinspected, and when necessary, recleaned prior to placing the concrete. Bases shall be wire tied or clipped at intersections, such fastenings being not more than 18 inches apart in either direction, unless otherwise approved by the Owner. Supports for reinforcement which are to remain in the finished work shall be precast concrete or plastic tipped metal.
2. The minimum clear distance between parallel bars shall be not less than the nominal diameter of the bars. In no case shall be clear spacing between bars be less than one inch, nor less than 1 1/3 times the maximum size of the coarse aggregate.
3. The minimum concrete cover for reinforcing steel shall be as called for in the current edition of ACI 318, where not specified otherwise on the drawings.
4. The clear distance between reinforcing steel and the face of the concrete shall be maintained at all points in order that the designed strength of the structure shall not be reduced. No reinforcing steel shall be bent or welded in the field without specific permission of the Owner.
5. Tolerances for location of reinforcing steel shall be as called for in current edition of ACI 318.

B. Splicing Reinforcing Steel

1. No splicing of reinforcing bars shall be made at points of maximum stress, except with prior approval of the Owner. Splices in adjacent bars shall be staggered. Lapped splices shall not be used for bars larger than Size No. 11. For bars size No. 11 and smaller in tension or compression lap splicing shall be used.
2. Lapped ends of bars shall be placed in contact and securely wired. Bars shall have a minimum lap of 40 bar diameters.

C. Dowels
1. All dowels shall be in position before the concrete is placed. Dowels shall not be inserted after the concrete has been placed.

D. Reinforcing Steel Schedules
1. Reinforcing bar schedules and detail shop drawings, showing complete details as to size, length, weight, arrangement, and bending of all reinforcing steel shall be submitted by the Contractor to the Owner. A complete schedule of reinforcement chairs, supports, saddles, spacers, and other accessories shall be included. No reinforcement shall be cut, bent, or fabricated before these schedules and/or drawings are reviewed by the Owner.

3.15 REMOVAL OF FORMS AND SHORES

A. Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and any superimposed load upon it without exceeding the normal amount of deflection. Members subject to additional loads during construction shall be adequately shored to support both the member and the construction loads in such a manner as will protect the member from damage.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

B. New surfaces and construction shall be painted. Existing surfaces and areas shall be painted as called for on the Drawings.

1.2 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. AWWA (American Water Works Association) - D102-17 - Painting Steel Water Storage Tanks.

C. International Concrete Repair Institute (ICRI) Guideline No. 310.2-R2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

D. NACE (NACE International) -Industrial Maintenance Painting.

E. SSPC (SSPC: The Society for Protective Coatings) SSPC Painting Manual Volumes 1 and 2.

F. NAPF (National Association of Pipe Fabricators) Section 500 Surface Preparation Standards.

1.3 DEFINITIONS

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

1.4 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. Samples: Submit two samples, 1 x 3 inch (25 x 76 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention, environmental considerations and any restrictions regarding time recoat.

E. A letter certifying the installer as a Manufacturer’s Approved Installer shall accompany the submittal package.

F. Daily Coating Inspection Reports (blank version included at the end of this Section) are to be submitted weekly to Architect/Engineer. One report is to be completed for each day of painting activity performed on the job site. Reports must be fully filled out. Payment may be withheld if reports are not submitted in a timely fashion or are not fully completed.

1.5 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 a minimum of ten years, approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Only materials approved for use on this project shall be delivered to the site.

E. Store paint materials at a 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.

1.7 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.

1.8 SURFACES NOT REQUIRING PAINTING

A. Aluminum (except for backcoating as specified in Section 3.2F).

B. Stainless Steel.

C. Copper.

D. FRP.

E. PVC, CPVC, HDPE and Fiberglass Pipe and Ductwork (including hangers).

F. PVC Coated Electrical Conduit.

G. Inside of pipe spaces, duct shafts, and similar areas not exposed to view.

H. Exterior galvanized grating or checkered plate need not be painted, except to meet MIOSHA requirements.

1.9 EXISTING PAINTED SURFACES

A. Existing painted surfaces that will be affected by project activities are to be tested by the Contractor as part of this work scope to determine if they contain lead. Any lead-based paint at affected areas are to be removed and abated in accordance with all federal, state and local regulations and guidelines as part of this work scope. Provide documentation of compliance methods to Owner for record as part of submittals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers - Paint and Special Coatings
   1. Tnemec Company
   2. Carboline Company
   3. Sherwin-Williams Company

B. Substitutions: No substitutions are allowed.

C. All products used on this project shall be from the same manufacturer unless written approval is received from the Engineer.

2.2 MATERIALS

A. Coatings:
   1. Ready mixed, except field catalyzed coatings.

2. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials:
1. As recommended by the manufacturer and required to achieve the finishes specified, of commercial quality.

C. Patching Materials:
1. Latex filler.

2.3 FINISHES

A. Refer to schedule at end of section for surface finish schedule.

B. Colors will be selected by the Owner from color samples submitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of the General Conditions.

B. Verify that surfaces and/or substrate conditions are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Commencement of the coating operations will signify acceptance of the substrate(s) as being suitable for the coating and ability to achieve the final results specified.

E. Test shop applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
2. Concrete Floors: 8 percent. Test concrete for moisture in accordance with ASTM F 2170.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

B. Correct defects and clean surfaces which affect work of this section.
1. Remove existing coatings that exhibit loose surface defects.

C. Marks:
1. Seal with a stain-blocking primer marks which may bleed through surface finishes.

D. 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. Concrete and Unit Masonry Surfaces:
   1. Prepare all cementitious substrates referencing SSPC-SP13.
   2. Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
   3. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry.
   4. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water.
   5. Allow to dry.
   6. Application of block filler will be by roller or brush.
   7. Spraying will not be allowed.

F. Ductile & Cast 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 accepted coating manufacturer's published recommendations.

G. 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.

H. 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. Substation equipment, control panels, panel boards, and other equipment specified to receive factory finish shall not be painted.
   1. However, factory painted equipment which is chipped or defaced due to handling, installation or construction activities shall be refinished in a manner satisfactory to the Owner.

2. This shall include glazing, sanding, and refinishing entire surface to a suitable boundary to avoid a patched effect.
3. Suitable boundaries shall be changes in planes of surfaces such as corners, frames, mouldings, recesses, etc.

E. Hazardous areas, moving machinery, handrails, and all other similar areas shall be finished to agree with the Owner's Standard Safety Code and all MIOSHA requirements, as approved by the Owner.

F. Paint shop primed equipment.

G. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

H. Prime and paint exposed pipes, conduit, boxes, ducts, hangers, brackets, collars and supports.

I. Paint dampers exposed behind louvers, grilles, to match face panels.

J. Paint exposed conduit and electrical equipment occurring in painted areas.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. Contractor shall refer to the SSPC Paint Inspection: Daily Coating Inspection Report that is a part of this section of the Specifications
1. This report shall be filled out daily for every day that the painter is on site and working.
2. The reports shall be filled out in their entirety as applicable for the work being performed.
3. Provide multiple reports if necessary because the work for the day will include several coatings so each paint/coating type is properly documented.
4. All reports shall be available to the Owner and the Owner’s representative upon request at the site.
5. Copies of these daily reports shall be submitted within (7) seven days from date of work for all painting and coating work performed on this project.
6. Failure to submit reports in a timely fashion or deficient reports shall be reason to not approve the requested payment for the work.

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

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

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

3.5 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
3A	Interior Masonry Units
3B	Interior exposed precast and poured in place concrete, including interior concrete wall surfaces below grade (not specified elsewhere).
6A	Submerged & Below Grade Buried Ferrous Mechanical Equipment Components and Piping (Non-Coal Tar)

3.7 PAINTING - SYSTEMS
(Contractor shall refer to Products Section herein with regard to acceptable material manufacturers.)

A. PAINTING SYSTEM NO. 3A – New and Existing Interior Masonry units
   1. Surface Preparation - SSPC-SP 13/NACE 6. Remove loose and flaking paint, feather edges. Abrade soundly adhered coating to remove gloss.

	Min. No. of Coats per Coating Layer	Product Name	Min. Total Thickness of Coating Layer Dry	Type
Undercoat	1	Tnemec 130-6602 Envirofill	60-80 s.f. gal.	Waterborne Cementitious Acrylic
Primer	1	Tnemec Series V69 Epoxoline	4.0	Polyamidoamine Epoxy
Finish	1	Tnemec 1095 Endura Shield	4.0	Aliphatic/ Acrylic Polyurethane
Undercoat	1	Carboline Sanitile 500 Block Filler	60-100 s.f. gal.	Water Based Epoxy Filler
Primer	1	Carboline Carboguard 890 VOC	4.0	Cycloaliphatic Amine Epoxy

Finish	1	Carboline Carboguard 134 MC	4.0	Aliphatic Acrylic Polyurethane
Undercoat	1	Sherwin-Williams Cement-Plex 875	60-100 s.f. gal.	Cementitious Waterborne Block filler
Primer	1	Sherwin-Williams Macropoxy 646	4.0	Polyamide Epoxy
Finish	1	Sherwin-Williams Hi Solids Polyurethane 250	4.0	Aliphatic Acrylic Polyurethane
CONTRACTOR shall choose one of Undercoat-Primer-Finish systems listed above. *Undercoat not required at existing or previously painted masonry.* Total Thickness of System – 8.0 Dry Mils Minimum over filled surface.				

B. PAINTING SYSTEM No. 3B - Interior exposed precast and poured in place concrete

1. Surface Preparation - Same as above
   Primer and Finish - Same as above, but without Undercoat
   Total Thickness of System – 8.0 Dry Mils Min.

C. PAINTING SYSTEM NO. 6A - Submerged & Below Grade Buried Ferrous Mechanical Equipment Components and Piping (non-potable) (Non Coal Tar)

1. Surface preparation, Submerged Ferrous Metal - SSPC-SP10
2. Surface preparation, Below Grade Ferrous Metal – SSPC-SP16 and Clean ‘n Etch
3. Surface preparation, Ductile Iron Pipe – NAPF 500-03-04
4. Surface Preparation, Ductile Iron Valves and Fittings – NAPF 500-03-05

	Min. No. of Coats per Coating Layer	**Product Name**	**Min. Total Thickness of Coating Layer Dry**	**Type**
Finish	1	Tnemec G435 Perma-Glaze	40.0	Modified Polyamide Epoxy
Finish	1	Carboline Plasite 4550 S	40.0	Reinforced Epoxy Novolac
Finish	1	Sherwin-Williams Dura-Plate 6000	40.0	Reinforced Epoxy
CONTRACTOR shall choose one of Finish systems listed above. Total Thickness of System – 40.0 Dry Mils Min.				

Paint Inspection:

Daily Coating Inspection Report

Project/Client:	Date: / / M T W Th F S Su	Pg. Of
Location:	Project #:	COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____
Description:	Inspector:	Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____
Requirements:		
Contractor:	Spec #	Revision #

Description of Areas & Work Performed

Hold Point Inspections Performed

- ☐ 1 Pre Surface Pep/Condition & Cleanliness
- ☐ 2 Surface Preparation Monitoring
- ☐ 3 Post Surface Preparation/Cleanliness & Profile
- ☐ 4 Pre Application Prep/Surface Cleanliness
- ☐ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6 Post Application/Application Defects
- ☐ 7 Post Cure/Dry Film Thickness (DFT)
- ☐ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: _____

Surface Conditions

- ☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure_____
- ☐ Steel ☐ Galvanize ☐ Concrete ☐ Other_____
- ☐ Hazard _____ ☐ Sample Report # _____
- ☐ Degree of contamination: _____
- Test: ☐ Cl_____ µg/cm² / ppm ☐ Fe ____ppm ☐ pH _____
- ☐ Degree of Corrosion: _____
- ☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges
- ☐ Weld_____ ☐ Moisture ☐ Oils ☐ Other_____
- ☐ Painted Surface Condition: _____
- Dry to: ☐ Touch ☐ Handle ☐ Recoat
- ☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays
- ☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

- ☐ Solvent Clean ☐ Hand Tool ☐ Power Tool
- ☐ HP Wash PSI_____ ☐ Other _____
- ☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample
- ☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____
- ☐ Air Supply CFM _____ ☐ Air Supply Cleanliness
- ☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

- ☐ Job Specification ☐ SSPC/NACE - SP- _____
- ☐ SSPC/NACE Spec / Visual Stds ☐ _____
- Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge
- ☐ Specified_____mils avg. / Achieved _____mils
- ☐ Surface effect on DFT Gauge/BMR_____mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	:	:	:	:
Dry Bulb Temp° (C/F)	°	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	%	%	%	%
Surface Temp° (C/F) Min/Max	/ °	/ °	/ °	/ °
Dew Point Temp° (C/F)	°	°	°	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time : Finish Time : Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type:	Qty Mixed:
Manuf.:	Mix Ratio:
Prod Name:	Mix Method:
Prod #:	Strain/Screen:
Color:	Material Temp: °F
Kit Sz/Cond.:	Sweat-in Time: Min/Hrs
Shelf Life:	Pot Life: Min/Hrs
Batch #'s	Reducer #:
(A)	Qty Added: Pt/Qt/Gal
(B)	% by Vol: %
(C)	Specified WFT Avg: Mils
Reducer:	Achieved WFT Avg: Mils

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

Inspector's Signature Date

SSPC the society for protective coatings Created03/03 by

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 and stop plate 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.

B. Slide gates and operators shall be of the type and size indicated on the Gate Schedule shown on the Drawings.

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.
   1. Fabricated Stainless Steel Slide Gates shall conform to ANSI/AWWA C561

1.3 ITEMS SPECIFIED ELSEWHERE

A. Section 01300 Submittals.

B. Section 01730 O&M Manuals.

C. The requirements of Section 15000, "General Mechanical Provisions," and all other applicable sections of the Specifications, form a part of this Section and govern work covered in this Section.

D. Grout is specified in Division 03.

E. Additional details are provided in the Gate Schedule on the Process 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), operators/actuators, 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, anchor details, etc.

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. As-Constructed Wiring Diagram (for actuated gates)

H. Warranty

1.5 QUALITY ASSURANCE

A. All gates, plates, accessories, and/or appurtenances shall be by the same manufacturer, and all actuators shall be by the same manufacturer. Gate and actuator 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 the approval of the Engineer.

C. Gates and actuators 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.

G. Slide gates shall be shipped fully assembled.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fabricated stainless steel slide gates shall be by H. Fontaine Ltd., Whipps, Golden Harvest, Rodney Hunt, or Hydro Gate.

2.2 STAINLESS STEEL SLIDE GATES

A. General

1. Fabricated gates shall be of stainless-steel construction, meeting the requirements of ANSI/AWWA C561, latest edition, and shall be furnished and installed complete with wall thimbles, operating stems, stem guides, floor stands, bench stands, actuators, and other appurtenances or accessories, as specified on the gate schedule or shown on the drawings.
2. All materials used in the construction of the gates and appurtenances shall conform to the following specifications:
    a. Frame, yoke, stem guides, slide, stem extension: Stainless steel ASTM A-276 Type 316L.
    b. Side and top seals: stem guide liner ultra-high molecular weight polyethylene (UHMWPE) ASTM D-4020.
    c. Bottom (invert) seal: Neoprene ASTM D-2000 Grade 2 BC-510
    d. Compression Cord: Nitrile ASTM D-2000, M6BG-708, A14, B14, E014, E034Stem and stem couplings: Stainless steel ASTM A-276 Type 304 or 316.
    e. Fasteners and hardware: ASTM F593 and F594 GR2 for type 316.
    f. Gasket (between frame and wall): EPDM ASTM 1056.
    g. Stem cover: Lexan or Polycarbonate ASTM A-707
    h. Stem thrust nut: ASTM A276, type 316 for rising stems, bronze ASTM B584 Alloy 432 for non-rising stems.
    i. Anchors: stainless steel 316, epoxy anchored, unless noted otherwise on the drawings.
    j. Wall thimble: ASTM A276, 316
    k. Pedestal: 316L Stainless steel
    l. The seals shall be mounted so as not to obstruct the water way opening.
    m. When the width of the gate opening multiplied by the maximum design head is greater than 80 square feet, the portion of the slide that engages the guide members shall be of a “thick edge” design. The thick edge portion of the slide shall have a minimum thickness of 3 inches.
3. Frames
    a. Frames shall be designed to the ultimate or yield strength safety factors per ANSI/AWWA C561 standards. All members shall have a minimum thickness of ¼ inch.
    b. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
    c. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flush bottom type on upward opening gates. A rigid stainless-steel member shall be provided across the invert of the opening on downward opening weir gates. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
    d. The means of mounting for each gate is shown on the gate schedule or drawings. Surface mounted frames shall have a gasket installed between the wall and gate.

4. Gate slides shall consist of a flat plate reinforced with formed plates or structural members to limit its deflection to ANSI/AWWA C561 standards under the maximum design head. Stems shall be anchored to the slide by thrust nut.
5. Seats and Seals
   a. Seats and seals shall be designed to meet the ANSI/AWWA C561 leakage rate. Seats and seals shall be self-adjusting by a full-length compression cord and secured to the gate frame or slide in a manner that will not loosen or distort for the life of the gate. The UHMW guide slot seals shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position.
   b. The sealing system shall maintain efficient sealing in any position of the slide and allow the water to flow only in the opened area of the gate.
   c. For upward opening gates, the bottom seal shall be made of resilient neoprene set into the bottom member of the frame and shall form a flush bottom. For downward opening weir gates, the bottom seal shall be UHMWPE, secured to the bottom frame. Top seals shall be UHMWPE, secured to the frame chord.
   d. When required to meet leakage rates, wedges and/or pressure pads shall be provided to ensure seat contact when fully closed. Wedges shall be adjusted and set in the factory and inspected by the manufacturer prior to installation. Wedge pressure plates can be bronze.
   e. The seal system shall have been factory tested to confirm negligible wear (less than 0.01”) and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit. Provide test report with shop drawing submittal.
6. Stem
   a. Gate stems shall be designed for the manual or actuated thrust and compression loads and safety factors established in ANSI/AWWA C561. Stems shall be machined.
   b. Stem couplings shall be threaded and keyed and shall be of greater strength than the stem.
   c. Rising stems shall be secured to the slide via threaded thrust nut keyed to the stem. Non-rising stems shall be threaded but not keyed. Stem shall be rising unless noted otherwise.
   d. Stem guides shall be provided to maintain L/R ratio less than 200. The guide shall be equipped with an UHMWPE bushing. (Greaseable bushings are not acceptable.) Guides shall be adjustable and spaced in accordance with the manufacturer’s recommendation, or as shown on the drawings. Where guides are not shown on the Drawings, it is imperative that the Manufacturer coordinate their locations with the Contractor so that the placement of stem guides does not interfere with any equipment, conduits, etc.
   e. Each gate requires a stem cover, of sufficient diameter and length to permit full, unobstructed travel. Covers shall be vented and mounted to an adaptor plate suitable to the actuator manufacturer. When clear stem covers are specified, each cover shall be graduated in one-inch increments between full open and full closed positions to show the position of the gate at all times. (Graduations are not required for steel covers.) The valve position indicator shall be compatible with and coordinated with the valve operator.
   f. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

g. The stem shall be constructed of solid stainless-steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
h. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown on the Contract Drawings.
i. In compression, the stem shall be designed for a critical buckling load caused by a 40 lb. effort on the crank or handwheel with a safety factor of 2, using the Euler column formula.
j. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16 micro inch finish or better. Stub threads are not acceptable.
k. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.

7. The fully assembled gates shall be shop inspected, tested for operation and adjusted before shipping. There shall be no assembling or adjusting on job sites.
8. Gates twice as wide as the height or greater, require dual stems on a single drive, connected by a 316 SS cross-over coupling.

B. Self-Contained Stainless-Steel Slide Gates (Type SCG)

1. Self-Contained Slide Gates shall comply with the provisions of Section 2.2.A above.
2. Gate frames shall be self-contained and upward opening. Frames shall be designed to contain all thrust forces, and shall be embedded, surface mounted or mounted on a wall thimble as noted in the gate schedule or shown in the Drawings.
3. The gate frame and yoke shall be designed such that the centerline of the operator or actuator shall be 42 inches AFF.
4. The entire assembly, frame, gate and stem shall be shipped as one unit to the site.
5. Stem guides shall be supported by the gate frame and removable so that the slide and UHMWPE seals can be easily removed and replaced.
6. Gate yokes shall be designed for the thrust and safety factors established in ANSI/AWWA C561. Yokes shall be removable such that the slide and UHMWPE seals can be easily removed and replaced.
7. Wherever possible (depending on gate travel and interference) the upper gate frame and cross member shall be located below the deck and grating
8. The section of the gate frame located above the operating floor shall be equipped with two channel section cross members and a 4” high kick plate bolted to both sides of the frame. The cross member and kick plate elevations above the floor shall comply with the standard handrail details indicated on the Drawings.
9. When a flush mounted installation is not available the frame shall be designed such that the actuator is approximately 42” AFF.

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.

2.4 MANUAL GATE OPERATORS

A. Unless otherwise shown on the Drawings, gates shall be operated by a manual handwheel or a manual crank-operated gearbox. The operator shall be mounted on the yoke of self-contained gates or on the pedestal of non-self-contained gates.
   1. The gate manufacturer shall select the proper gear ratio to ensure that the gate can be operated with no more than a 40 lb. effort when the gate is in the closed position and experiencing the maximum operating head.
   2. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.

B. Manual Handwheel
   1. Operators shall be fully enclosed and shall have a cast aluminum housing.
   2. Provide with threaded cast bronze lift nut to engage the operating stem.
   3. Equip operators with roller bearings above and below the operating nut.
   4. Provide positive mechanical seals above and below the operating nut to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
   5. The handwheel shall be removable and shall have a minimum diameter of 15 inches.

C. Manual Crank-Operated Gearboxes
   1. Shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
   2. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
   3. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
   4. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
   5. Gears shall be steel with machined cut teeth designed for smooth operation.
   6. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.
   7. Provide positive mechanical seals on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
   8. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
   9. The crank shall be removable.

D. All gates having widths greater than twice their height shall be provided with two gearboxes connected by an interconnecting shaft for simultaneous operation.
   1. Interconnecting shafting shall be constructed of aluminum or stainless steel.
   2. Flexible couplings shall be provided at each end of the interconnecting shaft. Couplings shall be stainless steel or non-metallic.
   3. One crank shall be provided to mount on the pinion shaft of one of the gearboxes.
   4. If the operating assembly is motorized, a stainless-steel enclosure shall be provided over the interconnecting shaft to comply with OSHA regulations.

E. An extended operator system utilizing chain and sprockets shall be furnished by the manufacturer when the centerline of the crank or handwheel, on a non-geared operator, is located over 48 in above the operating floor. Chain wheels are not acceptable.
   1. A removable stainless steel or aluminum cover shall be provided to enclose chain and sprockets.

2. The extended operator system shall lower the centerline of the pinion shaft to 36 in above the operating floor.
3. A handwheel may be utilized in conjunction with a gearbox in lieu of the extended operator system if the centerline of the pinion shaft is 60-in or less above the operating floor.

F. Pedestals
1. Shall be constructed of stainless steel.
2. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36 in above the operating floor.
3. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be constructed of stainless steel.
4. Wall brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb. effort on the crank or handwheel.
5. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the ENGINEER. The gate manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.

G. Operators shall be equipped with fracture resistant clear butyrate or Lexan plastic stem covers.
1. The top of the stem cover shall be closed.
2. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
3. Stem covers shall be complete with indicator markings to indicate gate position.

H. When shown on the Contract Drawings, provide 2-inch square nut, mounted in a floor box, with a non-rising stem.
1. The square nut shall be constructed of bronze.
2. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
3. Provide one aluminum or stainless-steel T-handle wrench for operation.

PART 3 EXECUTION

3.1 GENERAL

A. Field measure all gates and channels prior to shop drawing fabrication.

3.2 INSTALLATION

A. Gates must be clearly marked prior to shipment. Provide gate tags per Section 15000.

B. Gate vertical side members are to be installed surface mount. The gate bottom chord is to be embedded into the floor, flush to the floor surface. (See drawing details.) Manufacturer to review these details prior to the bid. If anchoring the new gate through the abandoned-in-place gate frame is unacceptable, notify the Owner prior to the bid.

C. Installation of the gates and appurtenances shall be done in a workmanlike manner and in accordance with the manufacturer's direction. 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.

D. The Contractor shall review the manufacturer's installation drawings and installation instruction prior to installing the gates.

E. For surface 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. Contractor shall align the frame true and plumb, fill the void with non-shrink gout, then tighten all bolts sequentially.

3.3 INSPECTION REQUIREMENTS

A. Factory gate and actuator 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 and stop plate.

3.4 SPARE PARTS

A. The following spare parts are required.
1. Actuator thrust bushing for all gates.

3.5 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 11310

SCREW PUMPS

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish, install and place in satisfactory operating condition open screw pump assemblies and appurtenances as shown on the Drawings and described in the Specifications.

B. The work under this section is intended to include the necessary materials and workmanship which are required for the completion of the pumping equipment, as shown on the Drawings, unless otherwise specified. 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.

C. The requirements of Section 15000 and all other applicable sections of the Specifications form a part of this Section and govern work covered in this Section.

1.2 REFERENCES

A. American National Standards Institute (ANSI)

B. American Institute of Steel Construction (AISC)

C. American Iron and Steel Institute (AISI)

D. American Society of Testing and Materials (ASTM)

E. American Society of Civil Engineers (ASCE)

F. American Welding Society (AWS)

G. American Gear Manufacturer’s Association (AGMA)

H. Steel Structures Painting Council (SSPC)

1.3 ITEMS SPECIFIED ELSEWHERE

A. Schedule of Pricing/Cost in Section III of procurement section of these Specifications.

B. Section 01600, “Materials, Products and Equipment.”

C. Section 01730, “Operation and Maintenance.”

D. Painting of all items installed as a part of this Section shall be as specified in Section 09900, unless specifically called for otherwise in this Section or applicable associated Sections.

E. General Mechanical provisions are specified in Section 15000.

1.4 SUBMITTALS

A. Provide submittals as described in Section 01300

B. Submit manufacturer's installation instructions for review prior to equipment installation.

1.5 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 Division 16 of these Specifications.

1.6 SYSTEM DESCRIPTION

A. Pump demolition and installation shall include the following:
   1. Pump Nos. 1, 2 and 3 at the Raw Sewage Lift Station: Lower bearing, screw, deflector plate, grout and/or concrete, upper bearing, and couplings, and demolition only of the lower bearing grease system. A price is also requested for demolition of the existing electric drive motors and gear reducers, and the Owner will determine the final scope of work for these three pumps during evaluation of the Bids.
   2. Pump Nos. 4 and 5 at the Raw Sewage Lift Station: Demolition of existing pump guards and installation of new guards supplied by the Owner as described on the Drawings.
   3. Pump Nos. 6, 7 and 8 at the Retention Basin: Lower bearing, screw, deflector plate, grout and/or concrete, upper bearing, couplings, electric drive motor, and gear reducer, and demolition only of the lower bearing grease system.

B. For Pump Nos. 1, 2, 3, 6, 7, and 8, each screw pump shall be furnished complete with spiral steel flighted screw assembly, profile plates, upper and lower stub shafts, upper and lower support bearing assemblies (sealed lower bearing), flow deflection plates, V-belts and sheaves, couplings, guards, and all necessary anchorage parts. Electric motor drives and reducers shall also be included per the final scope of work determined by the Owner.

C. Design Parameters Raw Sewage Lift Station Screw Pumps:
   1. Number of Pumps Being Replaced 3
   2. Pump Flow Capacity .....12,500 gallons per minute
   3. Total Head .....20.5 feet
   4. Pump Diameter.....72 inches
   5. Number of Flights .....2 per screw
   6. Screw Rotational Speed .....33 rpm
   7. Number of Motor/Gear Reducers being Replaced.....3*
   8. Motor Size .....100 hp
   9. Motor Speed .....1,800 rpm

   *Owner will determine if this item will be part of the proposed scope of work during bid evaluation.

D. Design Parameters Retention Basin Screw Pumps:
1. Number of Pumps Being Replaced 3
2. Pump Flow Capacity .....12,500 gallons per minute
3. Total Head .....17.9 feet
4. Pump Diameter.....72 inches
5. Number of Flights .....2 per screw
6. Screw Rotational Speed .....34.6 rpm
7. Number of Motor/Gear Reducers being Replaced.....3
8. Motor Size .....100 hp
9. Motor Speed .....1,800 rpm

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The Base Bid screw pump shall be manufactured by Spaans Babcock, Epic International, or Lakeside Equipment Corporation. No substitutions allowed, as described in Specification Section 01600.

B. The Contractor may elect to provide pricing for one or more manufacturers on the Schedule of Pricing/Cost in Section III of procurement section of these Specifications.

2.2 SPIRAL SCREW

A. The new screws shall be designed to be installed properly within the existing trough without modification to the existing structure of the troughs, wet well or Screw Pump Building beyond what is described in the Contract Documents.

B. The spiral screw shall be fabricated from ASTM A36 steel. Dimensions and number of screw flights shall be as noted previously. Flights shall be helical shaped and continuously welded on both sides to the torque tube. There shall be no more than one flight butt weld per pitch, and all flight butt welds shall be full penetration joints. Each flight segment is to be positioned and welded in place such that each flight is perpendicular to the axis of the center tube.

C. Center tube is to be sealed with end plates using continuous full penetration welds.

D. The center torque tube shall be designed to limit deflection to a maximum of 5/32 inch (4 mm) calculated with the pump axis in a horizontal plane supported by the upper and lower bearings. Circumferential welds of adjoining sections are to be full penetration welds with a backing ring of the same thickness as the center tube wall, welded to both sides of the joint in the inside of the center tube. Calculations for deflection and bearing loads shall be based on the dead weight of the screw plus the full weight of liquid being pumped. Decreased loading from buoyancy effects shall not be considered in the design calculations.

E. After full welded assembly of the spiral screw, mount in a precision lathe and finish cut or grind the outside diameter to the specified measurement. Machine the end plates to ensure they are perpendicular to the pump axis and parallel to each other.

2.3 PROFILE/DEFLECTION PLATES

A. Install profile plates to act as an extension of the trough, curving around the update side of the screw to deflect liquid as the screw rotates.

B. The flow deflection plate shall be fabricated of not less than 1/8 inch stainless steel plate complete with stiffeners where required and stainless steel anchors on 2 foot centers at the bottom edge.

C. The deflection plate top edge shall have adjustable stainless steel anchors at not more than 8 foot centers. Each section of profile plate must be adjustable to provide accurate clearance between the flight edge and the profile plate. Design clearance between the profile plates and the flights shall not be more than 0.25".

D. After installation, any cavities between the flange and the concrete trough are to be filled with grout by the contractor.

2.4 SPLASH PLATE

A. Provide a splash plate fabricated from mill certified A36 or RST-37-2 carbon steel with a minimum thickness of 1/8-inch (3 mm).

B. Design the splash plate to be split at the upper shaft centerline and to seal the drive area from the pump area.

C. The seal plate perimeter shall be installed such that it creates a gas-tight seal between the Screw Pump Building and the wet well. Manufacturer shall provide details on Shop Drawing submittal for method to support and seal upper bearing housing around seal plate shaft opening.

2.5 LOWER BEARING

A. The lower bearing and housing shall be designed to operate continuously when operating in open air, submergence or partial submergence. The bearing shall accept radial loads only and shall allow for free axial expansion of the screw. The lower bearing shall be replaceable without the removal of the screw pump spiral assembly or the base anchor.

B. Manufacture the bearing assembly to consist of a spherical roller, sealed bearing, a high carbon content steel stationary shaft, grease seals, a cast iron base, a cast iron hub flange and attached to the lower center tube end plate. The seals shall be located below the roller bearing and positioned such that debris from the wastewater will fall away from the seals and thus less likely to enter the bearing. No external grease lubrication system shall be required for this lower bearing.

C. Provide the bearing assembly to be delivered with a shipping and installation frame to maintain the lower bearing assembly in exact alignment during installation. Adjustable bearing housings that will allow realignment after installation will not be acceptable.

D. Provide the bearing to be completely protected by a stationary polyurethane shroud, manufactured in two halves to facilitate its removal.

E. Lower bearing shall be rated at a minimum of 100,000 hours AFBMA L10 theoretical design life, based on the dead weight of the screw plus the full weight of the liquid being pumped.

2.6 UPPER BEARING

A. The upper bearing and housing shall be designed to accept all thrust and radial loads for al operating conditions, exert all reaction forces on and into the support base and be manually grease lubricated.

B. All of the thrust load from the pump shall be carried by a spherical roller thrust type bearing assembly and the upper screw pump radial load shall be carried by a spherical roller bearing. A single dual purpose bearing will not be acceptable.

C. The two bearings (radial and thrust) shall be positioned in the bearing housing so that the pressure center of the thrust bearing and radial bearing intersects the axis of the screw at the same point to provide true self alignment in all planes

D. Upper stub shaft shall be grooved and positively locked into the upper bearing assembly by a split collar and locking halter ring. Use of threaded nuts to lock bearings and shafts for support of thrust loading will not be acceptable.

E. A split bearing housing shall be provided to allow removal of the cover for inspection of the bearings without removal of the stub shaft or the entire bearing assembly.

F. Both radial and thrust bearings shall be rated at a minimum of 100,000 hours AFBMA L10 theoretical design life, based on the dead weight of the screw plus the full weight of the liquid being pumped.

2.7 ANTI-ROTATION DEVICE

A. Provide a lubricated anti-rotation device mounted on the motor and sized to prevent backward rotation of the screw pump on power failure or stopping.

2.8 SPEED REDUCER

A. Provide for the screw pump, a totally enclosed, oil lubricated, air cooled, foot mounted, helical/bevel right-angle/parallel shaft speed reducer. Design for continuous duty with moderate shock loading and size not less than 1.5 times the absorbed power or 1.0 times the drive motor nameplate rated torque at the screw pump design speed whichever is greater.

B. Bearing life expectancy: 100,000 hours B-10

C. Manufacture to Quality Class No. 11 as per AGMA Standard 390.03 Gear Classification Manual.

D. Gears to run in an oil bath with ample capacity suitable for continuous operation in the angular mounting position corresponding to the inclination angle of the screw pump installation.

E. Provide the housing to be complete with removable inspection covers, oil filler and drain, oil breather and oil level indicators.

F. Treat, or protect, at the point of manufacture, all internal surfaces to prevent corrosion during shipment and/or storage.

G. Treat, or protect, at the point of manufacture, exposed shafts to prevent corrosion during shipment and/or storage.

2.9 V-BELT DRIVE

A. Connect between the drive motor and the input shaft of the speed reducer with a multiple V-belt drive, complete with sheaves and matched V-belts.

B. Provide the drive to be sized for not less than 1.5 times the absorbed power or 1.0 times the drive motor nameplate rated power, whichever is greater.

C. Provide safety guards for V-belt drive and slow speed coupling designed to OSHA requirements and are to be easily removable for inspection and maintenance.

2.10 MOTOR

A. Provide the electric drive motor to be of sufficient size to operate the screw pump at its design rated capacity at less than 90% of the drive motor nameplate power rating.

B. Comply with NEMA Premium Efficiency Standards.

C. Provide the motor with the following characteristics:
1. TEFC enclosure,
2. Efficiency: Meet or exceed EPACT values at full load and rated voltage when tested in accordance with ANSI/IEEE 112. High efficiency or energy efficient motors shall be in accordance with NEMA Standard MG-1-12.55 and efficiencies shall equal or exceed the efficiency values listed in NEMA MG-1 Table 12-10,
3. Speed and torque curve compatible with screw pump demand,
4. Synchronous speed not to exceed 1800 rpm,
5. 1.15 service factor with respect to nameplate rating,
6. Suitable for full voltage starting at 460volt/3 phase/60 Hertz power supply,
7. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate,
8. Class F insulation,
9. Diagonally split, gasketed, cast type terminal box complete with threaded hub for conduit entry,
10. Heavy duty eye-bolts and,
11. A rugged motor slide base to give means of adjusting V-belts,
12. Manufacturers:
    a. General Electric.
    b. Reliance.

c. U.S. Motors.

2.11 BASE PLATE

A. Screw Pump manufacturer to provide a fabricated steel base mounting base plate for the complete drive system.

2.12 LIFTING LUGS

A. Provide lifting lugs on all components great than 100 pounds.

2.13 SHOP COATING AND PAINTING

A. Provide surface preparation and coating as specified in Section 09900

B. Provide touch up paint. Field prepare and recoat any surfaces damaged during installation of the pumps in accordance with the coating manufacturer's instructions.

2.14 SPARE PARTS

A. One set of replacement wear parts and seals for the lower bearing assembly

B. One set of replacement wear parts and seals for the upper bearing assembly

C. One set of matched V-belts

PART 3 EXECUTION

3.1 GENERAL

A. Perform all installation activities according to the manufacturer's recommendations.

B. The Contractor shall furnish and install all necessary supports, framing, hangers, driving mechanisms, shafting, coupling guards, belt guards, motors, and all other appurtenances necessary for complete equipment installation.

C. Prior to assembly, coat all stainless steel bolts and nut threads with a non-seizing compound.

D. Touch-up any areas where coatings have been damaged or compromised prior to equipment startup.

3.2 TROUGH PREPARATION

A. Prepare the concrete trough and apply grout as directed on the drawings and in accordance with the manufacturer's recommendations.

B. Remove excess grout form screw. Screw must be free of grout after screeding operation.

3.3 FIELD ACCEPTANCE TESTS, INSTALLATION AND COMMISSIONING

A. Provide a factory trained representative to supervise the installation and aligning of the screw pump and check the installation thoroughly prior to the equipment being fixed in its final position. Also, provide a representative to be present during commissioning.

B. Provide to the following schedule:
   1. One trip of two days per pump for installation and alignment check and
   2. One trip of two days per pump for start-up and commissioning and
   3. One trip of a single day for operator training. Training shall be for 2 to 4 hours for the Plant's day shift and night shift, resulting in two (2) training sessions total. Training shall be performed on a Tuesday or Wednesday (excluding holidays) at 9:00 AM and 9:00 PM for the day shift and night shift, respectively. Classroom segments for training are not required.

C. Provide a per diem rate in the event additional time is required.

D. Provide a report authored by the factory trained representative indicating that the installation and balancing have been executed properly.

E. After the installation has been approved by the manufacturer, utilize each screw pump for a dewatering operation under typical conditions. Evaluate the actual installed flow rate to confirm that the pump meets the flow rate specified.
   1. Submit testing plan to engineer prior to testing. All test procedures shall be in accordance with the submitted testing plan.
   2. Submit certified results of tests for all tests conducted
   3. If a pump performance does not meet the Specifications, corrective measures shall be taken or the pump shall be removed and replaced with a pump which satisfies the conditions specified.

F. All costs associated with inspections, field tests or any required corrective action shall be borne by the Contractor.

3.4 NOISE TESTING

A. All noise levels produced by the specified equipment in a free field at all points 5-feet from the equipment shall not exceed 85-decibels when measured by a sound level meter meeting ANSI S1.4-1971, "Specification for General Purpose Sound Level Meters" set to "A" weighting and slow response.

B. Where noise or vibration appears to be excessive, provide approved testing services and test to verify the limits

C. If testing indicates noise and/or vibration are outside the specified limits, take corrective action and retest to ensure full compliance with the specifications.

D. All costs associated with the field tests or any required corrective action shall be borne by the Contractor.

3.5 WARRANTY

A. Submit a manufacturer's warranty for work of this Section against defects in workmanship and materials for a period of twelve (12) months after acceptance or eighteen months after delivery, whichever occurs first.

END OF SECTION

SECTION 15000

EQUIPMENT, GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. This section is comprised of standards of 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 Equipment Specifications to ascertain which systems he is required to provide. Construction methods and materials for special systems, not described in this section are specified under the detailed section to which they apply. Where more stringent construction methods are required than imposed by this section, they are specified in the detailed sections and shall apply.

1.2 WORK INCLUDED

A. These specifications and the accompanying drawings are intended to comprise the furnishing, layout, coordination and installing of all materials, equipment, ancillary components and supplies as specified herein and required for the satisfactory completion by the Contractor of all work including the installation of any Owner furnished equipment.

B. The drawings and these specifications are complementary to each other in that all components, 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 components 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 SUBMITTALS

A. Shop drawings are required for each item of equipment, apparatus, device and piping furnished, refer to section 01300. Each shop drawing submittal shall include as a minimum the following information.

B. Submit operation and maintenance manuals per Section 01730

C. In addition to the hard copies, the Contractor shall furnish an indexed, searchable (no scans allowed) portable document file (PDF) of the entire manual, as outlined above, on two compact discs (either CD or DVD format), USB drives or other portable media device.

D. Submit equipment and valve tag list prior to engraving.

E. As-Built drawings are required for all equipment.

PART 2 PRODUCTS

2.1 AREA DESIGNATIONS AND MATERIALS

A. Unless otherwise specified, materials for miscellaneous metals, products such as anchors, hangers and supports, hardware (nuts, bolts washers), and spacers/plates etc. shall be designated in accordance with the atmosphere, location and/or condition of service. The following table shall be used to select materials:

Area Designation	Process/Building Areas	Materials
Chemically Corrosive	Chemical Feed Facilities such as ferric/ferrous chloride, caustic, chlorine, and chlorine compounds	PVC, FRP, HDPE, PVDF, 316 SS and Titanium. Material selection must be compatible with the product. (Note: SS shall not be used directly with chlorine related compounds.)
Corrosive	Structures containing water and wastewater such as preliminary primary, secondary and tertiary tanks, chambers, wet wells, etc.	304 (L) / 316 (L) SS, brass or bronze.
Mildly Corrosive	Below grade facilities such as pipe galleries, dry wells, vaults, etc.	304/316 SS for materials and products attached to floor, galvanized carbon steel for all other areas.
Neutral	At and above grade buildings, rooms and facilities such as Administration Buildings, electrical and control rooms, service buildings, garages, etc.	Painted/coated carbon steel

B. STAINLESS STEL

1. 304L and 316 L – Low Carbon stainless steel – shall be used for all welding applications. 304/316 shall be used for all other applications. 316 (L) shall be used for all applications visible without confined space entry.
2. Stainless steel shall meet ASTM A240, A 312, A403, A774, A778, and must be pickled.

C. PVC, FRP, HDPE, PVDF plastics and other materials must be appropriate for the chemical/application. Contractor shall submit materials suitable for the process.

2.2 EQUIPMENT ANCHORS

A. All equipment anchors shall be designed by the equipment manufacturer. Materials shall comply with the environment and conditions. Anchors can be provided by the contractor.

2.3 HAZARDOUS MATERIALS

A. No Asbestos, Polychlorinated Biphenyl (PCB) or Mercury containing materials shall be allowed on the job site.

B. No asbestos gaskets, packing insulation, etc. shall be furnished as a part of any item provided under these specifications.

2.4 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 approved by the Owner. Where equipment is furnished by the manufacturer with non-approved 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.

C. All oil fill and drain parts shall be plumbed to provide east of access to fill and train each port. Ball cocks shall be provided to help facilitate oil maintenance regardless of whether or not they are shown on the drawings.

2.5 NAMEPLATES

A. Each major component of equipment, unless otherwise specified, shall have the manufacturer's name and catalog number on a stainless steel 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 identify the serial number and give data pertinent to the operation and characteristics of the equipment. Motor nameplates shall provide all motor information.

B. Provide 2 spare nameplates and turn over to owner.

C. All equipment installed shall be identified in accordance with the following unless otherwise indicated on the drawings.

D. Individual pieces of equipment and valves shall include tags identifying the serial numbers and equipment/valves numbers as called for on the drawings. Tags shall be white laminated plastic with engraved black letters. Equipment and valve tags can be secured with zip-ties, if acceptable to owner.

E. The tags 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 approved by the Owner.

2.6 VEE BELT DRIVES

A. Drive guards conforming to OSHA requirements shall be furnished and installed on all drives. Guards shall be easily removable, of material suitable for the environment, and painted safety yellow. Slotted openings to facilitate removal which are large enough to allow finger penetration shall be blocked by an adjustable cover.

2.7 GUARDS FOR DRIVES AND ROTATING PARTS

A. Unless guards are provided integral with the equipment each belt drive shall be enclosed in a galvanized 16 gage sheet steel guard, fastened to an approved structural iron frame. The frame shall be built in sections and bolted together for easy removal. The guards shall be securely fastened to the equipment housing. Convenient access doors shall be provided at shaft centers.

B. A solid guard of No. 16 gage galvanized steel shall be installed over the coupling of each item of direct driven equipment. Sides are not required on guards installed on horizontal couplings except to insure rigidity.

C. All guards shall meet the requirements of MIOSHA regulations for Machine and Equipment Guards.

2.8 INSERTS AND ANCHOR BOLTS

A. All equipment which must be secured to concrete walls, ceiling slabs, columns and other building masonry (except floors) shall be attached by means of approved inserts embedded in concrete or masonry.

B. Inserts shall be continuous slotted inserts approximately 1-5/8" wide, 1-3/8" deep by length as required, roll formed not less than 12 gage steel into slotted "U" conformation for 5/8 in. bolt size unless otherwise indicated, with anchors spaced on not more than 6 in. centers, plates and bolts and nuts as required by conditions, shall be provided. Slotted inserts shall be Gateway Erectors, Inc., Type "G", Hohman and Barnard Type CH05, or equal.

C. Equipment to be secured to floor slabs or concrete bases shall be fastened down with approved cast in place anchors.

D. Drilled expansive anchor bolts are permissible provided that electric hammers are used, and that the specific hammers have been approved for the purpose by the Owner. Anchor bolts shall be Wejit, Parabolts, Kwikbolt, or equal. All bolts shall be stainless steel coated with anti-seize compound prior to assembly.

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 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. Bench marks outside of the building shall be used from which lines and grades required for installation of mechanical work may be set.

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 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 contractors for the various trades involved, at the Contractor's expense.

B. The Contractor shall provide openings in the floors, manholes, walls, etc., as required for the installation of the piping and equipment.

3.4 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.

3.5 STORAGE AND HANDLING OF MATERIALS AND EQUIPMENT

A. The Contractor shall comply with provisions in 01600.

B. Materials and equipment may be stored on the site in locations designated by the Owner.

3.6 MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION

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.

B. Contractor shall comply with provisions of Section 01600.

3.7 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.

3.8 EQUIPMENT BASES

A. All equipment on concrete floors shall be mounted on minimum 6" high concrete pads, unless otherwise specifically noted on the drawings or specifically not required by the equipment manufacturer for proper installation.

B. All motor driven equipment installed by suspension from the 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 are 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 set on concrete pads.

D. The Contractor shall be responsible to construct structural bases, integral with floor slabs, where they are required by the specific equipment to be installed. These bases shall be sized as recommended by the manufacturer of the equipment. The Contractor shall arrange for their pouring at the same time as the floor slab. All costs incidental to the pouring of these bases shall be the responsibility of the Contractor including modification of the details as shown on the drawings.

E. All structural steel pump bases shall be curbed, as detailed on the drawings to retain seal leakage and enable its collection.

3.9 COORDINATION

A. Before proceeding with installation of equipment, 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.

3.10 WELDER QUALIFICATIONS AND PROCEDURES

A. All welding of piping covered by this specification, regardless of conditions of service, shall be performed according to these provisions.

B. For high pressure systems, 250 psi and above, pipe welding shall comply with the provisions of the latest revision of the following applicable codes, rules or regulations.
   1. Rules for construction of power boilers (Sections I, VI, and appendix, ASME Boiler and Pressure Vessel Code).
   2. Qualification standard for welding procedures, welders, and welding operators (Section IX ASME Boiler and Pressure Vessel Code).
   3. Code for pressure piping ANSI 831.1 with supplement No. 1 ANSI B 31.1A.
   4. State or local requirements as may supersede the above codes.

C. Standard procedure specifications and welders qualified by the national Certified Pipe Welding Bureau shall be considered as conforming to the requirements of these specifications.

D. Each welder shall provide proof of certification for both the material being welded and the techniques being utilized.

E. All pipe welding may be by either oxy-acetylene or arc method, and shall be done by approved 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.

F. 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.

G. Long radius welding ells shall be used in changing pipe directions of welded pipe lines. Mitered joints shall not be used unless specifically approved by the Owner in writing.

H. When welding cement mortar lined pipe, the contractor shall ensure that no damage is done to the lining.

3.11 ACCEPTANCE TESTS

A. Upon completion of 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 presence 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 operation point, and shall fully demonstrate the ability of each piece of apparatus to perform as herein required and/or as called for on the 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. Comply with equipment demonstration in Section 01650.

D. 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 175 degrees Fahrenheit (80 degrees C).

E. The Contractor shall provide all materials and labor necessary to perform these tests.

F. This Specification shall apply unless more stringent tests are outlines for a particular item of equipment.

3.12 DISPOSAL OF SALVAGED MATERIAL

A. All existing piping, valves and equipment which are required to be removed as part of this project shall be cleaned by the contractor and stored at a location on the site as designated by the Owner.

3.13 MAXIMUM PERMISSIBLE NOISE LEVEL

A. All steady or cyclical noise levels produced by machinery or equipment at the operator's position, and at all other points five feet from the equipment, shall not exceed 85 decibels (unless otherwise specified) when measured by a sound level meter meeting ANSI S1.4-1971, "Specification for General Purpose Sound Level Meters" set to "A" weighting and slow response.

3.14 ALIGNMENT

A. Piping connections to all pumping equipment shall be disconnected after installation and prior to alignment, in the presence of the Engineer, to verify that no strain is being placed on the pump nozzles by the piping. Movement shall not exceed 0.002 inches.

B. Laser alignment systems shall be utilized unless otherwise approved by the Engineer. A report shall be issued to the owner that documents, as a minimum, the date, time, technician, alignment tolerance (as specified by the manufacturer), initial and final shaft orientations (gap, angular and offset measurements), and the changes made. The report shall describe the instruments and methods used to measure and calculate the machine moves. It shall describe any other measurements or abnormalities detected including but not limited to:
   1. Shaft runouts
   2. Uneven bases
   3. Soft foot corrections

C. Equipment shall be realigned after running for a sufficient period of time which establishes a consistent temperature rise. Where shims are required, they shall be stainless steel, commercially die-cut, and not more than three can be used at one location.

3.15 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.

B. Vibration test shall be performed by a certified technician acceptable to the Owner.

3.16 CONNECTIONS

A. Provide unions to all equipment w/ connections less than 3 inches in diameter and Victaulic or Dresser style for equipment 3 inches and above.

B. Provide dielectric unions on all dissimilar metal connections

C. Provide thrust-restrained Dresser style connections on all pressurized pipe over 10 psi.

END OF SECTION

SECTION 15170

MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General requirements for electric motors furnished on equipment specified in other Sections, including single phase and three phase electric motors.

1.2 RELATED WORK

A. Division 16 - Electrical.

1.3 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.

D. ANSI/NEMA MG1 - Motors and Generators.

E. ANSI/NFPA 70 - National Electrical Code.

F. UL 674 - UL Standard for Safety Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01300.

B. Submit test results verifying nominal efficiency, inrush current, and power factor for three phase, high efficiency, or energy efficient motors.

C. Submit manufacturer's installation instructions under provisions of 01300.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01700.

B. Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable electrical codes and ANSI/NFPA 70.

B. Conform to UL Component Recognition for appropriate sizes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

C. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.8 WARRANTY

A. Provide one year manufacturer's warranty under provisions of Section 01700.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General Electric.

B. ABB Baldor Reliance.

C. U.S. Motors.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Motors: Design for continuous operation in 40 degrees C ambient, and for temperature rise in accordance with ANSI/NEMA MG1 limits for insulation class, Service Factor, and motor enclosure type. Motor speed shall not exceed 1800 RPM, unless specified otherwise.

B. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over-temperature protection.

C. Each electric motor shall be designed, constructed, and tested in conformity with all requirements of the applicable standards of the IEEE, NEMA, and ANSI, except as modified herein.

D. The electric motors, unless otherwise specified, shall be of the totally enclosed, fan cooled, squirrel cage induction type, designed for continuous operation. Each motor shall have sufficient horsepower rating so that the motor current at rated voltage shall not exceed the nameplate rating under any condition of operation of the respective equipment.

E. The motors hall be rated for continuous duty operation using Class F insulation suitable for operation in an ambient temperature of 40 degrees C.

F. The motor speed shall not exceed 1800 rpm, unless otherwise specified.

G. The motors shall be equipped with grease lubricated ball bearings and grease fitting(s), with the lubrication type and schedule clearly identified in the submittals.

H. NEMA Premium Efficiency type except for submersible motors.

I. The motor terminal leads shall be brought outside the motor frame to an approved terminal box mounted on the side of the motor and the leads shall be equipped with terminal lugs. Oversize terminal boxes shall be provided where specified or so indicated on the Drawings. The motor frame shall have drain plugs.

J. Where called for in specific sections of these Specifications, special quiet motors shall be provided.

K. For motors used for pumping applications, the pump brake horsepower (bhp) requirements shall not exceed the motor nameplate horsepower (hp) under the operating conditions as listed in the applicable equipment schedule.

L. Inverter Duty. All motors indicated by the equipment schedule for variable-speed duty shall be designed for use on Variable Frequency Drives without external filters or cable length limitations with the following requirements:
1. Listed meeting NEMA MG1 Part 31
2. Inverter-grade, 1600 volt
3. Service factor of 1.0 when operated from a VFD
4. Normally closed thermostat on stator windings

M. Shaft Grounding Ring
1. Motor windings shall be able to withstand the voltage spikes per NEMA MG1 Part 31.4.4.2 and protect against overheating when the motor is operating at slow speeds.
2. Shaft grounding rings shall be provided and installed by the motor manufacturer and shall be installed in accordance with the manufacturer's recommendations.
3. Motors up to 100 hp shall be provided with on AEGIS shaft grounding ring installed either on the drive end or non-drive end.
4. Motors over 100 hp shall be provided with AEGIS shaft grounding ring on the drive end of the motor and an insulated bearing on the non-drive end.

N. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor code letters, ambient temperature rating, temperature rise or insulation class, NEMA design letter (integral horsepower motors), frame size, manufacturer's name and model number, service factor, power factor, and nominal efficiency. Nameplate shall be of stainless steel or other approved corrosion resistant material providing a permanent legible marking. Nominal full load efficiency shall be identified on nameplate in accordance with NEMA MG-1-12.54.2

O. Electrical Connection: Conduit connection boxes, threaded for conduit, shall be provided with motor terminal leads brought outside the motor frame and equipped with terminal lugs. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

P. A connection plate shall be provided for dual voltage motors and fastened firmly to the frame near the terminal box indicating the proper grouping of external leads for the power supply.

This plate shall be of stainless steel or other corrosion resistant material which will provide a permanent legible marking.

Q. The nameplates and connection plates shall be attached to the motor frame by stainless steel rivets or screws.

2.3 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Motors less than 1/2 HP shall be 115-volt AC, single phase, 60 Hz, unless indicated otherwise.

B. Starting Current: Up to seven times full load current.

C. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve, or ball bearings.

D. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings, automatic reset overload protector.

2.4 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Motors 1/2 HP and larger shall be 460/230 or 460-volt, 3 phase, 60 Hz, unless otherwise indicated.

B. Starting Torque: Between one (1) and one and one-half (1 1/2) times full load torque.

C. Starting Current: Up to six (6) times full load current.

D. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.

E. Design, Construction, Testing, and Performance: Conform to ANSI/NEMA MG1 for Design B motors.

F. Insulation System: NEMA Class B or better.

G. Testing Procedure: In accordance with ANSI/IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data.

H. Motor Frames: NEMA standard frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts. Motor frames shall have drain plugs.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To ANSI/NEMA MG1.

K. Motor Enclosure: Totally enclosed, fan cooled, unless otherwise specified.

L. Service Factor: 1.15, unless otherwise indicated.

M. Nominal Efficiency: Meet or exceed EPACT values at full load and rated voltage when tested in accordance with ANSI/IEEE 112. High efficiency or energy efficient motors shall be in accordance with NEMA Standard MG-1-12.55 and efficiencies shall equal or exceed the efficiency values listed in NEMA MG-1 Table 12-10.

PART 3 - EXECUTION

3.1 APPLICATION

A. Motors drawing less than 250 Watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these Specifications.

B. Explosion proof motors shall be provided for areas indicated as hazardous.

C. Motors shall be high efficiency or energy efficient type.

3.2 SHOP DRAWINGS

A. Shop drawings for motor driven equipment MUST include the following motor information:

1. Horsepower
2. Voltage
3. Phase
4. Frequency
5. Speed
6. Maximum Temperature Rise In Continuous Service
7. Enclosure Type
8. Frame
9. Service Factor
10. Power Factor
11. Efficiency
12. NEMA Design Code Letter
13. Manufacturer
14. Full Load Amperes
15. NEC Code Letter
16. Insulation Class
17. Shaft Grounding

3.3 INSTALLATION

A. Section 01400 - Quality Control: Manufacturer’s instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 16010

GENERAL ELECTRICAL, INSTRUMENT, AND CONTROL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

A. Section 00700 – General Conditions.

B. Section 00800 – General Supplementary Conditions.

C. Section 01000 – General Specifications.

D. Section 16050 – Basic Electrical Materials and Methods.

1.3 REFERENCES

A. All equipment and workmanship shall be in conformance with the following documents:
1. National Electrical Code, latest approved edition.
2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
3. Latest approved standards of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories.

B. All equipment shall be designed, constructed, installed, and tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, and OSHA, except as modified herein.

1.4 GENERAL REQUIREMENTS

A. Unless otherwise specified, provide tools, equipment, apparatus, transportation, labor, and supervision to complete and place in satisfactory operation the work indicated on the Drawings and specified herein. Where permits or inspection fees are required in connection to the work under this Specification, the Contractor shall secure such permits and pay all fees.

B. Where any public or private utilities are encountered, the Contractor shall be responsible for any damages thereto resulting from his operations. Any existing lines or utilities damaged during the construction and which are not to be abandoned or removed, shall be replaced or repaired. The Contractor shall be responsible for determining the exact location of all underground or otherwise concealed utilities, conduit runs, piping, etc. which may interfere with construction or which require modifications.

C. All work shall be done in conformity with the applicable requirements of the codes, rules, and regulations of public utilities and all others having jurisdiction.

D. Where the Specifications describe or the Drawings show materials of higher quality than required by the above rulings and codes, the Drawings and Specifications shall govern the quality of materials which shall be furnished.

E. The wire, conduit, and equipment sizes shown on the Contract Drawings are based on estimated ratings. If ratings of equipment as furnished under the Contract exceed the estimated ratings, the wire, conduit, and equipment sizes shall be adjusted to meet NEC requirements at no additional cost to the Owner.

F. Dry locations are defined as interior; above grade; heated rooms, structures, buildings, cabinets, enclosures, etc. not normally subject to dampness or wetness. Damp locations are defined as interior; above grade; unheated rooms, structures, and buildings. Wet locations are defined as all outdoor areas; all underground rooms, structures, building areas, vaults, etc.; whether heated or unheated. Refer to National Electrical Code Article 100, "Location:" for additional definitions.

1.5 PROJECT CONDITIONS

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

1.6 INSPECTION

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

1.7 GUARANTEE

A. The equipment and installation furnished under this Section shall be guaranteed for a period of one (1) year as specified under Section 01700, Contract Closeout, except as modified by the Division 16 Specifications.

B. Repair and maintenance for the guarantee period is the responsibility of the Contractor and shall include all repairs and maintenance other than that which is considered as routine. (This is replacement of lamps, oiling, greasing, etc.) The Owner shall be the judge of what shall be considered as routine maintenance.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new, except where specifically identified otherwise.

B. All materials and equipment shall be listed or labeled by Underwriters' Laboratories, Inc., except for materials and equipment not available from any source with such listing and/or labeling, or as specifically required by the Division 16 Sections.

C. All conductor terminations, lugs, and connectors on all equipment supplied under this Contract shall be 75°C rated for copper conductors.

D. Concrete for electrical work shall be as specified in Section 03310 – Concrete Work.

2.2 LOOSE AND DETACHABLE PARTS

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

2.3 STANDARDS

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

2.4 SPARE PARTS

A. Spare parts shall be provided for electrical equipment supplied under this Contract, as specified in individual Specification Sections, and shall be furnished and delivered to the Owner.

B. Spare parts shall be packed and individually boxed for storing with each box labeled with the part's description including its part or catalog number, its use, and the equipment for which it is a part. Parts used during startup shall be replaced prior to acceptance.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

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

B. Material and equipment furnished and installed by the Contractor shall be completely protected against damage, pilferage, dampness, or abuse until turned over and accepted by the Owner.

C. The installation of all electrical, instrumentation, and control equipment shall meet the requirements of the State and Federal Occupational Safety and Health Statutes.

3.2 DRAWINGS AND MEASUREMENTS

A. Drawings shall be submitted in accordance with Sections 01300 and 01700 of these Specifications and as specified hereinafter. No work shall be undertaken until the Engineer has reviewed and approved the shop drawings. Only approved materials shall be installed and only approved installation methods shall be used.

B. The Drawings show the arrangement, general design, and extent of the systems. The work is shown on the Drawings by symbols, as shown in a legend on the Drawings. Equipment is shown in its general location, except where in certain cases the Drawings may include details giving the exact location and arrangement. Existing, underground or otherwise concealed utilities, piping, conduit runs, etc. indicated on the Drawings are shown in approximate locations and orientations only; the Contractor shall field verify exact locations.

C. The Drawings are not intended to be scaled for roughing-in measurements nor to serve as shop drawings. Where drawings are required for these purposes or have to be made from field measurements, they shall be prepared by the Contractor. Field measurements necessary to determine the required quantities of materials and fitting the installation of all materials and equipment into the building construction shall be taken by the Contractor.

D. Installation drawings and manufacturer's shop drawings are required for all electrical, instrumentation, and control work. Installation drawings shall show panel layout, conduit connection sizes, and location and equipment foundations, details, and locations, accurately dimensioned. Exposed runs of conduit need not be dimensioned. Conduit layout and installation drawings shall be submitted for approval and shall show all conduit runs, complete from origination to termination, and shall indicate conduit sizes and fills, raceway system components, methods and spacing of supports, etc.

E. Control schematics shall be provided for all new and modified existing control circuits. Control schematics shall use the ladder diagram type format incorporating line numbers, operation function statements, contact location line numbers with underlines indicating normally closed contacts. A description of operation of each device and complete written sequence of operation shall be provided with all control schematics. Format and symbols shall be as approved by the Owner. Wire and terminal numbers shall be clearly shown.

F. Upon completion of the work, complete “As-Built” drawings shall be provided. For additional requirements see Section 01700, Contract Closeout, Project Record Documents.

3.3 STORING OF EQUIPMENT

A. All equipment shall be stored in accordance with the manufacturer's recommendations. A letter from the manufacturer shall be provided stating those recommendations.

B. All equipment which has been set in place but not in operation shall be protected from damage or deterioration from whatever causes in accordance with the manufacturer’s recommendations until the equipment has been accepted by the Owner.

C. All wire and cable shall be stored on the original, manufacturer’s reels, protected from the weather, and all cable end seals shall be maintained intact until the cable is installed.

D. During construction, all electrical equipment insulation shall be protected against absorption of moisture and metallic components shall be protected against corrosion by strip heaters, lamps, or other acceptable means. This protection shall be provided immediately upon receipt of the equipment and maintained continuously.

3.4 CLEANUP

A. After substantial completion and prior to final acceptance, all electrical equipment shall be cleaned up, interior and exterior, to be free of dust and other foreign matter. Internal components shall be vacuumed, including windings of dry type transformers, and wiped free of dust.

B. De-energization of equipment to accomplish the cleaning work shall be done at a time as approved by the Owner.

3.5 PAINTING

A. The exterior of all enclosures shall be cleaned and touched up with matching paint where scratched or marred so that the exterior presents an "as new" appearance.

B. All factory finished equipment shall be protected from damage during erection, thoroughly cleaned after erection, and touched up as required. If the factory finish has, in the opinion of the Owner, been seriously damaged, the equipment shall be refinished as specified in Section 09900, Painting.

3.6 SALVAGED ELECTRICAL EQUIPMENT

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

3.7 SUBSTANTIAL COMPLETION

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

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

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General electrical equipment and installation requirements.

1.2 RELATED SECTIONS

A. Section 01000 – General Specifications.

B. Section 16010 – General Electrical, Instrument, and Control Requirements.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

1.4 WORK INCLUDED

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

B. The Contractor shall provide and install all conduit and wire connections required between components of equipment and systems supplied under other Sections of these Specifications, where shown or indicated on the Drawings.

C. The Contractor shall furnish and install modifications to existing secondary power distribution systems.

1.5 DESCRIPTION OF SYSTEMS

A. Secondary power shall be 480 volts, 3 phase, 3 wire plus ground, 60 Hertz.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. The Contractor shall furnish and install modifications to the existing power distribution system, together with all necessary supports, framing, hangers, and all other appurtenances. He shall furnish and arrange for the setting of anchor bolts, channels, etc. which are to be set in the concrete. He shall connect and make operable any and all electrical equipment whether or not it was furnished under this section of the Specifications, except as stated in Section 15010. The work shall include, but is not limited to, the following items:

1. Motor Starters
2. Power Factor Capacitors
3. Raceway System
4. Power Feeder and Branch Circuit Wiring
5. Lubrication Systems

PART 3 EXECUTION

3.1 DRAWINGS AND MEASUREMENTS

A. Power feeders shall be run in individual conduits, from source to load, as indicated in schedules, wiring diagrams, or by home runs on the Drawings.

3.2 SEQUENCE OF CONSTRUCTION AND DEMOLITION

A. The following is a suggested sequence of construction and replacement. The contractor shall provide and submit a sequence of work and work schedule for review. All necessary outages shall be kept to a minimum and coordinated with the owner.

1. Demolish Screw Pump No. 7 Motor along with all appurtenances.
2. Install new Screw Pump No. 7 Motor
3. Demolish Screw Pump No. 6 Motor along with all appurtenances.
4. Install new Screw Pump No. 6 Motor
5. Demolish Screw Pump No. 8 Motor along with all appurtenances.
6. Install new Screw Pump No. 8 Motor

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal conduit.

B. Liquidtight flexible metal conduit.

C. Fittings and conduit bodies.

1.2 RELATED SECTIONS

A. Section 16010 – General Electrical, Instrument, and Control Requirements.

B. Section 16050 – Basic Electrical Materials and Methods.

C. Section 16130 – Boxes.

D. Section 16170 – Grounding and Bonding.

E. Section 16190 – Supporting Devices.

F. Section 16195 – Electrical Identification.

1.3 REFERENCES

A. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated.

B. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 – National Electrical Code.

D. NECA 101-2013, Steel Conduits (Rigid).

E. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

F. NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. UL 6 Standard for Rigid Metal Conduit.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Conduit layout and installation drawings shall be submitted for approval and shall show all conduit runs, complete from origination to termination, and shall indicate conduit sizes and fills, raceway system components, methods and spacing of supports, etc. Indicate materials, finishes, dimensions, listings, and standards compliance.

C. Product Data: Provide data for conduit, tubing, duct, fittings, and accessories.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.

B. Accept conduit on site. Inspect for damage.

C. Conduit shall be delivered at the construction site in not less than ten foot lengths; each length of conduit to have approval label of the Underwriters.

D. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.6 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations, unless dimensioned. Route as required to complete the raceway system.

PART 2 PRODUCTS

2.1 CONDUIT AND FITTINGS

A. Provide all conduit, conduit fittings, outlet boxes, pull boxes, supports, hangers, plates, and such other items as are incidental to or required for a complete installation, all of which shall be made of cast iron, malleable iron, or galvanized steel, unless indicated otherwise.

B. No threadless couplings or running threads will be permitted on rigid conduits.

C. No conduit smaller than 3/4 inch shall be used, unless otherwise indicated or specified.

D. All raceways shall be marked with the manufacturer's name or trademark as well as type of raceway and size. This marking shall appear at least once every 10 feet and shall be of sufficient durability to withstand the environment involved.

E. Wherever conduits cross building, tank, or other structural expansion joints, the Contractor shall provide and install conduit expansion/deflection fittings as manufactured by O.Z./Gedney Type DX, Crouse-Hinds, Thomas & Betts, or equal, unless indicated on the Drawings as requiring an expansion fitting.

F. Expansion fittings with copper, ground bonding jumpers shall be installed where indicated on the Drawings and shall be O.Z./Gedney Type AX with Type BJ bonding jumper, Crouse-Hinds, or equal.

2.2 RIGID STEEL CONDUIT

A. Rigid steel conduits shall consist of heavy wall, 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 approved for use in rigid steel conduit systems.

B. Manufacturers:
1. Wheatland Tube Company
2. Allied Tube & Conduit Corporation
3. Maverick Pipe
4. Or Approved Equal

C. Rigid Steel Conduit: ANSI C80.1, UL 6.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; UL Standard 514B; all steel fittings.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
1. Anaconda "Sealtite" Type LA
2. Electriflex
3. AFC
4. Thomas & Betts Corp.
5. Or Approved Equal

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

D. All fittings used with this conduit shall be of the liquidtight type and shall be equipped with approved type grounding devices to insure continuity between the conduit and the connection. The fittings shall seal out vapors, coolants, oil, water, dust, and other foreign matter and shall be installed with a sealing O-ring between the fitting and the box. The fittings shall be "ST" series connections as manufactured by Appleton Electric Co., Ideal Industries 75-000 Series, or equal.

2.4 MISCELLANEOUS FITTINGS AND MATERIALS

A. Insulated grounding bushings shall be Type HBLG as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.

B. Insulating bushings shall be high impact resistant, thermoset plastic, 150°C rated, Type A as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.

C. All locknuts shall be of the sealing type, O.Z./Gedney Type SLG, Appleton, American Fittings Corp., Thomas & Betts, or equal.

D. Liquidtight hubs shall have a sealing ring between the fitting and the box and an insulated throat to insure protection of the wires as pulled. Hubs shall be made of nodular or malleable iron steel, zinc plated for corrosion resistance, UL listed, and shall meet or exceed the requirements of UL test 514B. Liquidtight hubs shall be Bridgeport, O.Z./Gedney Type CHM, Ideal Industries 75-000 Series, American Fittings Corp., Thomas & Betts, or equal.

E. Sealing fittings shall be Crouse-Hinds Co. Type EYS, Appleton, or equal. Sealing fittings used as water stops shall have an integral drain and shall be Crouse-Hinds Type EYD, Appleton, Thomas & Betts, or equal. Sealing fittings in hazardous or corrosive areas shall be PVC coated.

F. Couplings and fittings for electrical metal tubing shall be zinc plated steel compression or setscrew connectors and couplings as manufactured by O.Z./Gedney, American Fittings Corp., Thomas & Betts, or equal.

G. Conduit sealing compound shall be Waterguard Desiccants Industrial Encapsulant, Polywater FST-250, or equal.

H. Link seal for sealing conduits into sleeves and cored openings shall be GPT Industries - Thunderline, Metraflex Co. Metraseal, Calpico, or equal.

PART 3 EXECUTION

3.1 INSTALLATION OF RACEWAYS

A. Install conduit in accordance with NECA 101-2013, Steel Conduits (Rigid).

B. Arrange supports to prevent misalignment during wiring installation.

C. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

D. Do not attach conduit to ceiling support wires.

E. Arrange conduit to maintain headroom and present neat appearance.

F. Identify raceway systems under provisions of Section 16195.

G. Joints shall be made tight with standard couplings and corners turned with elbows or long radius bends in pipe.

H. Exposed multiple runs of conduit indoors shall be supported on hangers suspended from concrete inserts or structural steel. Single runs of conduit may be attached to ceilings or walls by means of approved type anchors. Conduit and other equipment may be attached to structural steel only where approved by the Owner. All conduit shall be secured to the supports by means of galvanized malleable iron clamps using two bolts or machine screws. Conduit supports, hangers, and anchors shall be as specified under Section 16190.

I. The use of wood plugs for anchoring raceways to concrete or masonry will not be permitted.

J. All conduits installed exposed shall be run vertically or horizontally and shall be parallel or at right angles to the building or structure walls.

K. The Contractor shall provide and install, where required, the additional steel to adequately support all conduits, boxes, and all other electrical equipment.

L. All conduit shall be dry, clean, and free of obstructions before conductors are pulled in. If there is evidence of moisture, obstructions, or foreign matter in the conduit when the conductors are installed, the wiring shall be removed and the conduit cleaned to the satisfaction of the Owner. All wiring showing evidence of damaged insulation shall be replaced.

M. All steel conduit run exposed shall be supported at intervals not exceeding 8 feet, unless shown otherwise on the Drawings. Multiple runs of conduit shall be mounted with steel supports so arranged that each individual conduit is clamped in place.

N. Conduit installed on walls shall be mounted on spacers to provide not less than 1/4 inch space between the conduit and the wall.

O. All conduit entrances through below grade walls and poured-in-place concrete roofs shall be installed through sleeves poured in place or through core drilled opening, unless poured in place.

P. Sleeves for passage of conduits through poured concrete roofs and below grade walls shall be constructed of heavy wall steel pipe with full circle continuously welded water stop plate. Sleeves shall be sized to accommodate the conduit and link seal combination as specified hereinbefore.

Q. All conduits passing through openings or sleeves in roofs, below grade walls, or floors shall be sealed in place and made watertight with link seal.

R. All conduit stubs for future use shall be terminated with pipe caps.

S. Conduit runs installed horizontally overhead shall allow a minimum of 7 feet of headroom, except where installed along structures, piping, equipment, or in other areas where headroom cannot be maintained because of other considerations.

T. Wherever a conduit emerges from the underside of a slab or roof or enters an area from above and that slab or area or conduit is exposed to the weather, then that conduit shall be provided with a pull box or fitting and filled to a length of 12 inches minimum with conduit sealing compound where the conduit emerges indoors to prevent water from following the conduit interior. The sealing compound shall be as specified hereinbefore under Miscellaneous Fittings and Materials.

U. Field bends in conduit shall not be of a lesser radius than that of manufactured elbows of the same trade size and shall show no flattening of the conduit. Conduit bends shall be held to as large a radius as possible for ease in pulling of conductors and to provide a neatly installed appearance. Generally, conduits 1" and smaller shall be bent in the field. Other conduit bends shall conform to the following: 2" and 2½" conduit, 24" radius, 3" and larger with a minimum radius of 36". Except where conduit runs are shown in exact detail on Drawings, the maximum length of straight conduit runs shall be 200 ft. between pull boxes, with 50 ft. deducted for each 90 degree bend and 25 ft. deducted for each 45 degree bend, reduction in length for all other angle bends shall be figured on a similar basis.

V. Conduit parallel to or crossing uninsulated hot water or steam pipes shall be separated from same by 12", if parallel, or 7", if crossing. Where hot water or steam pipe lines are insulated, conduit shall clear the insulation surface by 2". Conduit shall not run directly under cold water lines.

W. All conduits and sleeves passing through openings in walls above grade or floors shall be sealed in place and made watertight with non-shrink grout or other Owner approved sealant. Non-shrink grout used in floor or wall openings, shall be of the non-metallic type. All openings in fire rated walls and floors shall also be sealed with a fire barrier sealing system capable of maintaining the designed fire rating of the wall or floor and suitable for sealing out smoke and fumes. The fire barrier sealing system shall be capable of passing the ASTM E-814 (UL 1479) fire test and shall be subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory; provide products by Hilti Construction Chemicals, Inc.; 3M™ Fire Protection Products; or equal.

X. Metallic sleeves containing a ground conductor shall be bonded at each end to the ground conductor.

Y. The ends of all metallic conduits or elbows shall be cut square, reamed, and threaded.

Z. The threads of all steel conduit connections concealed in concrete shall be coated at the time of installation with No. B69A45 Zinc clad primary coating, as manufactured by Sherwin William's Corp., Ideal Industries No. 40-630, CRC Chemicals Zinc-It, or equal.

AA. The threads (metallic) of all corrosive area, outdoor, below grade, and hazardous area equipment connections including conduit, conduit fittings, pull and junction box covers, lighting fixture reflector, guard, and outlet box connections, wiring device boxes, etc. shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly. Coating compound shall be NO-OX-ID "A Special" by Sanchem, Inc., Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, or equal.

BB. Ground and bond metallic raceway systems under provisions of Section 16170.

CC. All metallic conduits, except those terminated in metal boxes or enclosures without knockouts and secured with double locknuts, integral hubs, or liquidtight hubs, shall be terminated with insulated grounding bushings. Conduits terminated in metal boxes or enclosures without knockouts and secured with double locknuts shall be terminated with an insulating bushing.

DD. All conduits and sleeves, metallic and non-metallic, intended for the passage of wire or cable and not terminated with a fitting, shall be terminated with a bushing or end bell.

EE. All connections between metallic conduits and NEMA Type 1 or NEMA Type 12 steel boxes shall be made with double locknuts. All connections between conduits and NEMA Type 3, 3R, 4, and 4X boxes shall be made with watertight connections. Watertight connections shall consist of integral hubs or liquidtight hubs.

FF. Electrical metal tubing or so called “Thin Wall” conduit and fittings shall not be used.

GG. To guarantee proper installation procedures and insure the validation of the manufacturer’s warranty, the Contractor must request installation training from the manufacturer, or his appointed representative, prior to installing any PVC Coated Conduit and Fittings on the project. The manufacturer shall provide installation training at no cost to the Contractor. The Contractor shall provide the time and place, preferably at the job site, and the manufacturer shall certify every Contractor’s employee completing the installation training.

HH. Flexible conduit may be used only where rigid conduit is impracticable or where indicated on the Drawings.

II. Liquidtight, PVC coated, flexible metal conduit and associated fittings shall be installed as follows:

1. All sections of flexible conduit larger than 1¼ inches in diameter shall be paralleled with a braided copper bonding strap connected between the last section of rigid conduit and the frame of the equipment to ensure a continuous ground.
2. Liquidtight, PVC coated, flexible metal conduit shall be installed with watertight connectors and in minimum lengths without sharp bends.

JJ. All final conduit connections to motors and other machinery, equipment, and devices which may be subject to movement or vibration shall be made with 15" to 18" of flexible, liquidtight, metallic conduit.

END OF SECTION

SECTION 16123

WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building wire.

B. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 16050 – Basic Electrical Materials and Methods.

B. Section 16110 – Raceways.

C. Section 16130 – Boxes.

D. Section 16190 – Supporting Devices.

E. Section 16195 – Electrical Identification.

1.3 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.

B. Underwriters' Laboratories Standard UL-83.

C. Underwriters' Laboratories Standard UL-44.

D. Federal Specification A-A-59544.

E. ANSI Standard C33.80.

F. ICEA – Insulated Cable Engineers Association.

G. ASTM – American Society for Testing and Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide for all wire and cable.

C. Test Reports: Indicate procedures and values obtained.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

1.5 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Wire and cable routing shown on Drawings is approximate. Route wire and cable as required to meet Project Conditions.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.6 COORDINATION

A. Coordinate Work under provisions of Section 01039.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 GENERAL

A. All wires and cables shall be permanently identified, at intervals not exceeding 3 feet, indicating type, size, voltage rating, and manufacturer's name.

B. All wires and cables shall be continuous and shall be delivered in reels or in coils. Reels and coils shall be plainly marked for complete identification, including the wire or cable size, the number of conductors, the type of wire or cable, length, weight, thickness and character of the insulation, and the name of the manufacturer.

C. All coils and reels of wires or cables shall carry original date perforated inspection labels of the Underwriter's laboratories, Inc. showing the number of feet and type of wire contained.

2.2 MANUFACTURERS – BUILDING WIRE

A. General Cable

B. Southwire Corporation

2.3 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Annealed, uncoated copper. All conductors shall be stranded. ASTM designation B-3.

C. Conductor Temperature Rating: 90°C in wet locations; 90°C in dry locations.

D. Insulation Voltage Rating: 600 volts.

E. Insulation: ANSI/NFPA 70, Type THWN; high temperature polyvinyl chloride with nylon jacket or Type XHHW-2, high temperature cross-linked polyethylene.

2.4 MANUFACTURERS – WIRING CONNECTORS AND ASSOCIATED MATERIALS

A. Solderless Pressure Connectors:
1. 3M™ Company Model Scotchlok
2. Thomas & Betts Model Sta-Kon
3. Burndy Model Insulug Type TN

B. Spring Wire Connectors:
1. 3M™ Company Model Scotchlok
2. Ideal Model Wing-Nut

C. Compression Connectors:
1. 3M™ Company Model Scotchlok
2. Thomas & Betts Model Color-Keyed
3. Burndy Model Hylug

D. Tap Connectors:
1. Thomas & Betts Model Color-Keyed
2. Burndy Model Crimpit
3. Anderson Model Crimptaps

E. Watertight, Twist-On Connectors:
1. 3M™ Company Direct Bury Splice Kits
2. King Innovation “DryConn”
3. Ideal Industries, Inc. Twister DB Plus

F. Watertight, Insulated Connector Blocks:
1. Utilco Type USPA-SS, Type PSA-SS, or Type PED-SS
2. Ilsco Type USPA-SS

G. Electrical Insulating Tape:
1. 3M™ Company “Scotch” No. 33+
2. Plymouth “Premium Black”

H. High Temperature Tape:
1. 3M™ Company “Scotch” No. 70
2. Plymouth “Plysil”

I. Fireproofing Tape:
1. 3M™ Company “Scotch” No. 77
2. Plymouth No. 50

J. Woven Fiberglass Tape:
   1. 3M™ Company “Scotch” No. 69
   2. Plymouth “Plyglas”

K. Color Coding Tape:
   1. 3M™ Company “Scotch” No. 35
   2. Plymouth “Slipknot” No. 45

L. Insulating and Watertight Sealing Materials:
   1. 3M™ Company “Scotchcast” kits
   2. Raychem WCS Series heat shrinkable sleeves
   3. 3M™ Company 8400 Series cold shrink materials
   4. 3M™ Company “Scotchkote” sealant

M. Watertight Cord Grip Fittings:
   1. Crouse-Hinds CGB-SG Series
   2. Appleton Electric Co.
   3. Thomas & Betts

N. Cable or Cord Strain Relief:
   1. Hubbell-Kellems
   2. Daniel Woodhead Co.

O. Cable Pulling Lubricant:
   1. American Polywater “Dyna-Blue”
   2. Ideal “Aqua Gel”
   3. Minerallac “Golden Glide”
   4. 3M™ Company “GEL”

2.5 WIRING CONNECTORS AND ASSOCIATED MATERIALS

A. All wiring connectors shall be 75°C rated and suitable for use on copper conductors.

B. Cable or cord strain reliefs shall consist of stainless steel wire mesh with support bale. Strain reliefs shall be of the split rod type where required or indicated on the Drawings.

C. Cable Pulling Lubricant:
   1. Lubricant shall be UL listed and approved for use on the cable jacket or insulation.
   2. Lubricant shall be polymer based and shall dry completely when exposed to air.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Interior Locations:
1. Wire for general power, light, and control shall be building wire, Type THWN or Type XHHW-2 insulation, in raceway.

B. Use wiring methods indicated on Drawings.

C. Color Coding:
The color schedule for the conductor insulation of wire and cable shall conform to the following:
1. Three phase lighting and power, 208Y/120 VAC-Black, Red, Dark Blue, White or Gray, and Green ground.
2. Three phase lighting and power, 120/240 VAC-Black, Red, Orange (high leg to ground), White or Gray, and Green ground.
3. Single phase lighting and power, 120/240 VAC-Black, Red, White or Gray, and Green ground.
4. Three phase lighting and power, 480 VAC-Brown, Orange, Yellow, and Green ground.
5. Three phase lighting and power, 480Y/277 VAC-Brown, Orange, Yellow, Gray, and Green ground.
6. DC power – Red with White stripe (+) and Light Blue with White stripe (-).
7. Single conductor control, AC voltage – Red.
8. Multi-conductor control cables – ICEA Method 1.
9. Alarm, annunciator, instrumentation, graphic, and telemetering (if not shielded), AC voltage – Pink.
10. Alarm, annunciator, instrumentation, graphic, and telemetering (if not shielded), DC voltage – Light Blue.
11. Intrinsically safe circuits – Purple.
12. On wire sizes larger than Number 8 AWG and/or where authorized by the Owner, coding may be identified by taping with the appropriate colored self-adhesive vinyl color coding tape.
13. Grounding conductors shall be continuous green or bare for all systems.
14. Neutral conductors shall be continuous white or gray for all systems.

D. Wiring Connections:
1. Dry location splices and tap connections shall consist of compression connectors or tap connectors, taped to 150 percent of insulation rating of the conductors.
2. Final connections to equipment wire leads for No. 8 AWG and smaller wire in dry locations only, except 480 volt motor leads, may be made with spring wire connectors.
3. Wet and damp location splices and tap connections shall consist of compression connectors or tap connectors with insulating and watertight sealing materials; water tight, twist-on connectors for wire sizes up to three No. 10 AWG; or watertight, insulated connector blocks; providing watertight connections suitable for direct burial.

4. All conductor terminations at screw terminals shall consist of solderless pressure connectors, except where conductor terminations are included with the equipment being connected.
5. Insulation of connections in lighting fixture and high temperature equipment shall consist of silicone rubber type high temperature tape with a woven fiberglass tape over-wrap.
6. Electrical insulating tape (plastic type) shall be used on all splice and tap connections, unless wire manufacturer's recommendations require otherwise.

3.4 INSTALLATION

A. All wiring shall be run in rigid metal raceway systems, unless noted otherwise.

B. Install products in accordance with manufacturer's instructions.

C. The minimum size of conductors shall be No. 12 AWG, unless specifically approved and/or shown otherwise on the Drawings.

D. Use stranded conductors for control circuits, No. 14 AWG minimum, unless shown otherwise on the Drawings.

E. Multi-conductor underground feeder, branch-circuit, and control cable shall meet the requirements of Article 340 of the National Electrical Code.

F. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 60 feet.

G. Use No. 8 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.

H. Use No. 6 AWG conductors for 20 ampere, 120 volt branch circuits longer than 170 feet.

I. Use No. 4 AWG conductors for 20 ampere, 120 volt branch circuits longer than 270 feet.

J. Use No. 3 AWG conductors for 20 ampere, 120 volt branch circuits longer than 420 feet.

K. Where conductors or cables are to be installed in non-metallic raceway systems, the Contractor shall allow 24 hours, minimum, for all solvents to evaporate after cementing the last joint before pulling wires or cables.

L. Pull all conductors into raceway at same time. Cable pulling tensions shall not exceed manufacturer's recommended values.

M. Use suitable wire pulling lubricant for wire, No. 4 AWG and larger, and for all cables. No soap flakes, vegetable oils, clays, or grease shall be permitted in raceways.

N. Use suitable cable fittings and connectors.

O. Neatly train and lace wiring inside boxes, equipment, and panelboards. Wires and cables shall be bundled and laced as specified in Section 16190.

P. All wires and cables routed through cable vaults, large pull boxes, and terminal cabinets shall be looped to provide two to three feet (minimum) of slack within the enclosure, where practical.

Q. Clean conductor surfaces before installing lugs and connectors.

R. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

S. Wire and cable shall be supported in vertical runs by insulated clamps so that wire or cable weight will not be unduly supported from conductor terminations.

T. Spade or fork tongue lugs shall not be used, except where approved by the Owner.

U. Wires and cables shall, in general, be run continuously, without splicing, from origination to termination. No splices shall be permitted in any feeder circuit, except in outlet, junction, and/or pull boxes, or where specifically noted on the Drawings. Use sufficient length of wire for connecting to equipment without straining. All methods of splicing shall meet cable manufacturer's recommendations. All splices shall be carefully placed in outlet boxes, etc. without crowding. No splicing shall be permitted in signal cables.

V. Splices and tap connections shall be made in junction boxes only; condulet type fittings shall not be used as junction boxes.

W. Wires and cables shall be installed in raceways, as indicated on the Drawings or required, and shall provide a complete and operating system.

X. All wires and cables shall be tagged as specified in Section 16195.

Y. Motor control center feeder circuits and distribution panelboard branch circuits shall each be run in individual raceways from source to motor or other load.

Z. Vertical lengths of wire and cable shall be supported as required by Article 300.19 of the National Electrical Code. Cable weight shall not be unduly supported from conductor terminations.

AA. Vertical lengths of exposed cable or cord runs over ten feet long shall be supported with a strain relief.

BB. Where an exposed run of cable or cord enters a box or enclosure, provide a watertight cord grip fitting suitable for the cable or cord diameter.

CC. All 120 VAC, single phase loads shall be connected to provide a balanced load on the lighting transformers. All 480 VAC, single phase loads shall be connected to provide a balanced load on the 480 VAC, three phase system.

DD. Make conductor length for parallel feeders identical on each phase leg.

EE. Feeders shall be connected for correct phase rotation. Where possible, busses shall be connected to result in the "A" or "X" phase being in the north, east, or top position with the

other phases following in sequence. The terminals H1, H2, and H3 of transformers shall be connected to A, B, and C; 1, 2, and 3; or X, Y, and Z conductors, respectively, of incoming feeders.

FF. Final connections to motors and other machinery, equipment and devices in hazardous areas which may be subject to movement or vibration may consist of a loop of mineral-insulated, metal-sheathed cable (Type MI) with UL listed fittings.

GG. All secondary wire and cables run exposed through cable vaults shall be fireproofed, where exposed. Fireproofing of wire and cables shall be accomplished with half lapped taping using fireproofing tape made of heat resistant organic fabric coated on one side with a flame retardant elastomer. The fireproofing tape shall be held in place by spiral wrapping at recommended intervals using woven fiberglass tape.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.6 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Sections 01400 and 16960.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer’s recommended values.

D. Verify continuity of each branch circuit conductor.

E. Verify continuity of each feeder conductor.

END OF SECTION

SECTION 16130

BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pull and junction boxes.

1.2 RELATED SECTIONS

A. Section 16010 - General Electrical, Instrument, and Control Requirements.

B. Section 16050 - Basic Electrical Materials and Methods.

C. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. NECA - Standard of Installation.

B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

D. NEMA OS 2 - Non-metallic Outlet Boxes, Device Boxes, Covers and Box Supports.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate materials, finishes, dimensions, listings, and standards compliance.

C. Product Data: Provide data for boxes, wireways, and accessories.

D. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 SUBMITTALS FOR CLOSEOUT

A. Section 01700 - Contract Closeout: Submittals for Project closeout.

B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70, National Electrical Code.

B. Provide Products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to the authority having jurisdiction, as suitable for the purpose specified and indicated.

C. All boxes shall be sized per Article 314 of the National Electrical Code as a minimum.

PART 2 PRODUCTS

2.1 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. Single and two gang pull boxes and junction boxes shall be rust proof, cast metal, Type FD boxes with gasketed covers.

D. Larger boxes and raceways shall be NEMA Type 12, in indoor, above grade locations, or stainless steel NEMA Type 4 or non-metallic NEMA Type 4X with stainless steel hardware in all other locations or where indicated on the Drawings, built of Code gauge steel, with angle iron supports and braces. Cable support racks shall be provided where required. Access shall be by means of removable, gasketed screw covers fastened with machine screws.

E. In-line pull boxes, where shown on the Drawings, shall be Appleton Type PTC with solid gasket or equal.

F. Threaded conduit fittings with gasketed covers shall be used for all exposed conduit outlets and boxes.

G. Conduit bodies and fittings shall be of cast iron, malleable iron, and/or galvanized steel.

2.2 MISCELLANEOUS COMPONENTS

A. Anti-seize, lubricating, and protective compound shall be Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, Crouse-Hinds HTL, Sanchem, Inc. NO-OX-ID “A Special”, or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify locations of floor boxes and outlets in all work areas prior to rough-in.

3.2 INSTALLATION

A. Install boxes in accordance with NECA "Standard of Installation."

B. Install pull boxes and junction boxes in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

C. Pull boxes and/or junction boxes shall be used in any conduit run where a splice is required. Pull boxes shall be provided every 200 feet of straight run, every 150 feet after 90 degrees of bends, every 100 feet after 180 degrees of bends, and every 50 feet after 270 degrees of bends. More than 270 degrees worth of bends shall not be installed between pulling points in any conduit run.

D. Pull boxes, auxiliary pull fittings (slip joints), and cable raceways for the pulling, nesting, or concealment of wires or cables shall be provided where indicated on the Drawings and also where required, though not indicated, as specified above.

E. Mark or label all boxes as specified in Section 16195.

F. Enough room shall be supplied in boxes for insulating joints, wires, and bushings, and deep boxes shall be installed where required by the type of fixture or outlet called for on the Drawings.

G. Wire and cable splices and tap connections shall be made in junction boxes only; condulet type fittings shall not be used as junction boxes.

H. Support boxes independently of conduit.

I. Wall and ceiling mounted pull and junction boxes shall be spaced 1/2 inch minimum out from the wall or ceiling using corrosion resistant channel: Unistrut; Grinnell “Power-Strut”, or other approved corrosion resistant spacers.

3.3 ADJUSTING

A. Section 01700 - Contract Closeout: Adjusting installed work.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Section 01700 - Contract Closeout: Cleaning installed work.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 RELATED SECTIONS

A. Section 03310 - Concrete Work.

B. Section 16010 - General Electrical, Instrument, and Control Requirements.

C. Section 16050 - Basic Electrical Materials and Methods.

D. Section 16960 – Electrical Testing and Equipment.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 GROUNDING ELECTRODE SYSTEM

A. Metal underground utility piping.

B. Metal frame of the building.

C. Ground loops, risers, and conductors.

D. Rod electrodes.

E. Ground mat.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

B. In the event that the ground resistance is not 5 ohms or less, additional rods or longer rods shall be installed or the soil treated to reduce its resistance by approved practices. All ground resistance measurements shall be made using the fall-of-potential method only and test reports shall be provided as specified under Section 16960, Electrical Testing and Equipment.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate facility's overall resistance to ground.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record actual locations of grounding electrodes.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MECHANICAL CONNECTORS

A. All compression connectors, lugs, etc., used in grounding circuits in any location shall have bolts, nuts, etc., of silicon bronze alloy equal to "Everdur" metal. Grounding connections, clamps, etc., shall be as manufactured by Burndy Engineering Company, Thomas and Betts Company, Delta-Star Electric Company, Harger, or equal.

B. Fittings for bonding a grounding conductor to metallic conduit shall be Thomas and Betts Series 3900BU or equal. Fittings for bonding a grounding conductor to its own conduit shall be Burndy Engineering Company GAR-BU Series, Thomas and Betts Series 3900, Harger, or equal.

2.2 EXOTHERMIC CONNECTIONS

A. Connections to steel, between conductors, and for water stops shall consist of exothermic welding similar and equal to Burndy Engineering Company's "Thermoweld", Erico Products, Inc. "Cadweld Kits", Thomas & Betts Corp. “Furseweld”, or Harger.

2.3 CONDUCTORS

A. Grounding conductors, loops, and risers shall be bare, stranded, soft-drawn copper and shall be of the sizes indicated on Drawings.

B. All bonding jumpers shall be copper and of a cross-sectional area at least equal to their corresponding grounding conductors.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Provide bonding to meet Regulatory Requirements.

C. The non-current carrying parts of all electrical equipment installed under this Contract, including but not limited to raceways, raceway supports, and equipment enclosures, shall be bonded by means of bare copper cable or copper strap to the grounding system as shown on the Drawings and specified hereinafter.

D. All exposed, including painted or coated, structural and architectural metal shall be bonded to the grounding system or rigidly secured to and in good electrical contact with grounded metal.

E. All grounding cables, bus, etc., in locations where subject to mechanical damage, shall be protected by rigid metal conduit, steel guards, non-metallic conduit, or other suitable shield. In all cases, where conduit or other metallic encasement of grounding conductors is required, the conductor shall be permanently and effectively grounded to the enclosure at both ends of its length. This requirement applies to all such enclosures regardless of their length.

F. Where grounding conductors pass through floor slabs, building walls, etc., and are not encased in the concrete pour, sleeves of rigid metal conduit or non-metallic conduit of the required size, shape, and length shall be provided with both ends of the sleeve sealed with duct seal after installation of the grounding conductor.

G. Where attached to equipment, conduits, cabinets, etc., suitable approved solderless lugs, compression connectors, or clamps shall be used. No soldered connections shall be used on grounding circuits at any point.

H. Where a grounding cable is to be bonded to structural or architectural metal, the exact location of each bond shall be approved by the Owner. The location of such grounding connections shall be at points where they will not be subject to mechanical damage and, if possible, shall be accessible for inspection.

I. Where welding to steel is prohibited, the grounding conductor shall be bolted directly to the steel as approved by the Owner. The contact surfaces of all bolted connections shall be thoroughly cleaned and coated with Alcoa No. 2 Electrical Joint Compound or equal.

J. Taps and splices in grounding cables and connections to ground rods shall be made by an exothermic weld process.

K. All metal ducts, conduits, starters, panels, switches, etc., which are not rigidly secured to and in good electrical contact with the grounded structural metal frame of the building or grounded

conduit system, or which are subject to excessive vibration and loosened ground contacts, shall be securely bonded to grounded building steel or to the grounded conduit system by means of stranded copper jumpers. This jumper shall have a circular-mil cross section of not less than 50 percent of that of the largest conductor entering the enclosure being grounded, with a minimum size of No. 8 AWG stranded copper being used in any jumper.

L. Conduits which run to boxes or cabinets having concentric or eccentric knockouts which partially perforate the metal around the conduit and impair the electrical connection to ground shall be provided with approved bonding jumpers. Jumpers shall consist of a stranded, braided copper wire at least No. 8 AWG with solderless indent type lugs. Jumper shall be connected from a grounding type locknut or bushing on the conduit inside the box to a stud or silicon bronze alloy bolt in the cabinet frame.

M. All metal support racks for electrical equipment and enclosures shall be securely bonded to grounded building steel or the grounding system with a No. 2 AWG grounding conductor.

N. A copper ground conductor shall be carried for each power, lighting at 120 volts and higher, and receptacle circuit with the circuit conductors. The ground conductor shall have the same type insulation as the circuit conductors and shall be green in color through No. 10 AWG and bare copper wire for larger sizes.

O. Switchgear, motor control center, and distribution panelboard grounding shall consist of ground connections to feeder conduits, ground busses, etc. as required or as indicated on the Drawings.

P. Splices in wire or cable ground leads shall not be permitted.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Conduit equipment supports and hangers shall be made of galvanized structural steel, with welded or bolted joints. Conduit and equipment supports and hangers shall be fabricated from

"Unistrut" Series P1000 galvanized channels and fittings, as manufactured by the Unistrut Products Company, Superstrut A-1200 Series, Grinnell "Power-Strut" PS-200, or equal.

D. All conduit and equipment supports, hangers, beam clamps (no "C" clamps shall be allowed), and other similar devices made of steel shall be hot dipped galvanized or sherardized after fabrication. All hanger rods, U-bolts, bolts, nuts, and other threaded support components shall be electro-galvanized (per ASTM-B633 Type III SC1) or sherardized. Field cuts and all welds shall be coated with an approved cold or hot galvanizing compound: Z.R.C., CRC Chemicals Zinc-It, or equal. All hanger rods shall be 3/8 inch diameter minimum. All such hardware shall be factory encased with polyvinyl chloride (PVC) of minimum .040 inch (40 mil) thickness where indicated on the Drawings and where indicated elsewhere in Division 16. All touch-up required in the field shall be in strict accordance with the manufacturer's printed instructions.

E. Concrete inserts shall be of the continuous channel or spot type. The channel type shall be No. 12 gauge steel with integral anchors, Super Strut No. C-302, Kindorf No. D-990, or equal. Spot inserts shall be Super Strut No. 452, Kindorf No. D-255, or equal.

F. Threaded anchors for use in concrete shall be self-drilling type expansion anchors made of case hardened and drawn carburized steel. The anchors and expander plugs shall be furnished with a rustproof finish. The expansion anchors shall be concrete fasteners as manufactured by the ITW "Red Head", Ideal Industries Co., or equal.

G. Threaded anchors for heavy loads (i.e.: panels, disconnect switches) supported from masonry or precast concrete panels shall be epoxy based adhesive anchors with threaded rod and screen tube. Adhesives shall match the application, as recommended by the anchor manufacturer. Threaded rods, nuts, and washers shall be furnished with a rustproof finish. Adhesive anchors shall be Hilti Type HIT or equal.

H. Anchors for light loads (i.e.: conduit clamps, outlet boxes, small pull and junction boxes) supported from masonry or precast concrete panels shall be lead type or plastic expansion anchors with corrosion resistant screws.

I. Threaded rods, nuts, washers, screws, and bolts for anchors used in areas classified as hazardous and in corrosive areas shall be made of 316 stainless steel. Also expansion anchors for light loads used in masonry or precast concrete panels in these areas shall be plastic only.

J. Anti-seize, lubricating, and protective compound shall be Never-Seez as manufactured by Bostik Div. of Emhart Corp., "Dry Molybdenum Lubricant" No. 40-640 by Ideal Industries, CRC Chemicals Lectra-Shield, Crouse-Hinds HTL, Sanchem, Inc. NO-OX-ID “A Special”, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions. Tighten all bolted connections to manufacturer's recommended torque values with compensation for lubricated threads (anti-seize, lubricating and protective compound applied) to avoid over-torqueing.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not anchor supports from pipes, ducts, mechanical equipment, or conduit.

D. Do not use spring steel clips and clamps.

E. Obtain permission from Architect/Engineer before using powder-actuated anchors.

F. Obtain permission from Architect/Engineer before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.

J. All electrical enclosures, including raceways, boxes, panelboards, motor control equipment, etc., shall be securely attached to the building or structure walls by means of concrete inserts or expansion anchors, unless indicated as rack mounted on the Drawings or of free standing design. Unless otherwise indicated, all electrical enclosures, except conduit and outlet boxes, shall be spaced at least 1/2 inch from the wall or ceiling with Unistrut, Grinnell "Power-Strut", or equal.

K. The use of wood plugs for anchoring raceways, cabinets, enclosures, or equipment to concrete or masonry will not be permitted.

L. The Contractor shall provide and install, where required, the additional steel to adequately support all conduits, boxes, and all other electrical equipment.

M. All wires and cables shall be laced when entering or leaving pull or junction boxes and at each termination. Wires and cables shall be laced so that the wires of the individual circuits are laced together by circuit. All wiring entering and exiting electrical enclosures shall be bundled into groups. Power, lighting, control, alarm, annunciator, and instrumentation wiring shall be bundled and laced as specified herein.

N. The threads of all corrosive area, hazardous area, and below grade support connections shall be coated with an anti-seize, lubricating, and protective compound prior to final assembly.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

D. Display diagrams.

1.2 RELATED SECTIONS

A. Section 09900 - Painting.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide catalog data for nameplates, labels, signs, diagrams, and markers.

C. Submit schedule of proposed equipment labels.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. The nameplates shall be 1 1/4" high by 3 1/2" wide (minimum), except pushbutton and selector switch stations and other enclosures where space is limited may have smaller plates of suitable size, and shall be attached to the equipment by means of corrosion resistant

screws. Nameplates may be attached to equipment located in dry, interior areas by means of pressure sensitive, firm acrylic adhesive tape, 3M "Scotch" No. 468 or equal. The plates shall be white laminated plastic with engraved black letters approximately 3/32" thick with beveled edges. Engraved letters shall be 1/8" high (minimum), block type.

B. Circuit number markers shall consist of self adhesive vinyl cloth or polyvinyl fluoride film markers with 1/8" high (minimum), black lettering on a yellow background, W. H. Brady Co. 3410 Series, Ideal Industries 44-500 Series and 44-600 Series, or equal. Circuit number markers may also consist of computer or typewriter generated, vinyl cloth, permanent, non-smearing, self-adhesive markers such as Brady Datab, BradyMarker XC Plus, 3M Scotchcode SCS or STS, or equal. Circuit number markers for panelboard circuit breakers may be the manufacturer's standard.

C. Meter address nameplates shall be white laminated plastic with engraved, 1/8" high (minimum), black, block type letters and shall be attached with corrosion resistant screws.

D. Arc flash and shock hazard warning labels shall consist of self-adhesive vinyl or polyester signs, 3-1/2” by 5” minimum, with “! WARNING” header (black letters on orange field), “Arc Flash and Shock Hazard” subheader and write-in spaces for the following information:
____ Flash Hazard Boundary
____ cal/cm^2 Flash Hazard at 18 inches
____ PPE _____
____ Shock Hazard When Cover is _____
____ Limited Approach
____ Restricted Approach _____
Equipment Name: _____

Warning labels shall be in compliance with NEC 110.16 requirements. Warning labels shall be Brady Signmark No. 89220, Lab Safety Supply Co. No. 68691, Seton Style No. M0548, or equal.

2.2 WIRE MARKERS

A. Wire and cable tags for use in large pull boxes, large junction boxes shall be made of minimum 1/8" thick white laminated plastic, 1-1/4" by 3-1/2", with black engraved identification in letters 3/64" deep by 3/16" high minimum. Tags shall be drilled at each end and secured twice to each cable by 3/32" minimum diameter polyethylene cord. Tags shall be engraved with the circuit number, equipment served, and associated nominal voltage level.

B. Wire and cable number tags for use in pull or junction boxes and at termination points shall be computer or typewriter generated, vinyl cloth, permanent, non-smearing, self-adhesive markers such as Brady Datab, Brady Marker XC Plus, or 3M Scotchcode. Pre-printed, vinyl cloth, plastic coated, self-adhesive, tape markers as manufactured by W. H. Brady Co. or 3M Company shall also be acceptable.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive nameplates and labels.

3.2 INSTALLATION

A. Nameplates shall be installed on the doors or covers of all panels, panelboards, starters, contactors, transfer switches, relays, control devices, signaling devices, and all other electrical equipment furnished under this Contract, except remote mounted pushbutton and selector switch stations, mounted adjacent to identified and associated disconnect switches or other control devices, need not be identified as described herein.

B. Nameplate engraving for equipment and devices associated with motor starters, panelboard, or control panel circuits shall match the engraving indicated in schedules on the Drawings, except nameplates for spare units and devices shall be furnished blank. All other nameplates shall be engraved as follows and shall be included on nameplate schedules submitted to the Owner for approval:
1. First Line - Process description, equipment served, or area served (if applicable).
2. Second Line - Equipment or device description.
3. Third Line - Equipment or device designation number and power source circuit number.
4. Abbreviations shall be used only where full wording will not fit. See the Drawings for nameplate details.

C. All devices and equipment powered from lighting panelboards shall be marked with the appropriate circuit number(s). Lighting circuits shall be identified on switch cover plates, receptacles on cover plates, and other devices on enclosure door or on associated disconnect switch door or cover.

The entire raceway system for intrinsically safe circuits shall be labeled "Intrinsic Safety Wiring" per National Electrical Code Article 504.80(B).

D. All pull boxes shall be marked with the type of system within them, i.e.: 480V power, alarm, 120V control, etc.

E. All wires and cables within control panels, motor starters, terminal boxes, etc. shall be tagged at each termination.

F. The wires and cables of each circuit in pull boxes and junction boxes larger than 12" by 12" by 8" shall be bundled together, neatly arranged, and clearly identified with a tag secured with polyethylene cabling twine indicating circuit number, equipment served, and nominal voltage level.

G. 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.

H. All enclosures, panels, boxes, and devices containing electrical components and circuits with exposed, energized parts when the door is open, shall have an arc flash and shock hazard warning label affixed to the door. All label blank fields shall be filled in with permanent markers according to the results of the Short Circuit, Flash Hazard, and Protective Devices Coordination Analyses, in Section 16050.

END OF SECTION

SECTION 16960

ELECTRICAL TESTING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Division 16 testing requirements.

B. Test equipment requirements.

C. Sample forms.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturer's Field Reports.

B. Section 16010 - General Electrical, Instrument, and Control Requirements.

C. Section 16050 - Basic Electrical Materials and Methods.

D. Section 16970 – Calibration and Start-up of Systems.

1.3 REFERENCES

A. All testing methods shall be in conformance with the following documents:
1. National Electrical Code, latest approved edition.
2. Any and all Federal, State, and/or local codes, ordinances, or regulations.
3. NETA Acceptance and Maintenance Specifications and Safety Guidelines.

B. All equipment shall be tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL, and OSHA, except as modified herein.

1.4 SUBMITTALS

A. Submit on Products under provisions of Section 01300.

B. Product Data: Indicate electrical characteristics and specifications; including layout of switches, buttons, displays, dimensions, weights, and external power requirements; and, list cables, connections and all available accessories.

1.5 PROJECT RECORD DOCUMENTS

A. Submit test results under provisions of Section 01700.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Operation Data: Include bound copies of operating and programming instructions.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and use of product(s).

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.

B. Cable testing shall be performed by technicians certified in accordance with ANSI/NETA ETT-2000 Standards for the Certification of Electrical Testing Technicians. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make an informed judgment on the continued serviceability or nonserviceability of the specific equipment. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.

1.8 REGULATORY REQUIREMENTS

A. Furnish Products listed and classified by Underwriters Laboratories, Inc. (UL), Factory Mutual (FM), and/or Canadian Standards Association (CSA), as specifically indicated, and as acceptable to authority having jurisdiction, as suitable for purpose specified and indicated.

B. All test instruments and devices shall be in conformance with all applicable standards and requirements of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories. NIST – traceable certificates of calibration shall be provided with each instrument/device.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Accept products on site in factory containers. Inspect for damage. Turn over to Owner immediately.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. The work shall include, but is not limited to, the following major items:
1. Testing, Start-up, Demonstration, and Training for all electrical, instrumentation and controls equipment and/or systems furnished and installed as a part of Division 16.

PART 3 EXECUTION

3.1 TESTING

A. The Contractor shall perform all testing necessary to ensure that the work performed under the Contract is satisfactory and in conformity with the requirements of the Contract Documents.

B. All testing shall be performed prior to start-up of equipment or systems as specified under Section 16970.

C. All tests shall be witnessed by the Owner's Representative and four (4) copies of all field tests, as specified herein and in other Sections, shall be submitted to the Owner. Twenty-four (24) hours (minimum) written notice shall be given the Owner prior to performing the tests. Such tests shall be scheduled at a time agreed upon by the Owner and the Contractor.

D. Testing shall include, but shall not be limited to, the following tests:
   1. Insulation resistance to ground of all conductors and equipment.
   2. Continuity, connections, and integrity of the facility's entire grounding system.
   3. Continuity, polarity, phase sequence, and connection of all current carrying conductors and equipment.
   4. Ground fault detection systems shall be tested in accordance with the NEC, UL, and manufacturer's recommendations.
   5. The following information shall be included in a test report on each cable:
      a. Complete identification of cable, including approximate length.
      b. Approximate average cable temperature.
      c. Megger readings versus time data, including converted values.
   6. In order to be acceptable, the cable must withstand the specified high voltage without breakdown or have satisfactory megger readings.

E. All improper connections, or materials, and equipment not adapted to the purpose for which it is intended, or material, or equipment found to be faulty while performing the tests, shall be corrected; and any changes or repairs necessary to put the work in satisfactory condition and operation shall be done by the Contractor and re-tested at no additional cost to the Owner.

3.2 CONTRACTOR'S ASSISTANCE

A. Testing of Package equipment, as described in Section 16010, shall be as required in other Sections of this Specification.

B. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturer's service representatives on any and all field test and adjustments as may be made or required by equipment manufacturers or the Contractor as the equipment is put into service. The Contractor shall make equipment manufacturers' service representatives available as required to assist in testing or putting equipment into operation.

3.3 TEST INSTRUMENTS TO BE PROVIDED

A. Provide one of each test instrument as described above, and as described in other Sections.

3.4 DEMONSTRATION

A. Turn over the test equipment at the time of, and as a condition of, acceptance.

B. After acceptance of the test equipment, the Owner's operators shall be provided with one day (in two ½ day sessions) of on site training in the use and maintenance of each piece of the equipment. The training shall cover the operation of the test equipment, preventative maintenance of all equipment, and trouble-shooting and repair/replacement procedures.

END OF SECTION

CABLE TEST CERTIFICATE

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 CABLE IDENTIFICATION

Cable Designation or Circuit No.: _____

Cable Source _____ Air Temperature _____

Termination Point _____ Humidity _____

Connected Equipment _____ Equipment Temperature _____

Test Voltage _____ No. of Conductors _____ Age _____

Length _____ Size _____ Operating Voltage _____

Cable Type _____ Rated Voltage _____ Ground Type _____

Manufacturer _____ Insulation Type _____

Insulation Thickness _____ Installed In _____

Conductor Material _____

Phase Color Identification

Phase A: _____ Phase B:_____ Phase C: _____

3.0 TEST INSTRUMENT

Manufacturer _____ Model No. _____

4.0 POWER CABLE TEST – HIGH POTENTIAL TEST

Time – Minutes	Test Voltage	Phase A µ A	Phase B µ A	Phase C µ A
.25				
.50				
.75				
1.00				
2.00				
3.00				
4.00				
5.00				
6.00				
7.00				
8.00				
9.00				
10.00				
11.00				
12.00				
13.00				
14.00				
15.00				

	Leakage Current at Full Test Voltage After 5 Minutes	Discharge Time Down To: 5 KV	Voltage After 1 Minute Discharge
Phase A			
Phase B			
Phase C			

5.0 CERTIFICATION

I certify that the above information is correct and that the cable installation and condition conforms to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature: _____ Date: _____

6.0 ENGINEER REVIEW

Test Witnessed: ☐ Yes ☐ No Reviewer Signature: _____ Date: _____

CABLE TEST CERTIFICATE

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 CABLE IDENTIFICATION

Cable Designation or Circuit No.: _____

Cable Source _____ Air Temperature _____

Termination Point _____ Humidity _____

Connected Equipment _____ Equipment Temperature _____

Cable Type _____ No. of Conductors _____ Age _____

Length _____ Size _____ Ground Type _____

Rated Voltage _____ Operating Voltage _____

Manufacturer _____ Insulation Type _____

Insulation Thickness _____ Installed In _____

Conductor Material _____

Phase Color Identification

Phase A: _____ Phase B:_____ Phase C: _____

3.0 TEST INSTRUMENT

Manufacturer _____ Model No. _____ Calibration Date: _____

4.0 POWER CABLE TEST – VLF HIGH POTENTIAL TEST

Test Data

Phase	Test Voltage (peak)	Test Duration (mins)	Frequency (Hz)	Cable µF
A				
B				
C				

Test Results

Phase	Peak Voltage (held or failed)	Charging Current µA	Time (mins)
A			
B			
C			

5.0 NOTES _____

_____

_____

_____

6.0 CERTIFICATION

I certify that the above information is correct and that the cable installation and condition conforms to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature: _____ Date: _____

7.0 ENGINEER REVIEW

Test Witnessed: ☐ Yes ☐ No Reviewer Signature: _____ Date: _____

CABLE TEST CERTIFICATE

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 CABLE IDENTIFICATION

Cable Designation or Circuit No.: _____

Cable Source _____ Air Temperature _____

Termination Point _____ Humidity _____

Connected Equipment _____ Equipment Temperature _____

Test Voltage _____ No. of Conductors _____ Age _____

Length _____ Size _____ Operating Voltage _____

Cable Type _____ Rated Voltage _____ Ground Type _____

Manufacturer _____ Insulation Type _____

Insulation Thickness _____ Installed In _____

Conductor Material _____

Phase Color Identification

Phase A: _____ Phase B:_____ Phase C: _____

3.0 TEST INSTRUMENT

Manufacturer _____ Model No. _____

4.0 POWER CABLE TEST – MEGGER TEST

Time	Phase A Megohms		Phase B Megohms		Phase C Megohms	
Minutes	Before	After	Before	After	Before	After
.25						
.50						
.75						
1.00						
1.25						
1.50						
1.75						
2.00						
2.25						
2.50						
2.75						
3.0						
4.0						
5.0						

5.0 CERTIFICATION

I certify that the above information is correct and that the cable installation and condition conforms to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature: _____ Date: _____

6.0 ENGINEER REVIEW

Test Witnessed: ☐ Yes ☐ No Reviewer Signature: _____ Date: _____

SECTION 16970

CALIBRATION AND START-UP OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Setup and Calibration of devices and instruments.

B. Requirements for Start-up of Systems furnished/installed under this Contract.

C. Calibration equipment requirements.

D. Sample Forms.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturer's Field Reports.

B. Section 16010 - General Electrical, Instrument, and Control Requirements.

C. Section 16050 - Basic Electrical Materials and Methods.

D. Section 16960 - Electrical Testing and Equipment.

1.3 REFERENCES

A. All setup, calibration, and workmanship shall be in conformance with the following documents:
   1. National Electrical Code, latest approved edition.
   2. Any and all Federal, State, and/or local codes, ordinances, or regulations.

B. All equipment shall be designed, constructed, installed, tested and calibrated in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL, and OSHA.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Indicate electrical characteristics and specifications; including layout of switches, buttons, displays, dimensions, weights, and external power requirements; and, list cables, connections and all available accessories.

1.5 PROJECT RECORD DOCUMENTS

A. Submit calibration, setup and programming documentation under provisions of Section 01700.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Operation Data: Include bound copies of operating and programming instructions. Include component parts replacement, adjustments, and preventative maintenance procedures and materials.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and use of product(s).

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Furnish Products listed and classified by Underwriters Laboratories, Inc. (UL), Factory Mutual (FM), and/or Canadian Standards Association (CSA), as specifically indicated, and as acceptable to authority having jurisdiction, as suitable for purpose specified and indicated.

B. All instruments and devices shall be in conformance with all applicable standards and requirements of ISA, IEEE, ANSI, NEMA, and Underwriters' Laboratories.

PART 2 EXECUTION

2.1 START-UP REQUIREMENTS

A. Setup, calibration and start-up of equipment and/or systems shall be performed as described below, and per the requirements of the Section under which the equipment/system was furnished.

B. Prior to scheduling Start-up of any equipment and/or system, the Contractor shall have complied with the requirements of Section 16960, Electrical Testing and Equipment, and shall have submitted reports indicating successful completion of testing for the equipment/system being started.

C. Prior to energizing and operating any equipment or system, the Contractor shall arrange for the manufacturer's representative to inspect the installation for compliance to the manufacturer's recommendations.

D. The Contractor shall energize the equipment/system and perform all setting of equipment limit and safety switches. The calibration of all sensing relays, and all timer/sequencer, etc. settings, along with any programming required for proper operation shall be made at this time. The Contractor shall then start-up the equipment/system and verify the proper operation of all features and functions as required by the Specifications and Drawings.

E. After completing the above items, the Contractor shall schedule a "Witnessed" Start-up. Twenty-four (24) hours (minimum) written notice shall be given the Owner's Representative prior to performing any Start-up. Start-up shall be scheduled at a time agreed upon by the Owner and the Contractor.

F. Start-up and operation of the equipment and/or system shall be performed using the manufacturer's Operation and Maintenance Manual. Any deficiencies in the O & M Manual noted during Start-up shall be corrected prior to scheduling the Owner's Demonstration as specified under Section 16980. Start-up will be witnessed by the Owner’s Representative.

G. Verification of the start-up performance of the equipment and/or system shall be provided in the form of a start-up report, indicating that the Owner's Representative witnessed all functions and operations required of the equipment and/or system. Four (4) copies of all Start-up reports, as specified herein and in other Sections, shall be submitted to the Owner.

H. All improperly functioning equipment not adapted to the purpose for which it is intended, or material, or equipment found to be faulty while performing the tests, shall be corrected; and any changes or repairs necessary to put the work in satisfactory condition and operation shall be done by the Contractor at no additional cost to the Owner. Start-up of the repaired equipment/system shall be witnessed by the Owner's Representative.

I. Successful and approved completion of the Start-up requirements is a prerequisite to determining whether the Work or a portion of the Work is Substantially Complete as specified under Section 16010.

2.2 CONTRACTOR'S ASSISTANCE

A. Setup, calibration, and Start-up of Package Equipment as described in Section 16010 shall be as required in other Sections of this Specification.

B. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturer's service representatives on any and all field tests and adjustments as may be made or required by equipment manufacturers or the Contractor as the equipment is started up. The Contractor shall make equipment manufacturers' service representatives available as required to assist in putting equipment into operation.

END OF SECTION

INSTRUMENT CALIBRATION CERTIFICATE

1.0 INSTRUMENT IDENTIFICATION

Tag Number _____
Instrument Name _____
DCS Point Reference _____
Manufacturer _____
Model Number _____
Part Number _____
Cal. Range _____
Serial Number _____

2.0 CALIBRATION / TEST EQUIPMENT IDENTIFICATION

Description _____
Manufacturer _____
Model Number _____
Part Number _____
Serial Number _____
Calibration Date _____
Accuracy _____

3.0 INSTRUMENT INSTALLATION

Installed per manufacturers instructions:	____ Yes	____ No
Installed per Contract Specifications:	____ Yes	____ No
Discrepancy Description _____		
Wiring Continuity from Instrument to Instrument:	____ N/A	____ OK
Wiring Continuity from Instrument to RIO Cabinet:	____ N/A	____ OK

4.0 INSTRUMENT CALIBRATION – ANALOG / DIGITAL

Level	Input Units	Value at Indicator	Value at DCS/PLC
0 %	_____	_____	_____
10 %	_____	_____	_____
50 %	_____	_____	_____
80 %	_____	_____	_____
100 %	_____	_____	_____

	Setting	Deadband	Activation at Device	Activation at DCS
Point 1	_____	_____	_____	_____
Point 2	_____	_____	_____	_____
Point 3	_____	_____	_____	_____

5.0 INSTRUMENT ADJUSTMENT SEALED

Adjustment Device Sealed With Colored Lacquer _____

6.0 CERTIFICATION

I certify that the above information is correct and that the instrument installation conforms to manufacturer and Contract Specifications, unless otherwise noted.

Technician Signature _____ Date: _____

7.0 ENGINEER REVIEW

Calibration Witnessed: ☐ Yes ☐ No Reviewer Signature _____ Date: _____

DEVICE SETTINGS CERTIFICATE
FOR MOTOR PROTECTION RELAY (MPR)

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 EQUIPMENT IDENTIFICATION

Starter or Panel Designation: _____

3.0 DEVICE SETTINGS

Attach Manufacturer's form(s), with settings filled in, whenever available.

MPR SETTINGS			
Device ID		Jam Trip Run Delay in Seconds	
Manufacturer		Underload Trip Level in % of FLA	
Model No.		Underload Trip and Alarm Start Delay in Seconds	
Full Load Amp Rating		Underload Trip Run Delay in Seconds	
Locked Rotor Current in % of FLA		Phase Unbalance Trip Level	
Maximum Allowable Stall Time in Seconds		Phase Unbalance Trip and Alarm Start Delay in Seconds	
Ultimate Trip Current in % of FLA		Phase Unbalance Trip Run Delay in Seconds	
Phase CT Ratio		Ground Fault Alarm Level in % of Ground CT Ratio	
Ground CT Ratio		I^2T Alarm Level in % of Full I^2T Trip Capacity	
50 or 60 Hertz Line Frequency		Jam Alarm Level in % of FLA	
Reversing or Non-reversing Starter		Jam Alarm Run Delay in Seconds	
RTD Temp in Degrees F or Degrees C		Underload Alarm Level in % of FLA	
Winding Temperature Trip		Underload Alarm Run Delay in Seconds	
Winding Temperature Alarm		Phase Unbalance Alarm Level	
Motor Bearing Temperature Trip		Phase Unbalance Alarm Run Delay in Seconds	
Motor Bearing Temperature Alarm		Starts Per Time Allowed	
Load Bearing Temperature Trip		Time Allowed for Starts Count in Minutes	
Load Bearing Temperature Alarm		Time Between Starts in Minutes	
Auxiliary Trip		Number of Cold Starts Allowed	
Auxiliary Alarm		Motor Start Transition Current Level in % of FLA	
Alarm on RTD Failure Diagnostic		Motor Start Transition Time in Seconds	
Ground Fault Trip Level in % of Ground CT Ratio		Transition on Time, Current, Time or Current, or Time and Current	
Ground Fault Start Delay in Cycles		Incomplete Sequence Report Back Time in Seconds	
Ground Fault Run Delay in Cycles		Incomplete Seq. Start Timer Initiated by	
Instantaneous Overcurrent in % of FLA		Long Acceleration Time in Seconds	
Instantaneous Overcurrent Start Delay in Cycles		Zero Speed Switch ON or OFF	
Jam Trip Level in % of FLA		Anti-Backspin Delay Time in Minutes	
Jam Trip and Alarm Start Delay in Seconds			

4.0 CERTIFICATION

I certify that the above information is correct and that the device installation and settings conform to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature _____ Date: _____

5.0 ENGINEER REVIEW

Setting Witnessed: ☐ Yes ☐ No Reviewer Signature _____ Date: _____

DEVICE SETTINGS CERTIFICATE FOR CIRCUIT BREAKERS

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 EQUIPMENT IDENTIFICATION

Panel or Switchgear Designation: _____

3.0 DEVICE SETTINGS

Attach manufacturer's form(s), with settings filled in, whenever available.

BREAKER SETTINGS									
Breaker ID:									
Device Manufacturer									
Device Model No.									
Bus Number									
Curve Shape									
Inv. TM. PU.									
Inv. TM. MULT.									
Short TM. Delay									
Inst. PU.									
Discrim.									
High Load TM.									
Frequency									
C.T. Ratio									
Ground Settings									

4.0 CERTIFICATION

I certify that the above information is correct and that the device installation and settings conform to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature _____ Date: _____

5.0 ENGINEER REVIEW

Setting Witnessed: ☐ Yes ☐ No Reviewer Signature _____ Date: _____

DEVICE SETTINGS CERTIFICATE
FOR VARIABLE FREQUENCY CONTROLLER

1.0 TECHNICIAN INFORMATION

Company Name: _____ Contact Person: _____

Address: _____ Phone No.: _____

_____

2.0 EQUIPMENT IDENTIFICATION

VFD Designations: _____

3.0 DEVICE SETTINGS

Attach manufacturer's form(s), with settings filled in, whenever available.

	SETTINGS					
Device ID:	VFD #	VFD #	VFD #	VFD #	VFD #	VFD #
Manufacturer						
Model No.						
Accel Time (seconds)						
Decel Time (seconds)						
Minimum Speed (Hz)						
Maximum Speed (Hz)						
Current Limit (%)						
Manual Torque Boost (%)						
V/Hz Base Speed (Hz)						
RPM at Base Speed						
Output Relay Configured to						
Carrier Frequency (kHZ)						
Remote Reference Gain (%)						
Remote Reference Offset (%)						
Electronic Thermal Overload (%)						
Electronic Thermal Overload Trip (on/off)						
Coast Stop Feature (on/off)						
Reverse (on/off)						
RPM Setpoint Feature (on/off)						
Power-Up Start Feature (on/off)						
Password Lockout Feature (on/off)						
Avoidance Frequency (Hz)						
Avoidance Bandwidth (Hz)						
Multi-Speed Preset 1 (Hz)						
Multi-Speed Preset 2 (Hz)						
Multi-Speed Preset 3 (Hz)						
Auto-Restart Number of Attempts						
Auto-Restart Retry Wait Time (seconds)						
Analog Output Configured to						

4.0 CERTIFICATION

I certify that the above information is correct and that the device installation and settings conform to manufacturer and Contract Specification requirements, unless otherwise noted.

Technician Signature _____ Date: _____

5.0 ENGINEER REVIEW

Setting Witnessed: ☐ Yes ☐ No Reviewer Signature _____ Date: _____

SECTION 16980

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Demonstration of equipment and/or systems for the Owner's personnel.

B. Requirements for Training of Owner's personnel in the operation and maintenance of the equipment/system.

C. Acceptance requirements.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturer's Field Reports.

B. Section 01700 - Contract Closeout.

C. Section 16010 - General Electrical, Instrument, and Control Requirements.

D. Section 16050 - Basic Electrical Materials and Methods.

E. Section 16960 - Electrical Testing and Equipment.

F. Section 16970 – Calibration and Start-up of Systems.

1.3 REFERENCES

A. All equipment and workmanship shall be in conformance with the following documents:
1. National Electrical Code (NEC), latest approved edition.
2. Any and all Federal, State, and/or local codes, ordinances, or regulations.

B. All equipment shall be designed, constructed, installed, and tested in conformity with all requirements, as a minimum, of applicable standards of IEEE, NEMA, ISA, ANSI, ICEA, UL and OSHA, except as modified herein.

PART 2 PRODUCTS

None.

PART 3 EXECUTION

3.1 DEMONSTRATION OF EQUIPMENT

A. Demonstration of equipment and systems, and training of the Owner's personnel in the proper operation and maintenance of the equipment and systems, shall be performed as required, as described below, and per the requirements of the Section under which the equipment/system was furnished.

B. The following shall occur prior to scheduling demonstration and training of any equipment and/or system:
   1. The Contractor shall have fully complied with the requirements of Section 16970, Calibration and Start-up of Systems, and shall have submitted reports indicating successful completion of start-up for the equipment/system being started.
   2. Any deficiencies in the manufacturer's Operation and Maintenance (O&M) Manuals and/or “As-Built” drawings, noted during Start-up shall be corrected prior to scheduling the Owner's Demonstration and Training, as required per Section 16970.
   3. The Contractor shall submit for approval a proposed agenda for said demonstration/training, and shall adhere to the approved agenda for the demonstration and training session(s).
   4. Any and all test equipment, maintenance equipment, tools, or devices, and/or spare parts required to be furnished under Division 16 shall be turned over, and stored as required under Sections 01700 and 16010.

C. After completing the above items, the Contractor shall schedule the Owner's Demonstration and Training. Seventy-two (72) hours (minimum) written notice shall be given the Owner's Representative prior to performing any Demonstration and/or Training. Such sessions shall be scheduled at a time agreed upon by the Owner and the Contractor. Multiple sessions shall be scheduled to allow attendance by all Owner’s Personnel.

D. The Demonstration shall instruct the Owner's personnel in all facets, features, and functions of the operation of the equipment and/or system. Training shall be performed using the manufacturer's Operation and Maintenance Manual and “As-Built” drawings, and shall familiarize the Owner's personnel in identifying improper operation, troubleshooting for the cause(s), and performing repair, replacement, and recalibration/setup necessary to correct the mis-operation. Use of any test equipment necessary, and a review of any recommended and/or provided spare parts shall be included in the Training.

E. Verification of the Demonstration and Training for the equipment and/or system shall be provided in the form of a report, indicating that the Owner's personnel attended and witnessed all functions and operations required of the equipment and/or system, and received the required instruction. Demonstration and Training will be witnessed by the Owner's Representative and four (4) copies of all demonstration and training reports, as specified above and in other Sections, shall be submitted to the Owner.

F. Successful and approved completion of the Demonstration and Training requirements is a prerequisite to determining whether the Work or a portion of the Work is Substantially Complete as specified under Section 16010.

3.2 CONTRACTOR'S ASSISTANCE

A. Demonstration and Training of Package Equipment, as described in Section 16010, shall be as required in other Sections of this Specification.

B. The Contractor shall provide the services of an electrician to assist either the Contractor or the equipment manufacturers' service representatives on any and all field set-ups and adjustments as may be required to demonstrate operation of the equipment or system. The Contractor shall make equipment manufacturers' service representatives available as required to assist in demonstrating equipment operation.

3.3 CLEANUP

A. Cleanup shall occur as required under Section 01700, and as specified under Section 16010.

3.4 ACCEPTANCE

A. Acceptance shall occur after all the above requirements have been satisfied, and as per Section 01700.

B. Acceptance of equipment and/or systems shall be signified by execution of Guarantees as described below.

3.5 GUARANTEES

A. The equipment and installation furnished under Division 16 shall be guaranteed for a period of one (1) year as specified under Section 01700, Contract Closeout.

B. The Contractor's Guarantee shall be furnished as follows:
   1. Provide multiple copies.
   2. Execute for Owner's signature a certificate of Contractor's guarantee, listing date of acceptance as start of warranty period (except where indicated otherwise under the detailed equipment specifications), for all work and materials provided and installed under this Division.*
   3. Execute and assemble any and all transferable warranty and/or license documents from Subcontractors, suppliers, and manufacturers.
   4. Provide Table of Contents and assemble in three D, side ring binder with durable plastic cover.

* For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of Owner’s acceptance as start of warranty period.

C. The Owner's dated signature on these documents shall constitute acceptance for warranty purposes.

END OF SECTION

APPENDIX

ATTACHMENT B
GENERAL DECLARATIONS

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, General Information, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services to the City under this Contract, with the wage and reporting requirements stated in the City Code provisions cited. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct. Bidder further agrees that the cited provisions of Chapter 14 and Chapter 23 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the City and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the City.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS _____ DAY OF _____, 202_.

_____	_____
Bidder's Name	Authorized Signature of Bidder
_____	_____
Official Address	(Print Name of Signer Above)
_____	_____
Telephone Number	Email Address for Award Notice

ATTACHMENT C
LEGAL STATUS OF BIDDER

(The bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of _____, for whom _____, bearing the office title of_____, whose signature is affixed to this Bid, is authorized to execute contracts.

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: __ _____
(initial here)

Authorized Official

_____ **Date** _____**,** 202_

(Print) Name _____ Title _____

Company:

_____

Address:

_____

Contact Phone ( ) _____ Fax ( ) _____

Email _____

ATTACHMENT D
PREVAILING WAGE DECLARATION OF COMPLIANCE

The "wage and employment requirements" of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City,

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

ATTACHMENT E
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here [___] *No. of employees__*

The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $17.08/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $19.04/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

Check the applicable box below which applies to your workforce

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

_____	_____
Company Name	Street Address
_____	_____
Signature of Authorized Representative Date	City, State, Zip
_____	_____
Print Name and Title	Phone/Email address

Attachment F

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE

RATE EFFECTIVE APRIL 30, 2025 - ENDING APRIL 29, 2026

$17.08 per hour
If the employer provides health care benefits*

$19.04 per hour
If the employer does **NOT** provide health care benefits*

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

ENFORCEMENT

The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

* Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

The Law Requires Employers to Display This Poster Where Employees Can Readily See It.

For Additional Information or to File a Complaint contact
Colin Spencer at 734/794-6500 or cspencer@a2gov.org

ATTACHEMENT G

Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	( ) Relationship to employee _____ ( ) Interest in vendor's company ( ) Other (please describe in box below)

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:		
Vendor Name	**Vendor Phone Number**	
Signature of Vendor Authorized Representative	**Date**	**Printed Name of Vendor Authorized Representative**

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org

ATTACHMENT H

DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email Address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500

ATTACHMENT I

CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below.
You can review the entire ordinance at www.a2gov.org/humanrights.

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City's Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk's Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.

THIS IS AN OFFICIAL GOVERNMENT NOTICE AND
MUST BE DISPLAYED WHERE EMPLOYEES CAN READILY SEE IT.

Michigan Department
Of Transportation
CP-347 (04/10)

MICHIGAN DEPARTMENT OF TRANSPORTATION

CERTIFIED PAYROLL

COMPLETION OF CERTIFIED PAYROLL FORM FULFILLS THE MINIMUM MDOT PREVAILING WAGE REQUIREMENTS

(1) NAME OF CONTRACTOR / SUBCONTRACTOR (CIRCLE ONE) (2) ADDRESS

(3) PAYROLL NO. (4) FOR WEEK ENDING (5) PROJECT AND LOCATION (6) CONTRACT ID

(a) EMPLOYEE INFORMATION	(b) WORK CLASSIFICATION	(c) Hour Type	(d) DAY AND DATE / HOURS WORKED ON PROJECT							(e) TOTAL HOURS ON PROJECT	(f) PROJECT RATE OF PAY	(g) PROJECT RATE OF FRINGE PAY	(h) GROSS PROJECT EARNED / GROSS WEEKLY EARNED	(i) TOTAL WEEKLY HOURS WORKED ALL JOBS	(j) DEDUCTIONS FICA	FEDERAL	STATE		OTHER	TOTAL DEDUCT	(k) TOTAL WEEKLY WAGES PAID FOR ALL JOBS
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.