CONSTRUCTION REQUEST FOR PROPOSAL

RFP# 22-43

Sodium Hypochlorite Storage Tank Replacement

City of Ann Arbor
Water Treatment Services Unit

Due Date: June 2, 2022 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 Contractor to procure and remove and replace two sodium hypochlorite bulk storage tanks and related piping, valves, electrical and instrumentation equipment within the existing containment area east of the Chemical Feed Building at the Ann Arbor Water Treatment Plant.

B. 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 May 13, 2022 at 3:00 p.m. (local time), and should be addressed as follows:

Scope of Work/Proposal Content questions shall be e-mailed to Ben Whitehead - **ben.whitehead@tetratech.com**

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.

C. PRE-PROPOSAL MEETING

A pre-proposal conference for this project will be held on **May 12, 2022 at 10:00 a.m. at the Ann Arbor Water Treatment Plant, 919 Sunset Road, Ann Arbor, MI 48103.** Attendance at this meeting is strongly encouraged. 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.

D. 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.

E. 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.

F. SEALED PROPOSAL SUBMISSION

All proposals are due and must be delivered to the City on or before June 2, 2022 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. 23-43 – SODIUM HYPOCHLORITE STORAGE TANK REPLACEMENT** 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 accessible to the public at all hours. 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 C - Legal Status of Bidder**
- **Attachment D - Prevailing Wage Declaration of Compliance Form**
- **Attachment E - Living Wage Declaration of Compliance Form**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Ordinance Declaration of Compliance Form**

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

G. 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.

H. 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.

I. 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 H 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.

J. 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.wdol.gov.

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

K. 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.

L. 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.

M. 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.

N. PROPOSAL PROTEST

All proposal protests must be in writing and filed with the Purchasing Manager within five (5) business days of the award action. 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.

O. SCHEDULE

The following is the schedule for this RFP process.

Activity/Event	**Anticipated Date**
Pre-Proposal Meeting	May 12, 2022 at 10:00 a.m. (Local Time)
Written Question Deadline	May 13, 2022 at 3:00 p.m. (Local Time)
Addenda Published (if needed)	Week of May 16, 2022
Proposal Due Date	June 2, 2022, 2:00 p.m. (Local Time)
Selection/Negotiations	June 2022
Expected City Council Authorizations	August 2022

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

P. IRS FORM W-9

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

Q. 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.

R. 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.

S. 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 encourages potential vendors to bring forward emerging and progressive products and services that are best suited to the City's environmental principles.

T. 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.

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 for more details.

A. Objective

The City of Ann Arbor, Michigan, is requesting proposals from construction firms able to provide chemical tank supply, tank installation, piping alterations, and electrical improvements to the City of Ann Arbor Water Treatment Services Unit.

B. Standard Specifications

All work performed 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 Advertisement. 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 provided during the implementation of individual tasks under this Contract.

Copies of the Standard Specifications can be downloaded from the following web link.

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

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 1:314(9) of the City Code which sets forth requirements for evaluating construction 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. Evidence of any quality assurance program used by the bidder and the results of any such program on the bidder's previous projects.

4. 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. Documentation of an on-going, Michigan OSHA-approved safety-training program for employees to be used on the proposed job site.

2. Evidence of the bidder’s worker's compensation Experience Modification Rating ("EMR"). 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 the OSHA 10-hour training course for safety established by the U.S. Department of Labor, Occupational Safety & Health Administration.

4. The safety record of bidder and major subcontractors, including OSHA, MIOSHA, or other safety violations.

C. Workforce Development – 20 Points

1. The ratio of masters or journeypersons to apprentices proposed to be used on the construction project job site, if apprentices are to be used on the project.

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

3. 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.

D. Social Equity and Sustainability – 20 Points

1. A statement from the bidder as to what percentage of its workforce resides in the City of Ann Arbor and in Washtenaw County, Michigan. The City will consider in evaluating which bids best serve its interests, the extent to which responsible and qualified bidders are able to achieve this goal.

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 proposed use of sustainable products, technologies, or practices for the project, which reduce the impact on human health and the environment, including raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and waste management.

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

E. Schedule of Pricing/Cost – 20 Points

SECTION 1 - SCHEDULE OF PRICES

Contractor's Company Name: _____

Project: Sodium Hypochlorite Storage Tank Replacement

Notes:
1. Provide a Unit Price and Total Price for all bid items specified.
2. Quantities included in the bid table represent estimated quantities for different work. The CONTRACTOR shall be compensated for the actual number of items completed using the unit prices provided.
3. The City, at its sole discretion, may elect to delete any portion of the work delineated below, with no change to the unit prices provided. Work shall be determined based upon the availability of funds.
4. Any item not provided in the following list shall be considered incidental.
5. Change order shall be awarded based on the base bid or any combination of a base bid and alternate bid in any manner the City believes to be in its best interest.

	BASE PRICING					
Item No.	**Item Description**	**Qty**	**Unit**	**Unit Price**	**General Contractor Mark-up (see contract)**	**Total Price**
1.	General Conditions (Max, 10% of items 2 through 13)	1	LS	$		$
2.	Tank Supply and Installation	1	LS	$		$
3.	Piping Improvements	1	LS	$		$
4.	Electrical Improvements	1	LS	$		$
5.	Concrete Surface Repair, Over 2-inches Deep	25	SF	$		$
6.	Concrete Surface Repair, Equal to or Less than 2-inches Deep	25	SF	$		$
7.	Concrete Crack Repair, Pressure Injection of Epoxy Resin	100	LF	$		$

8.	Concrete Crack Repair, Pressure Injection of Hydrophilic Grout	100	LF	$		$
9.	Start-up, Testing, Commissioning and Training	1	LS	$		$
10.	Final Closeout	1	LS	$		$
11.	Permit Allowance	1	LS	$ 2,000		$ 2,000
12.	Certified Payroll Compliance and Reporting	1	LS	$		$
13.	Provisionary Allowance	1	LS	$25,000		$25,000
TOTAL BASE PRICE (ITEMS 1 THROUGH 13)						**$**

Total Base Price: _____ Dollars

($_____)

(Amount shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.)

Alternates
Bidder shall list alternate bid item prices below.

Alternate No. 1 – Delete Internally Sloped Base (typical of two tanks) in specification section 43 41 45.

Deduct: _____ Dollars ($_____)
(Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.)

BID FORM

SECTION 2 – MATERIAL, EQUIPMENT AND ENVIRONMENTAL ALTERNATES

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

If the Contractor wishes to price 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 an environmental alternative is bid the City strongly encourages bidders to provide recent examples of product testing and previous successful use for the City to properly evaluate the environmental alternative. Testing data from independent accredited organizations are strongly preferred.

Item Number	Description	Add/Deduct Amount

If the Contractor does not suggest any material or equipment alternate, the Contractor **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any material or equipment alternate under the Contract.

Signature of Authorized Representative of Contractor _____ Date _____

BID FORM

SECTION 3 - TIME ALTERNATE

If the Contractor takes exception to the time stipulated in the Summary of Work-Mechanical, it is requested to stipulate below its proposed time for performance of the work. Consideration will be given to time in evaluating the proposal.

If the Contractor does not suggest any time alternate, the Contractor **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any time alternate under the Contract.

Signature of Authorized Representative of Contractor _____ Date _____

BID FORM

SECTION 4 - MAJOR SUBCONTRACTORS

For purposes of this Contract, a Subcontractor is anyone (other than the Contractor) who performs work (other than or in addition to the furnishing of materials, plans or equipment) at or about the construction site, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of Contract with the Contractor), but shall not include any individual who furnishes merely the individual's own personal labor or services.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision to Section 4 of the General Conditions covering subcontractor's employees who perform work on this contract.

For the work outlined in these documents the Bidder expects to engage the following major subcontractors to perform the work identified:

Subcontractor (Name and Address)	Work	Amount
	Mechanical	
	Electrical	
	Concrete	

If the Bidder does not expect to engage any major subcontractor, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT expect to engage any major subcontractor to perform work under the Contract.

Signature of Authorized Representative of Contractor_____ Date _____

BID FORM

SECTION 5 – CONTRACTOR REFERENCES

Include a minimum of 3 references from similar project completed within the past 10 years.

1) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

2) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

3) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

4) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

5) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

F. AUTHORIZED NEGOTIATOR / NEGOTIATIBLE 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 price alternative 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:

Administrative Use Only
Contract Date: _____

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 **[Insert Name of Administering Service Unit]**

Project means **[Insert Title of Bid and Bid Number]**

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: [**Insert the person's name**] whose job title is [**Insert job title**]. 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 365 (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 $_____ 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

Choose one only.

(A) The City shall pay to the Contractor for the performance of the Contract, the lump sum price as given in the Bid Form in the amount of:

_____Dollars ($_____)

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.

FOR CONTRACTOR

By_____

Its:_____

FOR THE CITY OF ANN ARBOR

By_____
Christopher Taylor, Mayor

By_____
Jacqueline Beaudry, City Clerk

Approved as to substance

By_____

City Administrator

By_____

Services Area Administrator

Approved as to form and content

_____
Stephen K. Postema, City Attorney

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 _____ _____, for RFP No. _____ 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 _____, 202_.

_____	_____
(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:
_____	_____
Stephen K. Postema, 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 Cityentitled _____ _____ _____, for RFP No. _____; 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 _____, 202_

_____	_____
(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:
_____	_____
Stephen K. Postema, City Attorney	_____
	_____

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

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 $14.82/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 $16.52/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, 2022 - ENDING APRIL 29, 2023

$14.82 per hour
If the employer provides health care benefits*

$16.52 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

Revised 2/1/2022

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.

SECTION 01 11 13 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. The Work to be performed shall consist of furnishing tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services (including applying for permits, paying permit fees, and scheduling and closing inspections), including but not limited to fuel, power, water, essential communications, and performing all Work or other operations required in strict accordance with the Drawings and these specifications. The Work shall be complete, and all Work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the City.

B. The Project is located at the Ann Arbor Water Treatment Plant, 919 Sunset Road, Ann Arbor, MI 48103.

C. The Work consists of demolition, installation of new chemical tanks, installation of new chemical piping, concrete placement, installation of new access ladders, and replacement of existing instruments.

1.02 WORK SEQUENCE

A. CONTRACTOR shall arrange its Work so that at no time shall it cause unnecessary interruption to the operation of existing facilities. In order to meet the overall objective of this Project, certain elements of the Work must be completed in a particular sequence. It may also be necessary to do certain parts of the Work outside normal working hours. CONTRACTOR shall do this Work at such times and at no additional cost to OWNER. CONTRACTOR shall be completely responsible for fines and other enforcement imposed upon the facility resulting from inadvertent or unplanned interruptions caused by CONTRACTOR that result in water quality violations. CONTRACTOR shall be responsible for the means and methods of construction but a suggested sequence of construction is as follows:

1. Isolate the two tank discharge pipes so each tank has a single dedicated discharge line. Remove supply and distribution piping and appurtenances to and from a single tank to the hose connection exiting the containment area. Piping to and from the second tank shall remain in service until the first tank is replaced and connected to proposed supply and discharge piping and the first tank and piping system has been cleaned, tested and commissioned.
2. Transfer chemical from first tank to be demolished to the second existing tank.
3. Demolish one chemical tank while keeping one tank and related supply and discharge pipe in operation.
4. Install new housekeeping pad, chemical tank and ladders.
5. Clean, test and Commission new chemical tank and related supply and discharge piping.
6. Transfer chemical from existing tank to new tank.
7. Demolish second chemical tank and related supply and discharge piping while keeping new tank and piping in operation.
8. Install new housekeeping pad, chemical tank and ladders.
9. Clean, test and Commission second chemical tank and related supply and discharge piping.

B. CONTRACTOR shall submit complete details of its plan to ENGINEER for review.

1.03 CONTRACTOR USE OF PREMISES

A. Limit use of the premises to construction activities in areas indicated; allow for OWNER occupancy and use by the public. Confine operations to areas within Contract limits indicated. Portions of the Site beyond areas in which construction operations are indicated are not to be disturbed.

B. Keep driveways and entrances serving the premises clear and available to OWNER, OWNER's employees, and private property owners at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on Site. Areas for CONTRACTOR's trailers, equipment, and material storage, and CONTRACTOR's employee parking shall be as indicated on Drawings or agreed by OWNER prior to the start of construction.

C. City will not make restrooms available for Contractor personnel. Refer to section 01 50 00 for restroom requirements.

1.04 OWNER OCCUPANCY

A. Full OWNER Occupancy: OWNER will occupy the Site and existing building during the entire construction period. Cooperate with OWNER during construction operations to minimize conflicts and facilitate OWNER usage. Perform the Work so as not to interfere with OWNER's operations.

B. City shall have use of hypochlorite chemical at all times. Two, 2-hour shutdowns will be allowed with 30-day notice.

1.05 MISCELLANEOUS PROVISIONS

A. Time and Sequence of Work: In general, it is the intention and understanding that CONTRACTOR shall have control over the sequence or order of execution of the several parts of the Work to be done under the Contract and over the method of accomplishing the required results, except as some particular sequence or method may be distinctly demanded by the Drawings and Project Manual or by the expressed provisions of the Contract. ENGINEER may, however, make such reasonable requirements as may, in ENGINEER's judgment, be necessary for the proper and effective protection of Work partially or wholly completed, and to these requirements CONTRACTOR shall conform.

B. The Contractor shall be responsible for coordinating the general construction and electrical, mechanical, plumbing, and controls construction schedules and for ensuring that permanent or temporary service is available for all existing, proposed, and temporary facilities that are required to be on line at any given time. Work shall be done during weather conditions conducive to the work.

C. The Contractor has the option of providing temporary facilities that can eliminate a constraint, provided it is done without cost to the Owner and provided that all requirements of these Specifications are fulfilled. Work not specifically covered in the following paragraphs may, in general, be done at any time during the contract period, subject to the operating requirements and constraints and construction requirements outlined hereinafter. All references to days in this Section shall be consecutive calendar days.

1.06 GENERAL CONSTRAINTS

A. The Contractor shall schedule the Work so that the plant is maintained in continuous operation. All treatment processes shall be maintained in continuous operation during the construction period except during approved process interruptions. Shutdowns and diversions shall conform to the requirements hereinafter specified and shall be minimized by the Contractor as much as possible. If in the judgment of the Engineer a requested shutdown is not required for the Contractor to perform the Work, the Contractor shall utilize approved alternative methods to accomplish the Work. All shutdowns shall be coordinated with and scheduled at times suitable to the Owner. Shutdowns shall not begin until all required materials are on hand and ready for installation. Each shutdown period shall commence at a time approved by the Owner. If the Contractor completes all required Work before the specified transfer period has ended, the Owner may immediately place the existing system back into service.

B. The Contractor shall give Owner advance notice of proposed shutdowns of any pipe, process, equipment, tank, treatment train, or power source, and shall present all desired shutdowns in the 30 and 60 day schedules at the progress meetings. Shutdowns shall be fully coordinated with the Owner at least 30 days before the scheduled shutdown. Contractor shall lockout/tagout equipment and power sources involved in the shutdowns and diversions. The Owner’s personnel shall operate Owner's facilities during shutdowns.

C. The Contractor shall submit a proposed written plan of work, with a request to schedule shutdown work for Owner and Engineer approval. Work plan shall include sequence of events, needs for coordination with plant staff, plans for lock-out/tag-out, contingency plans for how to return equipment and tanks to service early if needed for emergencies, and details of how the duration of the shut-down will be minimized.

D. Short-term shutdowns (24 hours or less) shall require 7 days prior notice to schedule date and time with Owner, unless otherwise noted herein. Once a short-term shutdown starts, Contractor shall work continuously until the work is complete and the disrupted process or system can be returned to service. Long-term shutdowns (longer than 24 hours) shall require 30 days prior notice to schedule date and time with Owner, unless otherwise noted herein. The Contractor shall submit a plan of work showing sequence of events throughout shutdown period, and listing all items requiring coordination with Owner’s staff. The Contractor shall schedule a coordination meeting with the Owner prior to the initiation of a long-term shutdown. Once a long-term shutdown starts, Contractor shall work on the shutdown area full days, every regular work day, until the work is complete and the disrupted process or system can be returned to service, unless otherwise required herein.

E. Any temporary work, facilities, roads, walks, protection of existing structures, piping, blind flanges, valves, equipment, etc. that may be required within the Contractor's work limits to maintain continuous and dependable plant operation shall be furnished by the Contractor at the direction of the Owner or Engineer at no extra cost to the Owner.

F. The Owner shall have the authority to order work stopped or prohibited that would, in his opinion, unreasonably result in interrupting the necessary functions of the plant operations. The Owner reserves the right to cancel a scheduled shutdown, without additional compensation due the Contractor, and will consider a contract extension if the cancellation affects the contractor’s critical path.

G. Unless specifically required by this specification, the Contractor shall not request more than one shutdown occur simultaneously.

H. If the Contractor impairs performance or operation of the plant as a result of not complying with specified provisions for maintaining plant operations, then the Contractor shall immediately make all repairs or replacements and do all work necessary to restore the plant to operation to the satisfaction of the Owner and Engineer. Such work shall progress continuously to completion 24 hours per day and seven work days per week.

I. After any damage to the existing facilities by the Contractor's Work that, in the opinion of the Owner, constitutes an emergency, the Contractor shall be immediately available and provide immediate services for the repair of damage and mitigation of the emergency.

J. Shutdowns shall be scheduled between Monday and Friday, unless there are extenuating circumstances approved by the Engineer.

1.07 GENERAL REQUIREMENTS

A. Access to Plant Site, Roadways, and Parking Areas
   1. An unobstructed traffic route through all water plant gates shall be maintained at all times for the Owner's operations personnel and maintenance equipment. The pavement areas needed for crane erection may be closed for one day to deliver the air handling unit and demolish the existing unit. Extensions of this schedule may be considered with prior notice. The Contractor shall be responsible for providing access to the construction area and for preparing and maintaining temporary access road, fence, and gate. Contractor shall be responsible for notices and signage needed to maintain access for WTP operations. Contractor's personnel shall park on approved City street curbs and shall not park on the water treatment plant site.
   2. An unobstructed traffic route around the plant site shall be maintained at all times for the Owner's operations personnel, maintenance equipment, and delivery vehicles. Vehicular access to the treatment units, buildings, and bulk chemical storage facilities for Owner personnel and for chemical delivery vehicles shall be maintained at all times by the Contractor except as explicitly permitted hereinafter.
   3. It shall be the responsibility of the General Contractor to obtain any permits required from the City of Ann Arbor Building Department or other governmental agency having jurisdiction and pay all associated fees. Contractor shall schedule and coordinate all inspections. Costs incurred by rescheduled inspections as a result of Contractor not being prepared shall be at Contractor's expenses.
   4. The Contractor shall be responsible for removal of snow in areas of the Contractor's work.
   5. The Contractor will not disturb the maintenance of plant operations without a written and approved plan. These operations at a minimum include chemical deliveries, sludge hauling and general deliveries.
   6. The Contractor will submit plans for approval for any needed outages or disturbances to operations. These plans will include the area, process or systems that will be impacted and duration of the outage. No plans can be implemented without written authorization from Owner or Engineer.

B. Personnel Access
   1. Treatment plant personnel shall have access to all areas which remain in operation throughout the construction period. The Contractor shall locate stored material, dispose of construction debris and trash, provide temporary walkways, provide temporary lighting, and other such work as directed by the Engineer to maintain personnel access to areas in operation. Access and adequate parking areas for plant personnel must be maintained throughout construction.

C. Plumbing Facilities
   1. Unless otherwise allowed by the Engineer, sanitary facilities in the existing structures shall be operational at all times for plant operating personnel. All other building plumbing systems such as roof and floor drains, pumping, etc., shall be maintained for all structures.

D. Power, Light and Communications Systems (General)

E. Electric power, lighting service and communications systems shall be maintained in uninterrupted operation in all areas which remain in operation. Individual units may be disconnected as required for replacement, but service shall be available at all times including periods when plant elements are out of service. Shutdown of electrical facilities, when allowed, shall be limited to not more than two (2) hours unless otherwise noted or approved by the Owner. The Owner may allow longer outages under conditions determined by the Owner by making use of the existing engine generator at the plant. The Contractor shall coordinate shutdowns required to minimize the duration of shutdowns and the total number of shutdowns required to complete construction. Owner's phone service to the plant shall be maintained in continuous operation during construction. Draining Process Pipes and Conduits (General)
   1. The contents of all pipes and conduits to be removed, replaced or relocated (or dewatered for a specific purpose) shall be transferred to a suitable facility in a manner approved by the Owner through hoses or piping, or by using pumps if hydraulic conditions so require them. The Contractor shall provide the pumps, piping, taps, valves and hoses at no additional cost to the Owner. No uncontrolled spillage of a pipe or conduit shall be permitted. Any spillage, other than potable water, shall be immediately washed down and flushed to the appropriate disposal location. The Contractor may use drains if available, appropriate and approved by the Owner.

1.08 SPECIFIC OPERATIONAL CONSTRAINTS

A. The Contractor shall schedule the work for the following based on the constraints given in such a manner as to maintain the water treatment plant operation. Contractor shall submit a proposed construction schedule including all planned system shutdowns and tie-ins for the Owner’s and Engineer’s review no later than 30 calendar days after issuance of the Notice to Proceed. At a minimum, Construction Schedule shall indicate a proposed start date and duration for each of the items listed in this section. No construction shall begin on any of the items listed in this section until the proposed schedule has been approved.

B. Contractor shall install as much of the new systems that will replace existing systems as feasible prior to shut-down of any duct, to minimize the duration of the shut-down. Contractor may install temporary ducts to replace demolished ducts, for Contractor’s convenience, at no added cost to the Owner. Temporary duct shall be of the same size and pressure rating as existing duct. New control wiring shall be installed prior to removing existing control wiring.

C. Specific operational constraints are specified in Table 1 with liquidated damages that may apply.

Table 1
Ann Arbor WTP
Summary of Shutdown Notices, Durations, Dates, Deadlines, and Liquidated Damages

Item	Notice to Owner (days)	Maximum Duration	Dates and Deadlines	Liquidated Damages
Sodium Hypochlorite shutdown		2 hours	Submit Schedule	$1,000/day
Substantial Completion	N/A	N/A	July 15, 2023	$500/day

D. Anticipated Contract Dates are:

Notice to Proceed	September 1, 2022
Submittals to Engineer or Owner	No Later than October 1, 2022
Tank Replacement	June 1, 2023
Commissioning	July 1, 2023
Substantial Completion	July 15, 2023
Final Completion	August 1, 2023

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 21 00– ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 DEFINITIONS

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

1.03 SUBMITTALS

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

1.04 OWNER'S INSTRUCTIONS

A. At the earliest feasible date after Contract Award, advise ENGINEER of the date when the final selection and purchase of each product or system described by an Allowance must be completed in order to avoid delay in performance of the Work.

B. When requested by ENGINEER, obtain Bids for each Allowance for use in making final selections; include recommendations that are relevant to performance of the Work.

C. Purchase products and systems as selected by ENGINEER from the designated supplier.

D. Use Allowances only as directed for OWNER's purposes, and only by Change Orders which designate amounts to be charged to the Allowance.

E. If the actual price for the specified Allowance is more or less than the stated Allowance, the Contract Price shall be adjusted accordingly by Change Order. The adjustment in Contract Price shall be made in accordance with Section 15 of the General Conditions.

F. Change Orders authorizing use of funds from the Contingency or Provisionary Allowances will include CONTRACTOR's related costs and reasonable overhead and profit margins.

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

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect products and services covered by an Allowance promptly upon delivery for damage or defects.

3.02 PREPARATION

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

SCHEDULE OF ALLOWANCES

1. Lump Sum Allowance for Building Permit. An Allowance of $2,000 shall be included in the Contract Price for this Work. CONTRACTOR shall make all arrangements for and shall pay for this Work under this Contract. For further information, contact:

Company	City of Ann Arbor Building Department
Address	301 E. Huron Street, Ann Arbor, MI 48104
Phone	734-794-6267

2. Lump Sum Allowance for Miscellaneous Conditions. An Allowance of $25,000 shall be included in the Contract Price for this Work. CONTRACTOR shall make all arrangements for and shall pay for this Work under this Contract as directed by OWNER:

END OF SECTION

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for Alternates.

1.02 DEFINITIONS

A. Alternate: An amount proposed by Bidders and stated on Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if OWNER decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1.03 OWNER'S INSTRUCTIONS

A. Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the Project.

B. OWNER will evaluate Bids from the Base Lump Sum Bid price and add or deduct the amounts stated on Bid Form for the Alternate in the order in which the Alternates are listed on Schedule at the end of this Section. OWNER reserves the right to determine how many Alternates will be added or deducted for this Project. The cost of the Alternate shall include any appropriate amounts for general conditions, bonds, insurances, materials, labor, tools, power, transportation, construction equipment, and associated items involved with the described Alternate.

C. Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected, or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

D. A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced on the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate. Drawings referenced on the Schedule indicate the Work required to perform the Alternate.

E. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items that are included with or required for a complete installation, whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SCHEDULE OF ALTERNATES

Alternates to the Base Bid Form are offered as follows:

Alternate No. 1

Description: The alternate consist of the deletion of the sloped base for two (2) storage tanks.

Reference Specification Section 43 41 45.

END OF SECTION

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.03 MINOR CHANGES IN THE WORK

A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the response to Contractor’s Request for Information (RFI).

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Engineer.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified. Contractor will be responsible for any costs Owner or Engineer incurs for evaluating a substitution even if substitution is later denied.
7. Proposal Request Form: Use form acceptable to Engineer.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Owner will issue a Change Order for signatures of Owner and Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 27 00 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies administrative and procedural requirements for measurement and payment. Payment for Work under this Contract will be made on a unit price or lump sum basis for Work actually completed. Final measurements of the Work will be taken by ENGINEER to determine the amount of Work completed. The method of applying the unit prices to measured quantities shall be as specified in this Section.

1.02 OWNER'S INSTRUCTIONS

A. Payment will only be made for items listed on Bid Form. The costs for other Work required for a complete Project will be included in the prices Bid for the other items of Work listed on Bid Form.

B. Payment for each item will be in accordance with the General Conditions, and include all applicable labor, material, equipment, and ancillary items to complete the Work specified.

C. All measurements shall be rounded to the nearest whole unit.

1.03 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by ENGINEER and paid for by OWNER.

B. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

C. The date for each progress payment will be determined at the Pre-Construction Conference. The period of construction Work covered by each Application for Payment is 1 month. Actual start/end dates will be determined at the Pre-Construction Conference.

D. Use the AIA (American Institute of Architects) Application and Certification for Payment form for Applications for Payment.
   1. Complete every entry on the form, including execution by person authorized to sign legal documents on behalf of CONTRACTOR.
   2. Incomplete applications will be returned without action.

E. Initial Application for Payment: Administrative actions and submittals that must precede submittal of the first Application for Payment include the following:
   1. List of subcontractors.
   2. List of principal suppliers and fabricators.
   3. CONTRACTOR's Construction Schedule (preliminary if not final).
   4. Schedule of principal products.
   5. Submittal Schedule (preliminary if not final).

F. Application for Payment at Substantial Completion: Administrative actions and submittals that shall proceed or coincide with this application include:
   1. Warranties (guarantees) and maintenance agreements.
   2. Maintenance instructions.
   3. Meter readings.
   4. Start-up performance and balancing reports.
   5. Changeover information related to OWNER's occupancy, use, operation, and maintenance.
   6. Final cleaning.
   7. Application for reduction of retainage, and consent of surety.
   8. Advice on shifting insurance coverages.
   9. Final progress photographs.
   10. List of incomplete Work, recognized as exceptions to ENGINEER's Certificate of Substantial Completion.

G. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
   1. Completion of Project closeout requirements.
   2. Completion of items specified for completion after Substantial Completion.
   3. Assurance that unsettled claims will be settled.
   4. Assurance that Work not complete and accepted will be completed without undue delay.
   5. Transmittal of required Project construction records to OWNER.
   6. Proof that taxes, fees, and similar obligations have been paid.
   7. Removal of temporary facilities and services.
   8. Removal of surplus materials, rubbish, and similar elements.
   9. CONTRACTOR's waivers of mechanics liens for Project.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SCHEDULE OF UNIT PRICES

Description: Allowances
Payment: Lump Sum.
Measurement: Each.
Work Required: As specified in Section 01 21 00 - Allowances.

Description: General Conditions, Max 10% of Total Base Bid
Payment: Lump Sum.
Measurement: Each.
Work Required: This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum, minus any deductions incurred for inadequate performance as described herein. This amount will not be increased for any reason, including extensions of time, extras, and/or additional work.

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification. The amount for this work shall be no more than 10% of the total base bid.

Description: Tank Supply and Installation
Payment: Lump Sum.
Measurement: Each.
Work Required: Demolition and supply/installation of new hypochlorite tanks. Also included in supply and installation of access ladders.

Description: Piping Improvements
Payment: Lump Sum.
Measurement: Each.
Work Required: Demolition and installation of new containment piping within containment area.

Description: Electrical Improvements
Payment: Lump Sum.
Measurement: Each.
Work Required: Removal, protection and reinstallation of existing instruments. Work shall also include installation of new electrical equipment specified.

Description: Concrete Surface Repair, Over 2-inches Deep
Payment: Unit.
Measurement: Square Foot.
Work Required: Preparation and repair of existing concrete surfaces greater than 2-inch depth from the existing surface, as identified by Engineer.

Description: Concrete Surface Repair, Equal to or Less than 2-inches Deep
Payment: Unit.
Measurement: Square Foot.
Work Required: Preparation and repair of existing concrete surfaces equal to or less than 2-inch depth from the existing surface, as identified by Engineer.

Description:	Concrete Crack Repair, Pressure Injection of Epoxy Resin
Payment:	Unit.
Measurement:	Each.
Work Required:	Preparation and injection of epoxy resin into existing concrete cracks, as identified by Engineer.

Description:	Concrete Crack Repair, Pressure Injection of Hydrophilic Grout
Payment:	Unit.
Measurement:	Each.
Work Required:	Preparation and injection of hydrophilic grout into existing concrete cracks, as identified by Engineer.

Description:	Start-up, Testing, Commissioning and Training
Payment:	Lump Sum.
Measurement:	Each.
Work Required:	Testing, start-up and commissioning of all mechanical, electrical and instrumentation systems, any specified training and coordination with City and other related work.

Description:	Final Closeout
Payment:	Lump Sum.
Measurement:	Each.
Work Required:	Submission of O&M documents, submission of record drawings, work outlined in specification 01 77 00 and all other work associated with closing out contract items.

Description:	Certified Payroll Compliance and Reporting
Payment:	Lump Sum.
Measurement:	Each.
Work Required:	The unit price for this item of work shall include all supervisory, accounting, administrative, and equipment costs needed to monitor and perform all work related to maintaining compliance with the tasks specified in this Detailed Specification, the City of Ann Arbor Code of Ordinances, its Prevailing Wage Compliance policy and the applicable Federal and State laws. Payment for this work will be made with each progress payment, on a pro-rata basis, based on the percentage of construction completed. When all of the work of this contract has been completed, the measurement of this item shall be 1.0 times the Lump Sum bid amount. This amount will not be increased for any reason, including extensions of time, extra work, and/or adjustments to existing items of work.

END OF SECTION

SECTION 01 29 00 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements governing CONTRACTOR's Applications for Payment.

B. Related Sections:
   1. CONTRACTOR's Construction Schedule and Submittal Schedule are included in Section 01 33 00.

1.02 OWNER'S INSTRUCTIONS

A. Schedule of Values:
   1. Coordinate preparation of Schedule of Values with preparation of CONTRACTOR's Construction Schedule.
   2. Correlate line items on Schedule of Values with other required administrative schedules and forms, including:
      a. CONTRACTOR's Construction Schedule.
      b. Application for Payment form.
      c. List of subcontractors.
      d. Schedule of Allowances.
      e. Schedule of Alternates.
      f. List of products.
      g. List of principal suppliers and fabricators.
      h. Schedule of Submittals.
   3. Submit Schedule of Values to ENGINEER at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial Application for Payment.
   4. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for Schedule of Values.
   5. Identification: Include the following Project identification on Schedule of Values:
      a. Project name and location.
      b. Name of ENGINEER.
      c. Project number.
      d. CONTRACTOR's name and address.
      e. Date of submittal.
   6. Arrange Schedule of Values in a tabular form with separate rows for each Specification Section and separate columns for each major structure or area of Work.
   7. Provide a breakdown of the Contract Price in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
   8. Round off amounts to the nearest whole dollar; the total shall equal the Contract Price.
   9. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   10. Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually on Applications for Payment. Each item on Schedule of Values

and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

11. At CONTRACTOR's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items on Schedule of Values or distributed as general overhead expense.
12. Update and resubmit Schedule of Values when Change Orders or Work Change Directives result in a change in the Contract Price.
13. A Lump Sum payment equal to 1-1/2% of the total Bid Price (to include all bonds, insurance, etc.) will be allowed for "mobilization" as a progress payment line item and as a portion of the amount bid for General Conditions. The actual cost of bonds and insurance (up to maximum payment of 1-1/2%) will be considered in the initial payment request provided that cost documentation suitable to the OWNER is furnished by the CONTRACTOR. Any outstanding balance of the mobilization line litem will be payable when the Project work is 10% complete as indicated by the approved progress payments (less costs of mobilization and stored equipment).
14. Payment Restrictions
    a. Major equipment items will be paid according to the following schedule:
        1) Upon equipment delivery – 60% of the contract amount
        2) Upon successful start-up, testing and validation (i.e. substantial completion) – 30% of the contract amount
        3) Upon completion of punch list work (i.e. final completion) – 10% of the contract amount
    b. Retainage shall apply to the above payment sequence
    c. Major equipment items are considered to consist of the following items:
        1) Electric motors
        2) Generator
        3) VFDs
        4) Motor control centers
        5) Air handling units/Roof-top units.

B. Initial Application for Payment: Administrative actions and submittals that must precede submittal of the first Application for Payment include the following:
    1. List of subcontractors.
    2. List of principal suppliers and fabricators.
    3. Schedule of Values.
    4. CONTRACTOR's Construction Schedule (preliminary if not final).
    5. Schedule of principal products.
    6. Submittal Schedule (preliminary if not final).

C. Applications For Payment:
    1. Each Application for Payment shall be consistent with previous applications and payments as certified by ENGINEER and paid for by OWNER.
    2. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
    3. The date for each progress payment will be determined at the Pre-Construction Conference. The period of construction Work covered by each Application for Payment is 1 month. Actual start/end dates will be determined at the Pre-Construction Conference.
    4. Complete every entry on the form, including execution by person authorized to sign legal documents on behalf of CONTRACTOR. Incomplete applications will be returned without action.
    5. Entries shall match data on Schedule of Values and CONTRACTOR's Construction Schedule. Use updated Schedules if revisions have been made.

6. Include amounts of Change Orders and Work Change Directives issued prior to the last day of the construction period covered by the application.
7. Submit executed electronic copy of each Application for Payment to ENGINEER; including waivers of lien and similar attachments.
8. After review by engineer and revisions, transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to ENGINEER or OWNER as defined at preconstruction meeting.

D. Application for Payment at Substantial Completion:
   1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for OWNER occupancy of designated portions of the Work.
   2. Administrative actions and submittals that shall proceed or coincide with this application include:
      a. Occupancy permits and similar approvals.
      b. Warranties (guarantees) and maintenance agreements.
      c. Test/adjust/balance records.
      d. Maintenance instructions.
      e. Meter readings.
      f. Start-up performance reports.
      g. Changeover information related to OWNER's occupancy, use, operation, and maintenance.
      h. Final cleaning.
      i. Application for reduction of retainage and consent of surety.
      j. Final progress photographs.
      k. List of incomplete Work, recognized as exceptions to ENGINEER'S Certificate of Substantial Completion.

E. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
   1. Submit documents required for progress payments.
   2. Submit documents required in the General Conditions, as may be modified by the Supplementary Conditions.
   3. Completion of Project closeout requirements.
   4. Completion of items specified for completion after Substantial Completion.
   5. Transmittal of required Project construction records to OWNER.
   6. Proof that taxes, fees, and similar obligations have been paid.
   7. Submit Consent of Surety.
   8. Removal of temporary facilities and services.
   9. Completion of all punch list items.
   10. Submission of warranties
   11. Submission of operation and maintenance materials
   12. Completion of record drawings
   13. Removal of surplus materials, rubbish, and similar elements.
   14. Releases of Waivers of Lien Rights:
      a. When submitting releases of waivers of lien rights, provide release or waiver by CONTRACTOR of each SUBCONTRACTOR and supplier that provided CONTRACTOR with labor, material, or equipment.
      b. Provide a list of Subcontractors and Suppliers for which release or waiver of lien is required.

c. Each release or waiver of lien shall be signed by an authorized representative of entity submitting release or waiver to CONTRACTOR, and shall include Subcontractor's or Supplier's corporate seal if applicable.
d. Release or waiver of lien may be conditional upon receipt of final payment..

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 31 00 - PROJECT COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
   1. Coordination of Work under this Contract.
   2. Scheduling
   3. Permits
   4. Administrative and supervisory personnel.
   5. Land survey work.
   6. Pre-Construction Conference.
   7. Progress meetings.
   8. Inspections
   9. Start-up
   10. General installation provisions.
   11. Cleaning and protection.

B. Related Sections Specified Elsewhere:
   1. Equipment installation check, and operation, maintenance, and training of OWNER's personnel are included in Section 01 60 00 and Sections for specific equipment items.
   2. Requirements for CONTRACTOR's Construction Schedule are included in Section 01 33 00.
   3. Liquidated Damages in Section 01 11 00

1.02 SUBMITTALS

A. Within 15 days of Notice to Proceed, submit a list of CONTRACTOR's principal staff assignments, including the Superintendent and other personnel in attendance at Site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1.03 SCHEDULING

A. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Make adequate provisions to accommodate items scheduled for later installation. CONTRACTOR shall coordinate the general construction including the work of subcontractors.

B. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at Site in accordance with Laws or Regulations. CONTRACTOR shall train CONTRACTOR's employees on use of these sheets and shall keep a master copy on hand at Site.

C. Coordination with Other Contractors:
   1. CONTRACTOR shall so conduct CONTRACTOR's operations as not to interfere with or injure the Work of other Contractors or workmen employed on adjoining or related Work, and CONTRACTOR shall promptly make good any injury or damage which may be done to such Work by CONTRACTOR or CONTRACTOR's employees or agents.
   2. Should a contract for adjoining Work be awarded to another CONTRACTOR, and should the Work on one of these contracts interfere with that of the other, ENGINEER shall decide which contract shall cease Work for the time being and which shall continue, or whether Work on both contracts shall continue at the same time and in what manner.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Installation and removal of temporary facilities.
   3. Delivery and processing of submittals.
   4. Progress meetings.
   5. Project closeout activities.

1.04 PERMITS

A. It is the responsibility of the CONTRACTOR to obtain and pay for any permits required to complete the work as well as scheduling/coordinating all inspections.

1.05 PRE-CONSTRUCTION CONFERENCE

A. ENGINEER will schedule a Pre-Construction Conference and organizational meeting at the Site or other convenient location prior to commencement of construction activities to review responsibilities and personnel assignments.

B. Attendees: OWNER, ENGINEER and ENGINEER's consultants, CONTRACTOR and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:
   1. Tentative Construction Schedule.
   2. Critical Work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Procedures for processing Applications for Payment.
   6. Distribution of Contract Documents.
   7. Submittal of Shop Drawings, product data, and samples.
   8. Preparation of Record Documents.
   9. Use of the premises.
   10. Office, Work, and storage areas.
   11. Equipment deliveries and priorities.
   12. Safety procedures.
   13. First aid.

14. Security.
15. Housekeeping.
16. Working hours.

1.06 PROGRESS MEETINGS

A. Attendees: In addition to representatives of OWNER and ENGINEER, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

B. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

C. CONTRACTOR's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to CONTRACTOR's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

D. Reporting: ENGINEER will prepare and distribute copies of minutes of the meeting to each party present and to other parties who should have been present. The minutes will include a brief summary, in narrative form, of progress since the previous meeting and report.

E. Schedule Updating: CONTRACTOR shall revise Construction Schedule after each progress meeting where revisions to Schedule have been made or recognized. Issue revised Schedule no later than 3 days after the progress meeting date to ENGINEER for distribution concurrently with the progress meeting minutes.

1.07 INSPECTIONS

A. CONTRACTOR shall participate in inspections with OWNER and ENGINEER as needed throughout the project.

1.08 LOCK-OUT/TAG-OUT

A. CONTRACTOR shall be responsible for locking and tagging all valves and electrical equipment in accordance with OWNER policies and procedures.

1.09 START-UP

A. CONTRACTOR shall coordinate the start-up of air handling units, ventilation equipment and related equipment with the City. The City shall be notified not less than 4 weeks prior to start-up.

1.10 SITE SUPERINTENDENT

A. CONTRACTOR shall provide a site superintendent present at all times work under the contract is being completed. The site superintendent shall have the authority to make decisions on all aspects of work in this contract.

PART 2 - PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's Construction Schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Unusual event reports.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.04 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. PDF file.

B. Startup construction schedule.
   1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Unusual Event Reports: Submit at time of unusual event.

G. Qualification Data: For scheduling consultant.

1.05 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.06 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.
f. Seasonal variations.
g. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Submittals.
   b. Purchases.
   c. Fabrication.
   d. Deliveries.
   e. Installation.
   f. Tests and inspections.
   g. Adjusting.
   h. Startup and placement into final use and operation.
   i. Commissioning.
6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Temporary enclosure and space conditioning.
   c. Permanent space enclosure.
   d. Completion of mechanical installation.
   e. Completion of electrical installation.
   f. Substantial Completion.

D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and the Contract Time.

E. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three days before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate final completion percentage for each activity.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Distribution: Distribute copies of approved schedule to Architect/Engineer Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.07 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
   1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.08 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Testing and inspection.
   8. Accidents.
   9. Meetings and significant decisions.
   10. Unusual events.
   11. Stoppages, delays, shortages, and losses.
   12. Meter readings and similar recordings.
   13. Emergency procedures.
   14. Orders and requests of authorities having jurisdiction.
   15. Change Orders received and implemented.
   16. Construction Change Directives received and implemented.
   17. Services connected and disconnected.
   18. Equipment or system tests and startups.
   19. Partial completions and occupancies.
   20. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
   1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 33 00 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals, including, but not necessarily limited to, the following:
   1. CONTRACTOR's Construction Schedule.
   2. Submittal Schedule.
   3. Shop Drawings.
   4. Product data.
   5. Samples.
   6. Progress photographs.
   7. Record photographs.

B. Topics covered elsewhere include, but are not limited to:
   1. Permits.
   2. Applications for payment.
   3. Performance and payment bonds.
   4. Insurance certificates.
   5. List of subcontractors.
   6. Demonstration and Training

1.02 SCHEDULE OF VALUES

A. Within fourteen (14) days after issuance of Notice to Proceed, CONTRACTOR shall submit two (2) copies of the proposed schedule of values for the ENGINEER’s review and approval.

B. Schedule of values shall meet requirements of Section 01 29 00.

C. Schedule of values shall be revised as needed based on ENGINEER’s comments.

D. Schedule of values shall be organized according to specification divisions.

E. Schedule of values shall include sections for tracking all costs associated with each stage of the project.

1.03 SUBMITTALS

A. Bonds and Insurance Certificates shall be submitted to and approved by OWNER and ENGINEER prior to the initiation of any construction on Site.

B. Permits, Licenses, and Certificates: For OWNER's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents; correspondence and records established in conjunction with compliance with standards; and regulations bearing upon performance of the Work.

1.04 SUBMITTAL PROCEDURES

A. Coordination:
   1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   3. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
   4. ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing:
   1. Allow sufficient review time so that installation shall not be delayed as a result of the time required to process submittals, including time for resubmittals.
   2. ENGINEER will review and return submittals with reasonable promptness, or advise CONTRACTOR when a submittal being processed must be delayed for coordination or receipt of additional information by putting the submittal "On Hold" and returning a transmittal identifying the reasons for the delay.
   3. No extension of Contract Time will be authorized because of failure to transmit submittals to ENGINEER sufficiently in advance of the Work to permit processing.

C. Submittal Preparation:
   1. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
   2. Provide a space approximately 4 inches by 5 inches on the label or beside the title block on submittals not originating from CONTRACTOR to record CONTRACTOR's review and approval markings and the action taken.
   3. Include the following information on the label for processing and recording action taken.
      a. Project name.
      b. Date.
      c. Name and address of ENGINEER.
      d. Name and address of CONTRACTOR.
      e. Name and address of subcontractor.
      f. Name and address of supplier.
      g. Name of manufacturer.
      h. Number and title of appropriate Specification Section.
      i. Drawing number and detail references, as appropriate.
   4. Any markings done by CONTRACTOR shall be done in a color other than red. Red is reserved for ENGINEER's marking.
   5. The number of copies to be submitted will be determined at the pre-construction conference. Reproducibles may be submitted and will be marked and returned to CONTRACTOR. Blue or black line prints shall be submitted in sufficient quantity for distribution to ENGINEER and OWNER recipients.

D. Submittal Transmittal:
   1. Package each submittal appropriately for shipping and handling. This shall include an index either on the transmittal or within the submittal itself. Transmit each submittal from CONTRACTOR to ENGINEER using a transmittal form. Submittals received from sources other than CONTRACTOR will be returned without action. Use separate transmittals for items

from different specification sections. Number each submittal consecutively. Number submittals with specification section numbering. Resubmittals should have the same number as the original, plus a suffix number designation for each resubmittal (i.e., 01 31 00-A, 01 31 00-B, etc.).

2. Indicate on the transmittal relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include CONTRACTOR's certification that information complies with Contract Document requirements. On resubmittal, all changes shall be clearly identified for ease of review. Resubmittals shall be reviewed for the clearly identified changes only. Any changes not clearly identified will not be reviewed and original submittal shall govern.

1.05 CONSTRUCTION SCHEDULE

A. Within fourteen (14) days after issuance of the Notice to Proceed, the CONTRACTOR shall prepare three (3) copies of the proposed schedule and submit two (2) copies to the ENGINEER for review and approval. Hard copies of project schedule shall be in color with critical path shown. CONTRACTOR shall also submit electronic copy of schedule.
   1. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on Schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
   2. Coordinate Construction Schedule with Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
   3. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on Schedule to allow time for ENGINEER's procedures necessary for certification of Substantial Completion.

B. Schedule Updating: Revise Schedule after each meeting or activity where revisions have been recognized or made within 2 weeks following the meeting or activity.

1.06 SUBMITTAL SCHEDULE

A. After development and acceptance of Construction Schedule, prepare a complete Schedule of Submittals. Submit Schedule within 10 days of the date required for establishment of Construction Schedule.

B. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products, as well as Construction Schedule.

C. Prepare Schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
   1. Scheduled date for the first submittal.
   2. Related Section number.
   3. Submittal category.
   4. Name of subcontractor.
   5. Description of the part of the Work covered.
   6. Scheduled date for resubmittal.
   7. Scheduled date ENGINEER's final release or approval.

D. Following response to initial submittal, print and distribute copies to ENGINEER, OWNER, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

E. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

F. Schedule Updating: Revise Schedule after each meeting or activity where revisions have been recognized or made within 48 hours following the meeting or activity.

1.07 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.

C. Nameplate data for equipment including electric motors shall be included on Shop Drawings. Electric motor data shall state the manufacturer, horsepower, service factor, voltage, enclosure type, oversize wiring box, etc.

D. Shop Drawings shall indicate shop painting requirements to include type of paint and manufacturer.

E. Standard manufactured items in the form of catalog work sheets showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, quantity, and all other pertinent information should be submitted and approved in a similar manner.

F. Measurements given on Shop Drawings or standard catalog sheets, as established from Contract Drawings and as approved by ENGINEER, shall be followed. When it is necessary to verify field measurements, they shall be checked and established by CONTRACTOR. The field measurements so established shall be followed by CONTRACTOR and by all affected trades.

G. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 36 inches by 48 inches.

H. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.08 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard

color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawings.

B. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
   1. Manufacturer's printed recommendations.
   2. Compliance with recognized trade association standards.
   3. Compliance with recognized testing agency standards.
   4. Application of testing agency labels and seals.
   5. Notation of dimensions verified by field measurement.
   6. Notation of coordination requirements.

C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.09 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

B. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match ENGINEER's Sample. Include the following:
   1. Generic description of the Sample.
   2. Sample source.
   3. Product name or name of manufacturer.
   4. Compliance with recognized standards.
   5. Availability and delivery time.

C. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

D. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3) that show approximate limits of the variations.

E. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

F. Preliminary Submittals: Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
   1. Preliminary submittals will be reviewed and returned with ENGINEER's mark indicating selection and other action.

G. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; 1 will be returned marked with the action taken.

H. Maintain sets of Samples, as returned, at the Site, for quality comparisons throughout the course of construction.

I. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

J. Sample sets may be used to obtain final acceptance of the construction associated with each set.

1.10 ENGINEER'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, ENGINEER will review each submittal, mark to indicate action taken, and return promptly.
   1. Compliance with specified characteristics is CONTRACTOR's responsibility.

B. Action Stamp: ENGINEER will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
   1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
   2. Final-But-Restricted Release: When submittals are marked "Furnish as Corrected," that part of the Work covered by the submittal may proceed, provided it complies with notation or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
   3. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
      a. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at Site, or elsewhere where Work is in progress.
   4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Acknowledge Receipt."
   5. The approval of ENGINEER shall not relieve CONTRACTOR of responsibility for errors on Drawings or submittals as ENGINEER's checking is intended to cover compliance with Drawings and Specifications and not enter into every detail of the shop work.

1.11 RECORD PHOTOGRAPHS

A. CONTRACTOR shall take a minimum of 48 pre-construction photographs to document the condition of the site prior to beginning work. These photos should document the conditions of the roof, ceiling and walls before and after installation.

B. After final acceptance of the Work, 48 photographs shall be taken of each structure and major feature of the Project as directed by ENGINEER. These photographs shall be taken from points and at times directed by ENGINEER.

C. Photographs shall include condition of parking lots and access roads before and after installation.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies procedural and administrative requirements for temporary services and facilities.

B. Temporary Utilities include, but are not limited to:
   1. Water service and distribution.
   2. Temporary electric power.
   3. Temporary lighting.

C. Temporary Construction and Support Facilities include, but are not limited to:
   1. Temporary heating facilities.
   2. CONTRACTOR's field offices and storage sheds.
   3. Sanitary facilities.

D. Construction Buildings and Facilities include, but are not limited to.
   1. Temporary enclosures.
   2. Temporary Project identification signs.
   3. Temporary Site identification signs.
   4. Temporary Project bulletin boards.
   5. Stairs.
   6. Hoists.
   7. Ongoing construction cleanup.
   8. Storage of equipment and material.

1.02 REFERENCES

A. Codes and Standards:
   1. Comply with NFPA Code 241, "Building Construction and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library, "Temporary Electrical Facilities."
   2. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services," prepared jointly by AGC and ASC, for industry recommendations.
   3. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Temporary Utilities: Submit a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to OWNER, change over from use of temporary service to use of the permanent service.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to:
   1. Building Code requirements.
   2. Health and Safety regulations.
   3. Utility Company regulations.
   4. Police, Fire Department, and Rescue Squad rules.
   5. Environmental Protection regulations.
   6. State and Local Soil Erosion and Sedimentation Control regulations.
   7. National Fire Protection Association (NFPA):NFPA No.70-93
   8. National Electrical Code (NEC) and local amendments thereto.
   9. Comply with federal, state, and local codes and regulations, and utility company requirements.
   10. American Water Works Association and National Sanitation Foundation.
   11. UL

B. Inspection: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.05 PROJECT CONDITIONS

A. There is no available sanitary service and limited water available at the project site. Unless otherwise provided in these Specifications, CONTRACTOR shall make CONTRACTOR's own arrangements for water, and sewer services for use during the construction of the Work and shall pay for all temporary facilities, connections, extensions, and services.
   1. Cost or use charges for temporary facilities are not chargeable to OWNER or ENGINEER, and will not be accepted as a basis of claims for a Change Order.

B. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do no overload facilities or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Site.

1.06 SEQUENCING AND SCHEDULING

A. CONTRACTOR shall inform the local Fire Department in advance of CONTRACTOR's program of street obstruction and detours, so that the Fire Department can set up plans for servicing the area in case of an emergency.
   1. CONTRACTOR shall also notify the public agency having jurisdiction over the roads at least 1 week prior to obstructing any street.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide new materials; if acceptable to ENGINEER, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Water: Provide potable water approved by local health authorities.

2.02 EQUIPMENT

A. Provide new equipment; if acceptable to ENGINEER, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110 to 120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

D. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

E. Temporary Toilet Units: Provide self-contained single-occupant toilet units, properly vented and fully enclosed with a glass fiber-reinforced polyester shell or similar nonabsorbent material. Provide handwashing station.

F. First Aid Supplies: Comply with governing regulations.

G. Bulletin Board: Provide a weather-protected enclosed bulletin board at Site. The bulletin board shall be mounted in a conspicuous and public outside location.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they shall serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required or as directed by ENGINEER/OWNER.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. Water Service and Distribution: CONTRACTOR shall at all times provide for CONTRACTOR's employees an abundant and convenient supply of cool drinking water taken from a potable source.

B. Temporary Lighting: Wherever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
   1. Install and operate temporary lighting that shall fulfill security and protection requirements, without operating the entire system, and shall provide adequate illumination for construction operations and traffic conditions.

C. Public and Private Utilities: Where any utilities, water, sewer, gas, telephone, or any other either public or private, are encountered, CONTRACTOR must provide adequate protection for them, and CONTRACTOR shall be held responsible for any damages to such utilities arising from CONTRACTOR's operations.

D. Water for Construction
   1. Owner will not provide water for cleaning or other purposes.

E. Sanitary Sewers: Sewers are not available. If sewers are not available or cannot be used, provide portable toilet units.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Temporary Heating Facilities: Provide temporary heat required by construction activities for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
   1. Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
   2. Use of gasoline-burning space heaters, open flame, or salamander-type heating units is prohibited.

B. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health Codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best service the Project's needs.
   1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
   2. Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
   3. Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

3.04 CONSTRUCTION BUILDINGS AND FACILITIES INSTALLATION

A. Storage platforms, sheds, temporary closures for doors, windows and other openings of buildings, temporary sidewalks, runways, and ladders shall be provided.
   1. Hazardous areas shall be protected by guardrails and fences. Storage platforms and sheds shall be provided for materials which require protection from the weather.
   2. Sheds shall be substantially constructed and covered with "ready roofing." Doors, windows, and other openings in the permanent work shall be closed as soon as necessary to safeguard the construction and materials from tampering or damage.
   3. Enclosures for openings easily accessible from the exterior shall be of solid wood or sash, provided with necessary hardware and padlocks. Other openings shall be enclosed by old sash or canvas on wooden frames for the protection of the building against damage by weather.
   4. Enclosures shall be weathertight and secured in such manner as not to damage the finish of the building.

B. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
   1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
   2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
   3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

C. Hoists: CONTRACTOR shall provide temporary hoists to lift building materials and equipment to the intended areas. Hoists shall be capable of carrying the intended load without exceeding the load limitation of the hoisting device.

D. Ongoing Construction Cleanup: Project cleanup shall be an ongoing operation. CONTRACTOR shall maintain an order of neatness and good housekeeping comparable to that maintained by OWNER. Project cleanup applies to the Site and all areas affected by construction operations. CONTRACTOR shall:
   1. Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (27 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
   2. Maintain dirt and debris resulting from CONTRACTOR's operations in designated spoil piles as approved by ENGINEER or remove from the Site daily. Dirt and debris shall not collect or interfere with OWNER's facility operations. Excess dirt and debris shall be removed from the Site as needed to confine spoil piles in designated areas.
   3. Perform general cleanup inside of OWNER's buildings at least once every two weeks. Cleanup shall include consolidation of stored materials, removal of waste material and debris, and sweeping of flooring surfaces.
   4. Maintain clear access to all properties affected by construction activities. Maintain unobstructed access to existing buildings, equipment, safety equipment, and other items requiring OWNER access for facility operation.
   5. Keep tools, equipment, and materials in a neat and orderly arrangement.
   6. Maintain culverts, sewers, and drainage structures by removing sediment and debris from construction operations.
   7. Repair all holes and ruts resulting from construction operations that affect OWNER's use of property with approved material; compact, level, and restore.

E. Storage of Equipment and Material: Pumps and other machinery units shall be stored in weathertight structures provided by CONTRACTOR.
   1. Motors, electrical switchgear, gauges, and other equipment of a delicate nature, as determined by ENGINEER, shall be stored in weathertight warehouses which are maintained at a temperature of at least 60 degrees F.
   2. Structural steel, miscellaneous and cast iron items may be placed in open yard storage, but any such items having attached motors or other machinery units shall have such units well wrapped with waterproof paper or cloth for protection from the weather.

3. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of ENGINEER.
4. Materials and equipment distributed, stored, and placed upon or near the Site of the Work shall at all times be so disposed as not to interfere with work prosecuted by OWNER or other Contractors in the employment of OWNER or with drainage. Materials and equipment shall not be stored on public streets.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by ENGINEER.

B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than 1 extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. Barricades, Warning Signs, and Lights: Comply with Standards and Code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

D. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

E. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the Site.

F. Control of Noise: CONTRACTOR shall eliminate noise to as great an extent as possible at all times. Air compressors shall be equipped with silencers, and the exhaust of all gasoline motors and other power equipment shall be provided with mufflers.

1. CONTRACTOR shall require strict observances of all pertinent ordinances and regulations. Any blasting permitted in such locations shall be done with reduced charges.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour-day basis where required to achieve indicated results and to avoid possibility of damage.

C. Protection: Prevent water-filled piping from freezing.

D. Termination and Removal: Unless ENGINEER requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of CONTRACTOR. OWNER reserves the right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period including, but not limited to:
      a. Replace air filters and clean inside of ductwork and housings.
      b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
      c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION

SECTION 01 53 40 - PROTECTION of ENVIRONMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor in executing work shall maintain work areas, on-and-off site, free from environmental pollution that would be in violation of federal, state, or local regulations.

1.02 PROTECTION of SEWERS

A. Take adequate measures to prevent impairment of operation of existing sewer system. Prevent construction material, pavement, concrete, earth, or other debris from entering sewer or sewer structure.

1.03 DISPOSAL of EXCESS EXCAVATED and OTHER WASTE MATERIALS

A. Dispose waste material in accordance with federal and state codes, and local zoning ordinances.

B. Unacceptable disposal sites include, but are not limited to, sites within wetland or critical habitat, and sites where disposal will have detrimental effect on surface water or groundwater quality.

C. Make arrangements for disposal subject to submission of proof to engineer that owner(s) of proposed site(s) has valid fill permit issued by appropriate government agency and submission of haul route plan, including map of proposed route(s).

D. Provide watertight conveyance for liquid, semi-liquid, or saturated solids that tend to bleed during transport. Liquid loss from transported materials not permitted, whether being delivered to construction site or hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at selected disposal site.

1.04 PROTECTION of AIR QUALITY

A. Contain paint aerosols and V.O.C.’s by acceptable work practices.

B. Minimize air pollution by requiring use of properly operating combustion emission control devices on construction vehicles and equipment used by contractor, and encouraging shutdown of motorized equipment not actually in use.

C. If temporary heating devices are necessary for protection of work, they shall not cause air pollution.

1.05 PROTECTION from FUEL and SOLVENTS

A. All required material must be submitted prior to the precon meeting. No equipment may be delivered to the site without approval of submittals.

B. The owner reserves the right to restrict equipment location.

C. Disposal of waste fluids shall be in conformance with federal, state, and local laws and regulations.

1.06 USE of CHEMICALS

A. Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of U.S. EPA, U.S. Department of Agriculture, state, or other applicable regulatory agency.

B. Use of such chemicals and disposal of residues shall be in conformance with manufacturer's written instructions and applicable regulatory requirements.

1.07 NOISE CONTROL

A. Conduct operations to cause least annoyance to residents in vicinity of work, and comply with applicable local ordinances.

B. Equip compressors, hoists, and other apparatus with mechanical devices necessary to minimize noise and dust. Equip compressors with silencers on intake lines.

C. Equip gasoline or oil-operated equipment with silencers or mufflers on intake and exhaust lines.

D. Route vehicles carrying materials over such streets as will cause least annoyance to public and do not operate on public streets between hours of 6:00 P.M. and 7:00 A.M., or on Saturdays, Sundays, or legal holidays unless approved by owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 HAZARDOUS MATERIALS PROJECT PROCEDURES

A. Applicable Regulations:
   1. RCRA, 1976 – Resource Conservation and Recovery Act: This federal statute regulates generation, transportation, treatment, storage and disposal of hazardous wastes nationally.
   2. Act 64, 1979 – Michigan's Hazardous Waste Management Act: This statute regulates generation, transportation, treatment, storage, and disposal of hazardous wastes.
   3. Act 641 as amended 1990 – Michigan's Solid Waste Act: This statute regulates generation, transportation, treatment, storage and disposal of solid wastes.

B. Use the Uniform Hazardous Waste Manifest (shipping paper) to use an off-site hazardous waste disposal facility.

C. Federal, State and local laws and regulations may apply to the storage, handling and disposal of hazardous materials and wastes. The list below includes the regulations which are most frequently encountered:

Topic	Agency and Telephone Number
Small quantity hazardous waste management, including hazardous waste stored in tanks	Hazardous Waste Division, DEQ (517) 373-2730 in Lansing, or District Office Certified County Health Department
Disposal of heavy metals into municipal sanitary sewers	Contact the superintendent of your wastewater treatment plant for permission
Hazard Communication Standards (for chemical in the workplace)	Occupational Health Division, Michigan Department of Consumer and Industrial Services (517) 373-1410
Burning of waste oil and other discharges to the air	Air Quality Division, DEQ (517) 322-1333 in Lansing, or District Office
Local fire prevention regulations and codes (including chemical storage requirements)	Local fire chief or fire marshal

D. Department of Environmental Quality
Hazardous Waste Division
Compliance Section District Offices

Jackson District Office
301 E. Louis Glick Hwy.
Jackson, MI 49201
(517) 780-7690
(517) 780-7855 (fax)

END OF SECTION

SECTION 01 60 00 - GENERAL EQUIPMENT STIPULATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. These General Equipment Stipulations apply, in general, to all equipment provided under other Specification Sections. They shall supplement the detailed equipment specifications, but in cases of conflict the equipment specifications shall govern.

1.02 OPERATION AND MAINTENANCE

A. Refer to Section 01 78 10

1.03 QUALITY ASSURANCE

A. Compliance with OSHA: All equipment provided under this Contract shall meet all the requirements of the Federal and/or State Occupational Safety and Health Acts. Each equipment supplier shall submit to ENGINEER certification that the equipment furnished is in compliance with OSHA.

B. Electrical Codes, Ordinances, and Industrial Standards: The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable State and local requirements. UL listing and labeling shall be adhered to under this Contract. Any equipment that does not have a UL, FM, CSA, or other listed testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment furnished has been manufactured in accordance with the National Electrical Code and OSHA requirements. Any additional cost resulting from any deviation from codes or local requirements shall be borne by CONTRACTOR.

1.04 SHIPPING AND HANDLING EQUIPMENT

A. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment and handling.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Anchor Bolts: Anchor bolts, nuts, and washers shall be hot-dipped galvanized in conformity with ASTM A 385 and be supplied with sleeves.

B. Shop Painting:
   1. Non-submerged Applications: Tnemec Series 37H, Chem-Prime.
   2. Submerged, Non-potable Applications: Tnemec Series 66, Hi-Build Epoxoline.
   3. Submerged, Potable Applications: Tnemec Series 139, Pota-Pox II.
   4. Rust preventive compound shall be:
      a. Dearborn Chemical, No-Ox-ID2W.
      b. Houghton, Rust Veto 344.
      c. Rust-Oleum R-9.

2.02 MANUFACTURED UNITS

A. Wall and Slab Sleeves and Castings: Where water- or gas-tightness is essential and at other locations where indicated, wall castings and sleeves shall be provided with an intermediate flange located approximately at the center of the wall or slab.
   1. All sleeves and casting shall be flush with walls and underside of slabs but shall extend 2 inches above finished floors.

2.03 COMPONENTS

A. Lubrication: Equipment shall be adequately lubricated by systems which require attention no more often than weekly during continuous operation. Lubrication system shall not require attention during start-up or shutdown and shall not waste lubricants.
   1. Lubrication point shall be easily accessible with all points of application provided with standard fittings for greasing or placing oil.
   2. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity for all consumption prior to completion of required testing and acceptance of equipment by OWNER.

B. Safety Guards: All belt or chain drives, fan blades, couplings, vertical or horizontal drive shafts, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal and painted safety yellow.
   1. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be hot-dipped galvanized.
   2. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

C. Anchor Bolts: All necessary anchor bolts shall be provided as per the manufacturer's recommendations for size, strength, and location and shall meet the requirements of Standard Details on Drawings. Substantial templates and working drawings for installation shall be provided. Two nuts shall be furnished.
   1. Unless otherwise shown or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

D. Seals: Mercury seals will not be acceptable.

E. Bearings: All antifriction bearings shall be designed per the Anti-Friction Bearing Manufacturers Association (AFBMA) recommendations with a rating life of B-10, 30,000 hours.

F. Equipment Bases: A cast iron or welded steel baseplate shall be provided for all equipment and motor assemblies. Each baseplate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have a threaded drain connection. Bases shall be fully braced to withstand shock loads and resist buckling. Necessary safety guard mounting shall be provided as part of the equipment base.

G. Motor Starters and Control Panels: Motor starters 480 volt or less shall be size one or larger and have 120 volt AC contactor coils. All control circuits and indicating lights associated with the starter shall be 120 volt. The control transformer shall be sized to have 100 VA minimum spare capacity for future use. A terminal strip shall be provided for all control wires entering the starter with spare terminals for future use. The terminal strip and wires shall be identified. One spare normally open auxiliary starter contact, wired to the terminal strip, shall be provided for future use. Indicating lights shall be 120 volt, oiltight, push-to-test type. Explosion-proof units shall meet NEC Class I, Division I, Group D requirements.
   1. Provide equipment enclosures appropriate for areas in which they are installed. Each area will be designated on Drawings with a type of construction, such as NEMA 4, 4X, 7, or 9 if it is other than NEMA 12. An area designated by a name and elevation includes space bounded by floor, ceiling, and enclosing walls.

2.04 FABRICATION

A. Shop Painting: All iron and steel surfaces shall be protected by suitable paint or coatings applied in the shop or at point of fabrication. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment.
   1. All iron and steel surfaces which will be totally or partially submerged or located in a continuously or intermittently moist atmosphere during normal operation shall be shop blast cleaned to a near-white finish, removing all dirt, rust-scale, and foreign matter by any of the recommended methods outlined in the Steel Structures Painting Council Specification SP-10.
   2. The cleaned surfaces shall be shop primed before any rust bloom forms. All other exposed surface shall be properly filed, scraped, sanded, etched, brushed, sandblasted, and/or cleaned to provide surfaces free from dirt, loose crystals, rust, scale, oil, and grease and shop primed.
   3. Shop primed surfaces shall be painted with one or more coats of a primer which meets the requirements of this Section and is compatible with the finish painting system specified in Section 09900. Minimum shop coat thickness shall be 1.5 dry mills.

B. Electric motors, speed reducers, starters, pumps, motor control centers, control panels, and other self-contained or enclosed components shall be shop finished with 2 coats of an enamel paint as per manufacturer's recommendations.

C. Where specified, steel and iron surfaces shall be hot-dipped galvanized in conformity with ASTM A 153 and A 385.

D. Machined, polished, and nonferrous surfaces which are not to be painted or galvanized shall be coated with rust preventive compound.

PART 3 - EXECUTION

3.01 EQUIPMENT BASES

A. The baseplate shall be installed on a concrete base. Baseplates shall be anchored to the concrete base with suitable anchor bolts and grouted in place.

3.02 WALL AND SLAB SLEEVES AND CASTINGS

A. Unless otherwise shown on Drawings or specified, at all points where pipes or conduit pass through walls, slabs or roofs, suitable sleeves or castings shall be furnished and installed. Sleeves and castings shall not be painted in areas to be embedded in the concrete. All loose rust, scale, grease, or oil shall be removed prior to pouring the concrete.

B. Unless otherwise shown or approved by ENGINEER, the space between the pipe and the sleeve shall be caulked. All ground buried and water or gas retaining wall or slab sleeves or castings shall be mechanical joint.

3.03 EQUIPMENT INSTALLATION CHECK

A. Refer to Section 01 81 00.

B. Manufacturer's representative shall provide all necessary tools and testing equipment required including noise level and vibration sensing equipment.

3.04 OPERATION AND MAINTENANCE TRAINING

A. Refer to Section 01 82 00.

END OF SECTION

SECTION 01770 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for Contract closeout including, but not limited to:
   1. Warranties and Bonds.
   2. Requirements for Substantial Completion.
   3. Project record document submittal.
   4. Final cleaning.

B. Certifications and other commitments and agreements for continuing services to OWNER are specified elsewhere in the Contract Documents.

1.02 WARRANTY REQUIREMENTS

A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with CONTRACTOR.

B. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.

E. OWNER's Recourse: Written warranties made to OWNER are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which OWNER can enforce such other duties, obligations, rights, or remedies.

F. Rejection of Warranties: OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

G. OWNER reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.03 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. All wearable items should be supplied to provide at least two years of operation and maintenance.

1.04 SUBSTANTIAL COMPLETION

A. Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price.
   2. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
   3. Advise OWNER of pending insurance changeover requirements.
   4. Submit specific warranties, workmanship bonds, maintenance agreements, O&M Manuals, final certifications, and similar documents.
   5. Obtain and submit releases enabling OWNER unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates, and similar releases.
   6. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, ENGINEER will either proceed with inspection or advise CONTRACTOR of unfilled requirements.
   1. ENGINEER will prepare the Certificate of Substantial Completion following inspection, or advice CONTRACTOR of construction that must be completed or corrected before the certificate will be issued.
   2. ENGINEER will repeat inspection when requested and assured that the Work has been substantially completed.
   3. Results of the completed inspection will form the basis of requirements for final acceptance.

C. The warranty period for specific portions of the Work will begin on the date established on Component Acceptance Form or at such other date as agreed by OWNER, ENGINEER, and CONTRACTOR.

1.05 FINAL ACCEPTANCE

A. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
   2. Submit an updated final statement, accounting for final additional changes to the Contract Price.

3. Submit a copy of ENGINEER's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by ENGINEER.
4. Submit consent of surety to final payment.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Submit record drawings, maintenance manuals, final Project photographs, damage or settlement survey, property survey, and similar final record information.
8. Deliver tools, spare parts, extra stock, and similar items.
9. Make final changeover of permanent locks and transmit keys to OWNER. Advise OWNER's personnel of changeover in security provisions.
10. Complete start-up testing of systems, and instruction of OWNER's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
11. Meet all other conditions of the contract.

B. Reinspection Procedure: ENGINEER will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to ENGINEER.
   1. Upon completion of reinspection, ENGINEER will prepare a certificate of final acceptance as shown in the end of this Section, or advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   2. If necessary, reinspection will be repeated.

1.06 SUBMITTALS

A. Submit written warranties to ENGINEER prior to the date certified for Substantial Completion. If ENGINEER's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of ENGINEER.

B. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.

1.07 RECORD DOCUMENT SUBMITTALS

A. Record Drawings:
   1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown.
   2. Mark whichever Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   3. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

4. Mark new information that is important to OWNER, but was not shown on Contract Drawings or Shop Drawings.
5. Note related Change Order numbers where applicable.
6. Organize Record Drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.

B. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work.
1. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to ENGINEER for OWNER's records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. General cleaning during construction is required by the General Conditions and included in Section 01 31 00 and 01 50 00.

B. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a municipal water treatment plant.

C. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion as shown at the end of this Section.
1. Remove labels that are not permanent labels.
2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances.
3. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition.
4. Clean Site, including landscape development areas, of rubbish, litter, accumulated debris, surplus materials of any kind which result from its operation, including construction equipment, tools, sheds, sanitary enclosures, etc., and foreign substances.
5. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth even-textured surface.
6. The site of the work shall be rehabilitated or developed in accordance with other sections of the Specifications. In the absence of any portion of these requirements, the CONTRACTOR shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by the OWNER.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
   1. Do not burn waste materials. Do not bury debris or excess materials on OWNER's property.
   2. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
   3. Remove waste materials from Site and dispose of in a lawful manner.

F. Where extra materials of value remaining after completion of associated Work have become OWNER's property, arrange for disposition of these materials as directed.

END OF SECTION

CERTIFICATE OF SUBSTANTIAL COMPLETION

Contract _____

Contract No. _____

Date Issued: _____

OWNER _____

CONTRACTOR _____

This Certificate of Substantial Completion applies to all Work under the Contract.

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____ _____
DATE OF SUBSTANTIAL COMPLETION

A tentative punch list of items to be completed or corrected is attached hereto as Attachment No. A. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR by _____, _____.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees pending final payment shall be as follows:

OWNER: Shall perform and/or maintain insurances, if any, in accordance with Article 5 of the General Conditions, and allow CONTRACTOR reasonable access to complete or correct items on the tentative list. Additional responsibilities are:

_____

_____

CONTRACTOR: Shall perform and/or maintain Site security, temporary facilities, Bonds and insurances in accordance with Article 5 of the General Conditions, and protect the Work. Additional responsibilities are:

_____

_____

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

Attachment A: Tentative Punch List of Items to be completed prior to Final Payment (Pages 1 to 2, inclusive).

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

Executed by ENGINEER on _____
Date

_____
_____
ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____
Date

_____
CONTRACTOR

By: _____
(Authorized Signature)

CERTIFICATE OF FINAL COMPLETION

Contract _____

Contract No. _____

Date Issued: _____

OWNER _____

CONTRACTOR _____

This Certificate of Final Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, in accordance with Paragraph 14.06 of the General Conditions, and that Work is hereby declared to be finally complete in accordance with the Contract Documents on

_____
DATE OF FINAL COMPLETION

CONTRACTOR's general warranty and guarantee period commences on ___ __ and terminates on __ ____.

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to correct defective Work in accordance with the General Conditions of the Contract Documents.

Executed by ENGINEER on _____
Date

_____
ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Final Completion on _____
Date

_____
CONTRACTOR

By: _____
(Authorized Signature)

END OF SECTION

SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Spare parts and maintenance products.

C. Preventative maintenance instructions

D. Warranties and bonds

1.02 PROJECT RECORD DOCUMENTS

A. Maintain on site one clean, undamaged set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by OWNER.

C. Store record documents separate from documents used for construction.

D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish floor datum.
   2. Measured horizontal and vertical locations of all underground and exposed utilities and appurtenances, including thrust blocks, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   4. Measured horizontal and vertical locations of all concealed and exposed electrical conduits. Conduits shall be shown in plain view on the record drawings with their size and contents indicated.
   5. Field changes of dimension and detail.
   6. Details not on original Contract drawings.

F. Indicate the date of revisions to the plans in the appropriate box on the plans.

G. Submit documents to ENGINEER prior to Final Application for Payment.

1.03 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections. This may include, but is not limited to the topics in Table 01780.

B. All wearable items should be supplied to provide at least two years of operation and maintenance.

01 78 00-A, Spare Parts Table

Equipment	**Specification Section**	**Parts**

C. Deliver to project site and place in location as directed; obtain signed receipt from the City prior to final payment.

D. Cover and protect parts from moisture.

E. Crate in containers designed for prolonged storage suitable for handling with hoisting equipment containers: wooded, cardboard, or palletized.

F. Stencil on containers:
   1. Manufacturer/supplier name.
   2. Unit name.
   3. Spare part name.
   4. Manufacturer catalogue number.
   5. Other identifying information.
   6. Precautionary information.

1.04 PREVENTATIVE MAINTENANCE SCHEDULE

A. Submit, in addition to the operation and maintenance data, an equipment maintenance schedule for each piece of equipment. Include the following:
   1. Identity of Equipment.
   2. Routine manufacturer recommended preventative maintenance
      a. Daily
      b. Weekly
      c. Monthly
      d. Quarterly
      e. Semi-Annually
      f. Annually

B. Equipment maintenance schedule shall be in a clear, tabular format and the same format for all equipment. Four (4) copies of each shall be provided.

1.05 WARRANTIES AND BONDS

A. Warranties and bond requirements are covered in the General Conditions except where modified in the technical specifications.

B. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers. All warranties shall begin at the Date of Final Payment, or at the date of acceptance by the OWNER, whichever is later. Table 01780-B is a guide for warranties in this contract but is not intended to replace any warranty requirements listed in individual sections of this project manual.

01 78 00-B, Warranty Table

Equipment	**Specification Section**	**Warranty Length**

C. Execute and assemble all transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers into one binder.

D. Verify that documents are in proper form, contain full information, and are notarized. Manufacturer's warranties shall be in the name of the Owner.

E. Provide Table of Contents and assemble in three-ring binders with durable plastic cover.

F. Submit prior to Final Application for Payment.

G. Time of submittals:
   1. Make warranty submittal within ten days after Date of Substantial Completion, prior to Final Application for Payment.
   2. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty or bond period.

H. Rejection of Warranties: OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 78 10 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Operation and maintenance data/manuals.

1.02 SUBMITTALS

A. Submit operations and maintenance data for all equipment. Submittals shall be in separate binders. One binder will cover all O&M procedures and a second binder will cover preventative maintenance procedures.

B. Quantity Required and Timing of Submittals:
   1. Preliminary Submittal:
      a. Printed Copies: 4 copies, exclusive of copies required by CONTRACTOR.
      b. Electronic Copies: 1 copy.
      c. Submit to ENGINEER by the earlier of: ninety days following approval of Shop Drawings and product data submittals, or thirty days prior to starting training of operations and maintenance personnel, or ten days prior to field quality control testing at the Site.
      d. Furnish preliminary operation and maintenance data submittal in acceptable form and content, as determined by ENGINEER, before associated materials and equipment will be eligible for payment.
   2. Final Submittal: Provide final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.
      a. Printed Copies: 4 copies.
      b. Electronic Copies (Searchable PDF): 2 copies

1.03 OPERATION AND MAINTENANCE DATA/MANUALS

A. Binding and Cover:
   1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be minimum one-inch wide and maximum of three-inch wide. Binders for each copy of each volume shall be identical.
   2. Binders shall be locking three-ring/”D”-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.
   3. Do not overfill binders.
   4. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.
   5. Provide the following information on cover of each volume:
      a. Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”.
      b. Name or type of material or equipment covered in the manual.
      c. Volume number, if more than one volume is required, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.

d. Name of Project and, if applicable, Contract name and number.
e. Name of building or structure, as applicable.
f. Names and contact information of Engineer, General Contractor and Major Subcontractors.

6. Provide the following information on spine of each volume:
   a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
   b. Name or type of material or equipment covered in the manual.
   c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.
   d. Project name and building or structure name.
7. The manuals' cover sheets and spines shall all be matching. The CONTRACTOR shall prepare a template for use by the various subcontractors.

B. Pages:
1. Print pages in manual on 30-pound (minimum) paper, 8.5 inches by 11 inches in size.
2. Provide each page with binding margin at least one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:
1. Bind into the manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing specified for pages.
2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include no more than three drawing sheets per pocket.

D. Copy Quality and Document Clarity:
1. Contents shall be original-quality copies. Documents in the manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.
2. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:
1. Table of Contents:
   a. Provide table of contents in each volume of each operations and maintenance manual.
   b. In table of contents and at least once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identification is unacceptable.

2. Use dividers and labeled index tabs between equipment items and between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.
3. Each equipment item shall have an individual cover sheet with the following information:
    a. Name or type of material or equipment.
    b. Manufacturer's name, address, telephone number, fax number, and Internet website address.
    c. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.
    d. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
    e. City Equipment Number if applicable.

1.04 ELECTRONIC REQUIREMENTS

A. Electronic Copies of Operation and Maintenance Manuals:
    1. Each electronic copy shall include all information included in printed copy.
    2. Submit each electronic copy on a separate compact disc (CD), unless another electronic data transfer method or format is acceptable to ENGINEER.
    3. File Format:
        a. The O&M Manuals will be placed into the OWNER's Content Management System. All electronic files shall be compatible with this system.
        b. Files shall be in "portable document format (PDF)". Files shall be entirely electronically searchable and created from the original document. Scanned/Image PDF's will not be accepted.
        c. Submit separate file for each separate document in the printed copy.
        d. Within each file, provide bookmarks for the following:
            1) Each chapter and subsection listed in the printed copy document's table of contents.
            2) Each figure.
            3) Each table.
            4) Each appendix.
    4. Also provide drawings and figures in one of the following formats: ".bmp", ".tif", ".jpg", or ".gif". Submit files in a separate directory on the CD.
    5. Technical drawings will be provided in both AutoDesk DWG format and PDF format.

1.05 CONTENT

A. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

B. Submit written explanations of all safety considerations relating to operation and maintenance procedures.

C. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:
   1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.
   2. Recommended schedule for each preventive maintenance task.
   3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
   4. Table of alternative lubricants.
   5. Troubleshooting instructions.
   6. List of required maintenance tools and equipment.

D. Complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
   1. Manufacturer's name, address, telephone number, fax number, and Internet website address.
   2. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.
   3. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
   4. For each part or piece include the following information:
      a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
      b. Part name or description.
      c. Manufacturer's part number.
      d. Quantity of each part used in each assembly.
      e. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

E. Compete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.

F. Manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

G. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

H. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

I. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

J. Copy of warranty bond and service contract as applicable.

K. When copyrighted material is used in operations and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 81 00 - COMMISSIONING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Commissioning Plan

B. Functional Completion Testing

C. Startup

D. Commissioning

E. Performance Testing

F. Operational Demonstration

1.02 DEFINITIONS

A. Commissioning: Commissioning is the series of activities or processes necessary to ensure that equipment and systems are designed, installed, functionally tested, started up and capable of being operated and maintained to perform in conformity with the design intent for the facility improvements. Commissioning includes, but is not limited to factory testing, field testing, dry testing, performance testing, Manufacturer's checkout, and operational demonstration.

B. Contractor: Contractor in this section shall mean a mechanical subcontractor or other contractor who has installed the system to be commissioned and is an expert in its operation.

C. Factory Testing: Factory testing is performance testing, operation testing, or documentation verification conducted in the production facility, specialized test facility, or by the equipment manufacturer or supplier. Such testing shall conform to the requirements of the individual sections of the Contract Documents. "Witnessed" factory testing shall mean that the testing is witnessed by the OWNER or his designated representative.

D. Field Testing: Field testing is performance testing, operation testing, or documentation verification conducted in the field after installation, to provide comparison with the results obtained in the factory testing.

E. Dry Testing: Dry testing is performed by the CONTRACTOR without introducing either process material or other test material into the component, system, or unit process.

F. Performance Testing: Performance Testing is testing performed by the CONTRACTOR to demonstrate the specified throughput of the equipment and unit process systems while maintaining regulatory compliance with Federal, State, and Local government regulations and minimum compliance with the equipment or unit process systems performance requirements and guarantees.

G. Manufacturer's Checkout: Manufacturer's checkout shall be performed directly by the manufacturer. Checkout by the local equipment representative or salesman is not permitted. Checkout shall include, but not be limited to, wiring and power supply, installation, tolerances, clearances, rotation, etc.

H. Startup: Startup shall be defined as the operation of equipment or unit process systems using clean water, air, or other fluids and gases as necessary to demonstrate the operation of the equipment or systems with other equipment that is a part of the Facility. Startup shall be performed by the CONTRACTOR, manufacturer, and local equipment representative.

I. System: A "system" includes all required items of equipment, devices, and appurtenances connected so that their operation or function compliments, protects, or controls the operation or function of the others.

J. Operational Demonstration: A commissioning activity performed by the CONTRACTOR wherein the CONTRACTOR operates and maintains a fully functional component system, unit process for a period of time after stable operation has been achieved. For purposes of this project, the period of time shall be 14 days, unless noted otherwise for specific pieces of equipment.

K. Commissioning Plan: The Commissioning Plan incorporates all aspects of functional completion testing, startup, commissioning, performance testing, training, and reliability tests to ensure the facility operates properly and meets design intent and performance.

1.03 QUALITY ASSURANCE

A. CONTRACTOR shall appoint a Performance Testing Manager who shall:
   1. Manage, coordinate, and supervise CONTRACTOR's start-up, testing, and commissioning activities including but not limited to field testing, dry testing, performance testing with process liquids and solids, manufacturer's checkout and the Operational Demonstration.
   2. Assist in coordinating and documenting Site quality control Work specified in individual Specification Sections.
   3. Prepare, or review and approve, all submittals for the Work under this Section and related Work contained within the Contract Documents.
   4. Coordinate activities of subcontractors, manufacturers and suppliers relative to the start-up, testing, and commissioning activities.

B. Performance Testing Manager shall be at the Site a minimum of eight hours per day during all testing and be available at all times, 24 hours per day, seven days per week to perform these duties.

C. Performance Testing Manager shall supervise the CONTRACTOR's Operations ENGINEER and Operations Specialists who shall be dedicated to the start-up, testing, and commissioning Work.

1.04 SUBMITTALS

A. Field Installation Reports – Submit reports by Manufacturer's Representative in accordance with the Contract Documents.

B. Detailed Commissioning Plan – Submit detailed commissioning plan in accordance with the Contract Documents 90 days in advance of starting, testing and placing equipment into operation.

C. Start up and Testing Documentation: CONTRACTOR shall prepare and submit all documentation for review and approval. The documentation shall include, but not be limited to, the following:
   1. Develop blank testing forms specific to each item of equipment or system to be filled out during start-up and testing.
      a. All forms must be approved by ENGINEER and OWNER prior to use.
      b. Pump testing form shall at a minimum include VFD speed, flow, suction pressure, discharge pressure, amperage, voltage, and kW.
   2. Field testing plans, dry testing plans and that describe in detail the proposed testing procedures that will show the equipment and systems performance is in accordance with the requirements of the Contract Documents.
   3. Field testing, dry testing reports including recorded test data, performance tolerances, observations, measurements taken, problems and modifications or corrective action taken for the equipment and systems to perform in accordance with the Contract Documents.
   4. Certification by the preparer that he/she is the person responsible for the data, and that the data is authentic and accurate.
   5. Certification by the CONTRACTOR or equipment or unit process systems supplier that the equipment or the unit process systems were operated continuously for the specified period and that the equipment or unit process systems operated in compliance with the specified operating conditions, parameters and performance, and that the equipment or unit process systems are suitable for Operational Demonstration.

D. Develop performance testing plans and operational demonstration plans describing in detail, coordinated, sequential testing and demonstration of each system to be tested. Performance testing plan and operational demonstration plan shall be specific to the system or equipment item to be tested, and shall identify by specific equipment or tag number each device or control station to be manipulated or observed during testing, and specific results to be observed or obtained. Subcontractors and suppliers shall be present during testing, and for the planned testing duration. Performance testing plans and operational demonstration plans shall include:
   1. Summary of results of field testing and dry testing.
   2. Calibration of all field instruments and control devices.
   3. Description of and information on temporary systems, equipment, and devices proposed for performance Testing and Operational Demonstrations, including calibration data for temporary instrumentation and controls.
   4. Description of data reduction required, if any, and proposed time between collection of data and submittal of results to ENGINEER.
   5. Summary of criteria for acceptance of test results. Summary shall include performance tolerances (if any) included in the Contract Documents. Where performance tolerances are not included in the Contract Documents, testing plans shall include proposed performance tolerances for approval by OWNER and ENGINEER.

6. Following ENGINEER's approval of performance testing plans and operational demonstration plans, CONTRACTOR shall reproduce performance testing and operational demonstration plans in sufficient quantity for CONTRACTOR'S purposes plus five copies to ENGINEER and five copies to OWNER. Do not start performance testing or operational demonstrations until required quantity of approved plans are provided.

E. Testing Schedule: Provide a testing schedule that sets forth the planned sequence for performance testing and operational demonstration work. Testing schedule shall be part of the Progress Schedule and shall conform to requirements for Progress Schedule.
   1. Detail the equipment and systems to be tested.
   2. Show planned start date, duration, and completion of each test.
   3. Testing schedule shall submitted no later than eight weeks in advance of the date performance testing and operational demonstrations are to begin. ENGINEER will not witness performance testing and operational demonstration work until test schedule is accepted by ENGINEER.
   4. Testing schedule shall be updated weekly and resubmitted to ENGINEER. Updates shall indicate actual dates of performance testing and operational demonstration Work, indicating equipment, systems and treatment train for which testing is in progress, and that are satisfactorily completed in accordance with the Contract Documents.

F. Following a successful Operational Demonstration, a summary report containing the following, at a minimum, shall be provided by the CONTRACTOR:
   1. Equipment, systems and plant treatment trains started-up and commissioned.
   2. Start-up and commissioning dates.
   3. Equipment, systems and performance criteria tested, clearly showing requirements and field data that verifies requirements were met.
   4. Names of witnesses for start-up and commissioning.
   5. Any repairs, corrections, or modifications required for the equipment or unit process systems to successfully complete start-up and commissioning.
   6. Loop diagrams accurately depicting the installed condition of instrumentation and controls.
   7. Any other important Operational Demonstration information.
   8. Report Appendix containing the following, as a minimum:
      a. A summary of all testing data used and calculations, including source, formulas with all terms defined.
      b. Copies of all raw field data sheets, including those indicating sampling point locations, and notes.
      c. Production and operational data.
      d. Calibration sheets for equipment.
      e. Copies of calibration records for instrumentation.

1.05 COMMISSIONING PLAN

A. The CONTRACTOR shall be responsible for preparing, coordinating, and executing the Plan.
   1. The CONTRACTOR shall use the resources of the equipment and unit process systems suppliers in this work, particularly for specific equipment and unit process systems.
   2. An initial draft Plan for the Facility shall be completed and submitted by the CONTRACTOR to the ENGINEER for review at least 90 days prior to the expected commencement of commissioning. The ENGINEER will require 45 days to review the submittal and return with any exceptions noted. The CONTRACTOR shall incorporate the ENGINEER's comments into the revised Plan within 30 days of receiving comments,

and reissue the Plan to the ENGINEER and OWNER.

B. The CONTRACTOR shall provide a dedicated field staff to support the Plan activities. A full-time Startup Manager shall be responsible for day to day activities and shall be the primary contact with the ENGINEER regarding Plan activities. Support staff shall include but not be limited to designated mechanical, electrical and instrumentation and control ENGINEERs and technicians, and operating staff.
   1. The CONTRACTOR may require assistance from the OWNER's operating and maintenance staff in commissioning and performance testing activities specified herein. Activities requiring OWNER's staff shall be specifically noted in the Plan.

C. The Plan shall define:
   1. A chronological schedule of all testing and inspection activities.
   2. A checklist of all inspection and testing activities broken down by location, discipline, system, and device or item.
   3. All blank forms proposed by the CONTRACTOR for verification or recording of the functional completion testing, startup, commissioning and performance testing.
   4. An index which cross references the forms to their intended application(s).
   5. A list of all supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for retesting, in the event it is required.
   6. A list of participants in functional completion testing, startup, commissioning, and performance testing.
   7. A list of special test equipment required for functional completion testing, startup, commissioning, and performance testing.
   8. Sources of the test media (water, power, air.) for functional completion testing.
   9. The proposed method of delivery of the media to the equipment to be tested during functional completion testing, startup, commissioning, and performance testing.
   10. Temporary or interim connections for the sequencing of multiple units during functional completion testing, startup, commissioning, and performance testing.

D. The CONTRACTOR shall designate, in the Plan, a Testing and Checkout Coordinator, to coordinate and manage the activities defined in the Plan.

1.06 ROLES AND RESPONSIBILITIES

A. CONTRACTOR shall provide competent, qualified representatives of material, equipment, and system manufacturers to provide services specified, including supervising installation, adjusting, starting-up, and testing of materials and equipment.

B. The CONTRACTOR shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the Plant Testing, Startup and Commissioning specified herein. In addition, the CONTRACTOR shall arrange for and provide the participation or assistance of survey crews, quality control technicians, Supplier's representative(s), and required governmental agency representatives.

C. The CONTRACTOR shall provide the services of the Supplier's representative(s) as follows:
   1. Assistance during installation as specified in Divisions 1 through 16 and as specified herein.
   2. Field Testing as specified in Divisions 1 through 16 and as specified herein.

3. Startup as specified in Divisions 1 through 16 and as specified herein.
4. Commissioning as specified in Divisions 1 through 16 and as specified herein.

D. The Supplier's representative's activities required by this Section are in addition to the requirements for vendor training and other services specified elsewhere in the Contract Documents. Timing for the performance of these services is to be defined in the CONTRACTORS Checkout Plan, specified herein, and shall not be concurrent.

E. The ENGINEER will review and comment on the CONTRACTOR's deliverables, participate in the physical inspection activities, witness the shop and field testing, witness functional testing, maintain the permanent record of all testing results, and provide verification of conformance to the specifications. The ENGINEER's right to perform inspections, witness tests or monitor or assess the Work and activities does not relieve the CONTRACTOR of its obligation to comply with the requirements of the Contract Documents nor does it imply completion of the Work.

1.07 FUNCTIONAL COMPLETION TESTING

A. Functional Completion Testing shall be completed as construction and installation of equipment is completed to demonstrate that the equipment is ready for equipment and systems startup.

B. Functional Completion Testing shall be done in a coordinated manner based on the Plan prepared by the CONTRACTOR.

C. The OWNER's operating and maintenance staff shall be allowed to observe for the purposes of familiarization and training.

D. Functional Completion Testing procedures and documentation forms shall be developed by the CONTRACTOR. The procedures shall include a listing of items inspected for Functional Completion Testing.

E. If any equipment or unit process systems do not meet Functional Completion Testing requirements, it shall be the responsibility of the CONTRACTOR and/or equipment suppliers to make the necessary corrections or replacements and repeat the test.

F. The equipment and unit process systems shall not be started up or put into service until the Functional Completion Testing is completed as evidenced by a completed Functional Completion Testing certificate for the equipment or subsystem.

G. Modifications to the equipment and unit process systems required to meet Functional Completion Testing requirements shall be provided, and all retesting shall be performed at no additional cost to the OWNER.

H. A Functional Completion Testing Certificate shall be prepared by the CONTRACTOR for each piece of equipment or system and submitted to the ENGINEER and OWNER for review.

1.08 COMMISSIONING

A. All equipment shall be commissioned.

B. Commissioning activities for the project shall not be initiated until the requirements of Startup are completed for the equipment or unit process systems.

C. The requirements of this section shall be satisfactorily completed prior to beginning Performance Testing for equipment and unit process systems.

D. Commissioning shall be used by the CONTRACTOR and equipment or unit process suppliers to adjust, fine tune, modify and prepare the equipment or system for continuous operation and Performance Testing.

E. Equipment shall not be operated without the guidance of qualified personnel having the knowledge and experience necessary to conduct proper operation thereof and obtain valid results.

F. All required adjustments, tests, operation checks, and Startup and Commissioning activities shall be provided by qualified personnel.

G. CONTRACTOR shall be responsible for planning, supervising, and executing the Startup and Commissioning of the equipment and unit process systems with the assistance of equipment or unit process systems suppliers in accordance with the Plan.

H. The CONTRACTOR shall be responsible for commissioning under the direction of its Startup Manager.

I. The OWNER's operating and maintenance staff shall be allowed to observe for the purposes of familiarization and training.

J. For equipment or unit process systems that do not meet Commissioning requirements, it shall be the responsibility of the CONTRACTOR and/or equipment or unit process systems suppliers to make the necessary corrections or replacements and repeat Commissioning at no additional cost to the OWNER.

K. The equipment or unit process systems shall not be Performance Tested or otherwise placed into service until Commissioning is completed as evidenced by a completed Commissioning certificate for the equipment or unit process systems.

L. Commissioning Certificates for each piece of equipment or unit process shall be completed and submitted by the CONTRACTOR to the ENGINEER and OWNER for review.

1.09 PERFORMANCE TESTING AND OPERATIONAL DEMOSTRATION

A. CONTRACTOR shall demonstrate the operation of all equipment and systems. CONTRACTOR shall provide all labor, materials, services, equipment, and incidentals required for Performance Testing and Operational Demonstrations as indicated in the Contract Documents. This Performance Testing and Operational Demonstrations shall be conducted, coordinated and recorded by the CONTRACTOR in accordance with the requirements specified herein and in cooperation with the OWNER and ENGINEER. The pump station will not be considered Substantially Complete until the completion of the performance testing and

operational demonstration.

B. This Work is additional to any other installation, shop and factory testing, field testing, dry testing, performance testing, balancing or adjustments required elsewhere in the Contract Documents.

C. Conduct Performance Testing and Operational Demonstration testing for each item of process, mechanical, instrumentation and controls, plumbing, heating, ventilating, and air conditioning (HVAC); electrical systems and equipment, and other systems and equipment, to demonstrate compliance with the performance requirements of the Contract Documents.

D. Objectives of Performance Testing and Operational Demonstrations are to:
   1. Demonstrate to the satisfaction of the OWNER and ENGINEER that structures, equipment and systems tested comply with all functional and performance requirements in the Contract Documents.
   2. Establish baseline operating conditions for OWNER's use in establishing standard operating procedures and preventative maintenance programs.
   3. The Performance Testing shall maintain conformance with performance tolerances for a period of not less than 7 days. If a testing failure occurs (whether process, mechanical, electrical, instrumentation) during the 7-day testing period, the malfunction shall be repaired, and the 7 day testing period shall restart.
   4. The Operational Demonstrations shall maintain conformance with the performance tolerances for a period of not less than 14 days. If a testing failure occurs (whether process, mechanical, electrical, instrumentation) during the 14-day testing period, the malfunction shall be repaired, and the 14-day testing period shall restart.

E. Utilities and Consumables:
   1. CONTRACTOR shall provide the following: fuel, compressed air, temporary conduit, cable and wire, piping and appurtenances, and all other items and Work required for completing Performance Testing and Operational Demonstrations.
   2. OWNER will provide the electricity, chemicals, and plant water for the initial Performance Testing and Operational Demonstrations. CONTRACTOR shall provide all temporary electrical equipment, including but not limited to conduit and cable, piping and appurtenances required to convey electricity, chemicals, and plant water to the required testing location. If re-testing is required, cost of utilities and consumables furnished by OWNER for initial testing shall be paid by CONTRACTOR at OWNER's cost or standard rates, as applicable.
   3. CONTRACTOR shall provide a temporary backflow preventor if test water is supplied from a potable source. Materials connecting to potable water piping shall be disinfected prior to connection.
   4. Upon completion of hydrostatic testing, water shall be drained to the existing containment area sump at a controlled rate not to overflow sump or exceed sump pump capacity. CONTRACTOR shall provide a temporary portable sump pump and discharge piping to nearest service drain.

F. Sequence: The following general sequence applies to Performance Testing and Operational Demonstrations:
   1. Furnish submittals required prior to Performance Testing, in accordance with the Contract Documents.
   2. Furnish acceptable operations and maintenance manuals in accordance with the Contract Documents.
   3. Complete the Work associated with starting and placing equipment and systems in

operation in accordance with the Contract Documents.

4. Training of operations and maintenance personnel in accordance with Section 01820, Demonstration and Training. Training must occur prior to the Operational Demonstration.
5. Proceed with Performance Testing in accordance with the Contract Documents, simulating the range of actual operating conditions to the greatest extent possible.
6. Complete site quality control Work specified in the Contract Documents for individual equipment items and systems. Field inspection, testing, and adjustments shall be signed off by approved representative of the Manufacturer, indicating that the equipment, components, systems, or unit processes meets the Manufacturer's requirements.
7. Following acceptance of the Performance Testing by the ENGINEER and OWNER, CONTRACTOR shall initiate a 14-day Operational Demonstrations, as described herein.
8. Successful completion of Operational Demonstration is part of the requirements to achieve Substantial Completion.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 STARTUP

A. The CONTRACTOR's Performance Testing Manager and Manufacturer's Representative shall inspect equipment and systems prior to each start-up and verify their readiness for start-up. Conditions hazardous to equipment or personnel shall be corrected by the CONTRACTOR's Performance Testing Manager prior to start-up of equipment.

B. Start-up operations shall not precede using temporary power or temporary instrumentation and control wiring. All electrical and control connections shall be permanent and complete, and all such electrical components and equipment fully functional.

C. Use of repair parts during start-up operations shall not be permitted, except in such situations where the actual on-site verification of such repair parts' operability is specified.

D. The CONTRACTOR's Performance Testing Manager shall verify that all initial copies of the maintenance and operating instructions have received, from the ENGINEER, an acceptable disposition as defined in Section 01 33 00, Submittal Procedures, and the only outstanding item is the field verification of the maintenance and operating instructions.

E. CONTRACTOR's Performance Testing Manager shall compare, and make adjustments to conform to; the Manufacturer's recommendations for the following minimum start up requirements:
   1. Motor Bearings and Shafting:
      a. Inspect for cleanliness, and clean and remove foreign matter.
      b. Verify alignment.
      c. Replace defective bearings and those that operate rough or noisy.
      d. Grease as necessary, in accordance with Manufacturer's recommendations.
   2. Motors:
      a. Check each motor for comparison to amperage nameplate value.

b. Correct conditions that produce excessive current flow and conditions that exist due to equipment malfunction.

3. Pipe System:
    a. Check glands and seals for cleanliness and adjustment before running pump.
    d. Verify that piping system is free of dirt and scale before circulating liquid through system.
4. Valves:
    a. Inspect manual and automatic control valves, and clean bonnets and stems.
    b. Tighten packing glands to ensure no leakage, but allow valve stems to operate without galling.
    c. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
    d. Replace packing on valves that continue to leak.
    e. Remove and repair bonnets that leak.
    f. After cleaning, coat packing gland threads and valve stems with surface preparation of “Molycote” or “Fel-Pro”.
    g. Verify that control valve seats are free from foreign matter and are properly positioned for intended service.
5. Tighten flanges and other pipe joints after system has been placed in operation.
    a. Replace gaskets that show signs of leakage after tightening.
6. Inspect all joints for leakage:
    a. Promptly remake each joint that appears to be faulty; do not wait for rust or other corrosion to form.
    b. Clean threads on both parts, and apply compound and remake joints.
7. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats, and headers in fluid system to ensure freedom from foreign matter.
8. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.
9. Inspect fan wheels for clearance and balance.
10. Check each electrical control circuit to ensure that operation complies with the Contract Documents.
11. Inspect each pressure gauge, thermometer, and other instruments for calibration.
    a. Replace items that are defaced, broken, or that read incorrectly.
12. Repair damaged insulation.
13. Vent gasses trapped in systems.
14. Verify that liquids are drained from all parts of gas or air systems.

A checklist showing the completed steps shall be submitted to OWNER upon successful start-up.

3.02 COMMISSIONING

A. On successful completion of startup, the CONTRACTOR shall begin commissioning of the equipment and systems, wherein the equipment and systems are subjected to full operation. Adjustments shall be made as necessary and the equipment and system shall be optimized and brought into compliance with design criteria in preparation for performance testing and the Operational Demonstration specified within the Contract Documents.

B. The various vendors, equipment suppliers and manufacturers shall provide on-site supervision and assistance for Commissioning services for the new facility.

C. The CONTRACTOR shall coordinate all Commissioning activities for equipment and systems in accordance with the accepted commissioning plan.

D. Commissioning shall show that the equipment and unit process systems are capable of continuous operation using process liquids and solids, chemicals, and utilities; and that the flows, operating parameters and performance requirements have been demonstrated for a minimum of seven days of continuous operation, or the period required in the equipment specifications, whichever is longer.

E. If the commissioning fails, the CONTRACTOR will be responsible for redoing the commissioning at no additional costs to the OWNER.

F. Shutdowns that occur because of power outages, acts of God, or failure of support systems not part of this contract will not be a cause of failure of continuous operation during the Operational Demonstration.

3.03 PERFORMANCE TESTING AND OPERATIONAL DEMONSTRATION

A. CONTRACTOR shall perform Operational Demonstration of the work. Unless otherwise specified, the Operational Demonstration shall be a continuous 14-day (336 hours) period during which the work is operated and maintained in a continuously on-line, fully functional process status.

B. The Operational Demonstrations shall encompass the entire work, or the portion thereof designated for Substantial Completion. The Operational Demonstrations shall include all the equipment and systems.

C. Filling, draining, cleaning, stabilizing, adjusting, or other start-up activity time shall not be counted as Operational Demonstration time.

D. During the entire 14-day Operational Demonstration period, the operation of equipment will be assumed by the OWNER's personnel, under the direction of the CONTRACTOR. The CONTRACTOR shall provide labor and sufficient material to fully operate and maintain the work 24 hours per day, 7 days per week for the entire duration of the Operational Demonstrations.

E. Prior to the Operational Demonstrations, all parts of the work designated for the operational demonstration shall have passed all required tests as specified. No testing shall be allowed during the Operational Demonstrations.

F. During the Operational Demonstration period, CONTRACTOR shall obtain baseline operating data on equipment with motors greater than one horsepower. Baseline data shall include amperage, bearing temperatures, and vibration data obtained at intervals in the approved testing plan. Methods of measurement shall be in accordance with industry standards applicable for the motors being tested.

G. All required maintenance and servicing prior to the date of Substantial Completion shall be performed by the CONTRACTOR at the specified interval and as necessary. All maintenance and servicing shall be noted in the Operational Demonstration Log.

H. All outages of equipment or system(s) should be noted in the Operational Demonstration Log. Plant outages are considered a part of normal plant operation and will not invalidate the Operational Demonstration. The CONTRACTOR is responsible for the safe and orderly shutdown and restart of equipment as necessary in the event of an outage.

I. CONTRACTOR and Performance Testing Manager shall attend Operational Demonstration coordination meetings as called by the ENGINEER to review operating conditions of equipment and systems.

J. If during the Operational Demonstration, any part of the work fails to fully conform to the requirements of the Contract Documents, the Operational Demonstration shall be considered to have failed, and the work shall not be considered to be Substantially Complete, and the ENGINEER shall so notify the CONTRACTOR in writing. If, during the Operation Demonstration, the provisions of the General Conditions are evoked to stop the work, the Operational Demonstration will also be considered to have failed.

K. Re-testing Because of Disputed Testing Results or Procedures: In the case of an otherwise satisfactory Operational Demonstration, when there is doubt, dispute, or difference between ENGINEER and CONTRACTOR regarding testing results, methods, or equipment used in the Operational Demonstration testing, ENGINEER may order CONTRACTOR to repeat the testing. If repeat testing using such modified methods or equipment required by ENGINEER confirms the previous test, all costs of repeat test will be paid by OWNER. Otherwise all costs, including costs of the ENGINEER, labor, testing agencies, and inspections, shall be paid by CONTRACTOR.

L. Post-test Inspection: After completing Operational Demonstration testing, check equipment for proper alignment and realign, as required. Check equipment for loose connections, unusual movement, and other indication of improper operating characteristics. Disassemble and inspect equipment and devices that exhibit unusual or unacceptable operating characteristics. Repair or replace defective Work to conform to the Contract Documents at no additional cost to OWNER.

M. Upon failure of the Operational Demonstration, the CONTRACTOR shall promptly remedy any defects in the work and shall promptly reschedule and re-start the complete 14-day, (336 hours) Operational Demonstration time period. No Operational Demonstration time will be considered to have accrued to any part of the work by reason of a failed Operational Demonstration.

N. During the Operational Demonstration, the OWNER may require or permit the Operational Demonstration to be suspended:
   1. As provided in the General Conditions.
   2. Upon the written request of the CONTRACTOR, to correct or adjust the work, when in the judgment of the ENGINEER such required correction or adjustment is insufficient to deem the Operational Demonstration to have failed.
   3. If the Operational Demonstration is suspended for any reason except failure, Operational Demonstration time shall accrue to the work from the time of the beginning of the Operational Demonstration to the time of the suspension.
   4. If the Operational Demonstration is suspended at the request of the CONTRACTOR, the CONTRACTOR shall continue operation and maintenance of the work without additional charges to the OWNER, according to the extent required by the Contract Documents and the OWNER. No Operational Demonstration time shall accrue to the Work during the period of suspension.

O. Completion of the Operational Demonstration does not relieve the CONTRACTOR of its other requirements for Substantial Completion as required by the Contract Documents.

3.04 SCHEDULE

A. CONTRACTOR shall complete operational demonstration prior to beginning work at next chemical tank.

END OF SECTION

SECTION 01 82 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Training

B, Instructor Manual

C. Trainee Manual

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:
   1. Submit two copies of the outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   2. Submit resumes, including three outside references, for each instructor proposed for training program. The qualifications of the instructor shall include the type of training instructor has received for the specific equipment and previous training work experience.
   3. Submit two (2) electronic copies of each training module within seven (7) calendar days following the delivery of each training module.
   4. On each copy of the training module, provide an applied label with the following information:
      a. Name of Project.
      b. Training Session Name.
      c. Name of Engineer.
      d. Name of Construction Manager.
      e. Name of Contractor.
   5. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in a PDF electronic file. Include a table of contents with links to corresponding training components.
      a. The PDF electronic file format shall be electronically searchable.

1.03 COORDINATION

A. Contractor to coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of the Owner's personnel. Contractor shall schedule training sessions at least 60 days in advance.

B. Contractor shall provide a minimum of two (2) general training sessions for topics indicated in technical specifications. Each of the two training sessions shall cover all topics. Training sessions shall be on non-consecutive weeks to accommodate shift changes at the plant.

C. Training sessions shall be provided prior to the operational demonstration.

D. Contractor to coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

E. Contractor to coordinate content of training modules with content of accepted emergency, operation, and maintenance manuals. Do not submit instruction program(s) for review until the operation and maintenance data required under Section 01 78 00 has been reviewed and accepted by Engineer.

PART 2 - PRODUCTS

2.01 INSTRUCTOR MANUAL

A. The Contractor shall prepare an Instructor Manual or each curriculum that includes all of the information specified below and written at the journeyman level for electrician specialists, mechanical specialists and instrument technicians, and for water treatment plant operators, or other disciplines, depending upon the target audience.

B. The Instructor Manual shall be consistent with the nomenclature and contents of the accepted Contractor's O&M Manuals required in Specification Section 01 78 10. The O&M Manuals cannot be substituted for the Instructor Manual.

C. The purpose of the Instructor Manual is to define the concepts and information that will be taught to each target audience and to describe the methods and materials to be used during the training. The Instructor Manual is designed to provide specific guidance to the Instructor regarding all aspects of the training program. The Instructor Manual shall include:
1. Description of the equipment.
2. Parts and equipment graphics.
3. Safety procedures.
4. Startup checks and procedures.
5. Overview of routine operation, including startup and shutdown and operating parameters.
6. Routine, preventive, and corrective maintenance procedures.
7. Lubrication (schedule and type).
8. Assembly and disassembly procedures.
9. Troubleshooting procedures.
10. Parts list.
11. Special maintenance practices.
12. Emergency shutdown.

D. All manuals shall be presented in electronic format per the requirements of Specification Section 01 33 00. All equipment shall be cross-referenced to the equipment tag identification numbers.

E. Each Instructor Manual shall contain:
1. Instructor Manual cover page.
2. Instructor Manual table of contents.
3. Lesson Plan cover page.
4. Lesson Plan summary.
5. Lesson Plan text, including:

a. Identity of the target audience (a separate Lesson Plan is required for each target audience, such as mechanical O&M personnel, electronic/electrical O&M personnel, etc.).
b. Length of the training program and each topic to be covered.
c. Performance and/or training objectives.
d. Outline of the material to be covered.
e. Training strategies to be used and interaction with the trainees.
f. Audio visual and/or support materials required, and when used or referred to during instruction.
g. A list of resource and/or reference materials.

6. A copy of all training aids, including electronic files.
7. A copy of trainee materials (handouts, reference materials, etc.) in electronic format.

F. The Contractor shall submit the equipment manufacturer's lesson plans for acceptance by the Engineer no less than ninety (90) days prior to the date that the training is to take place.

G. With the exception of cutaway models or other items expressly exempted by the Engineer, all training aids and trainee materials contained in the Instructor Manual or used in the delivery of training shall become the property of the Owner and may be duplicated by the Owner for its own use.

H. The Contractor shall provide required acceptance and/or copyright releases obtained from those who own proprietary and/or copyrighted materials provided by the Contractor so that the materials can be reproduced by the Owner.

2.02 TRAINEE MANUAL

A. Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required in the individual Specification Sections.

B. The Contractor shall submit a Trainee Manual for each curriculum that includes all of the information specified below and written at the journeyman level for electrician specialists, mechanic specialists and instrument technicians, and for water treatment plant operators, or other disciplines, depending upon the target audience.

C. The Trainee Manual shall be consistent with the nomenclature and content of the accepted Contractor O&M Manuals required in Specification Section 01 78 10. The O&M Manual cannot be substituted for the Instructor Manual or Trainee Manual.

D. The purpose of the Trainee Manual is to provide an organized package of information for use by trainees during the training sessions and as reference Water Treatment Plant (New) material for operation and maintenance in the future. The Trainee Manual shall include:
1. Description of the equipment.
2. Parts and equipment graphics including "exploded" views.
3. Safety procedures.
4. Pre-startup checks.
5. Startup procedures.
6. Operation and monitoring procedures including normal operating parameters, and the operating limits of the equipment.
7. Shutdown procedures.
8. Troubleshooting procedures.

9. Non-routine emergency procedures.
10. Safety/Protective equipment required by Trainees.

E. All manuals shall be presented in electronic format per the requirements of Specification Section 01 33 00. All equipment shall be cross-referenced to the equipment tag identification numbers.

F. The Contractor shall provide at least one hard copy of each Trainee Manual for each trainee. Hard copies shall be on 8.5" x 11" paper in a 3-hole D-ring binder.

PART 3 - EXECUTION

3.01 FACILITIES FOR TRAINING

A. Use Owner's designated training facilities for specified field training programs (with the exception of remote training described in this section). Facilities shall include the project site, which shall be used for hands-on training programs. Coordinate use of Owner's facilities with Owner.

3.02 ON-SITE TRAINING

A. Training shall include the following:
   1. Equipment Overview (required for all types of operations and maintenance training):
      a. Describe equipment's operating (process) function and performance objectives.
      b. Describe equipment's fundamental operating principles and dynamics.
      c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.
      d. Identify all support equipment associated with operation of subject equipment, such as air intake filters, valve actuators, motors, and other appurtenant items and equipment.
      e. Identify and describe safety precautions and potential hazards related to operation.
      f. Identify and describe in detail safety and control interlocks.
   2. Operations Training:
      a. Describe operating principles and practices.
      b. Describe routine operating, start-up, and shutdown procedures.
      c. Describe abnormal or emergency start-up, operating, and shutdown procedures that may apply.
      d. Describe alarm conditions and responses to alarms.
      e. Describe routine monitoring and recordkeeping procedures.
      f. Describe recommended housekeeping procedures.
      g. Describe how to determine if corrective maintenance or an operating parameter adjustment is required.

B. Maintenance Training:
   1. Describe preventative maintenance inspection procedures required to: inspect equipment in operation, identify potential trouble symptoms and anticipate breakdowns, and forecast maintenance requirements (predictive maintenance).
   2. Define recommended preventative maintenance intervals for each component.

3. Describe lubricant and replacement part recommendations and limitations.
4. Describe appropriate cleaning practices and recommend intervals.
5. Identify and describe use of special tools required for maintenance of equipment.
6. Describe component removal, installation, and disassembly and assembly procedures.
7. Perform “hands-on” demonstrations of preventive maintenance procedures.
8. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
9. Define recommended torqueing, mounting, calibrating, and aligning procedures and settings, as appropriate.
10. Describe recommended procedures to check and test equipment following corrective maintenance.

C. Equipment Troubleshooting:
1. Define recommended systematic troubleshooting procedures.
2. Provide component-specific troubleshooting checklists.
3. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
4. Describe common corrective maintenance procedures with “hands on” demonstrations.

D. Equipment to be covered during training shall be per the requirements of the individual sections of the Contract Documents.

3.03 SCHEDULE

A. The Contractor shall coordinate the manufacturer’s training services with the Owner and the Engineer, providing a minimum of thirty (30) days prior notice of training, subject to the acceptance of the Engineer and the Owner.

B. Training shall occur prior to the operational demonstration.

END OF SECTION

SECTION 03 93 00 - REPAIR OF EXISTING CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of repair of existing concrete structures shown on Drawings and specified, and includes patching loose, spalled, and unsound concrete, grouting cracks, removing debris resulting from Work, and other Work required to produce a neat and complete job.

B. Related Documents: Drawings and general provisions of Contract, including General Conditions and Division 1, apply to Work of this Section.

1.02 METHODS OF PAYMENT

A. Concrete Surface Repair, Over 2-inches Deep: Measure surface area and average depth after surface preparation and prior to beginning actual repair. ENGINEER, with CONTRACTOR, will determine the volume of each location for repair. These measurements shall be done to the nearest inch, and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown, will be included in a Change Order increasing or decreasing the Contract Price noted on Bid Form.

B. Concrete Surface Repair, Equal to or Less than 2-inches Deep: Work shall be paid for by the square foot of surface area repaired. Measure surface area after surface preparation and prior to beginning actual repair. ENGINEER, with CONTRACTOR, will determine the surface area of each location or fraction of each location for repair that is equal to or less than 2 inches deep. These measurements shall be done to the nearest 0.1 square foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.

C. Concrete Crack Repair, Pressure Injection of Epoxy Resin: Work will be paid for by the linear foot of crack injected. These measurements shall be done to the nearest linear foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.

D. Concrete Crack Repair, Pressure Injection of Hydrophilic Grout: Work will be paid for by the linear foot of crack injected. These measurements shall be done to the nearest linear foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Product data for proprietary materials and items, including patching compounds and others requested by ENGINEER.
   2. Samples of materials as requested by ENGINEER, including names, sources, and descriptions.

B. Material certificates in lieu of laboratory test reports on other materials. Manufacturer and CONTRACTOR shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements.

C. Qualification Data for Installers.
   1. Manufacturer's certificates that the installer's workers are trained and qualified for each type of product.
   2. Satisfactory experience record including references from previous applications of the specified materials for repairs of a similar type and under similar conditions.

D. Repair Plan: Submit before Work begins.

1.04 REFERENCES

A. Codes and Standards:
   1. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
      a. ACI 224, Causes, Evaluation, and Repair of Cracks.
      b. ACI 201, Chapter 6, "Repair of Concrete."
      c. ACI 301, Specifications for Structural Concrete for Buildings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each product manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

B. Installer Qualifications: Entity qualified in the field of concrete repair with a minimum of 5-years' experience and employs installers and supervisors who are trained and approved by product manufacturers to apply products used.

C. Repair Plan: Prepare a written plan for repair of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

D. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at CONTRACTOR's expense.

E. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at CONTRACTOR's expense.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

C. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, or freezing temperatures.

1.07 FIELD CONDITIONS

A. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40-degrees F and will remain so for at least 48 hours after completion of Work.

B. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures 90-degrees F and above.

C. Protect adjacent finish materials against spatter during patching operations.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

A. Patching up to 2-inch Deep: Cement-polymer patching mortar with an integral corrosion inhibitor suitable for the particular patching application.

B. Patching over 2-inches Deep: Class A concrete with the use of an epoxy bonding agent applied at the bonding surfaces, unless otherwise noted.

C. Epoxy Bonding Agent: Epoxy-modified cementious material with integral corrosion inhibitor.

D. Epoxy Gel Adhesive: Moisture-tolerant 2-component epoxy adhesive conforming to ASTM Specification C 881.

E. Epoxy Injection Resin: Moisture-insensitive 2-component epoxy-resin system conforming to ASTM Specification C 881, Type I. Provide Grade and Class to suit Project requirements.

F. Grouting of Non-structural and Leaking Cracks: Moisture reactive (hydrophilic) TDI (toluene diisocyanate) based polyurethane chemical grout. For structures in contact with potable water, chemical grout shall be NSF 61 approved.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

PART 3 - EXECUTION

3.01 GENERAL

A. All workers shall have sufficient experience on concrete repair work to be familiar with the use of these materials and methods of operation.

B. To ensure the quality of the finished work, ENGINEER may require CONTRACTOR to replace workers who, in ENGINEER's judgment, are not capable or qualified to perform this Work. CONTRACTOR, upon receipt of the written notification from ENGINEER, shall immediately comply with this request at no additional cost to OWNER.

3.02 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete repair work begins and during its progress.

3.03 PATCHING

A. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries.

B. Square cut perimeter of areas to be patched to a minimum depth of 1/4-inch. Remove deteriorated or unsound concrete as required to reach sound concrete. Removal shall be to a minimum depth of 1/4-inch.

C. Thoroughly clean by sandblasting all corroded and rusted reinforcement. Wherever a reinforcing bar has lost more than 30 percent of its cross-sectional area, place a new bar of the same size parallel to it using 24-bar diameters lapped length at each end. When a bar has exposed 50 percent or more of its perimeter, chip out the concrete around the bar to provide a minimum of 1-inch gap all around so the bar can be completely encased in new mortar.

D. Test areas where concrete has been removed by tapping with a hammer, and remove additional concrete until unsound and disbanded concrete is completely removed.

E. After concrete removal, mechanically prepare concrete surface to obtain a minimum surface profile of 1/16-inch +/-.

F. Thoroughly clean dirt, oil, dust, or foreign matter from repair surfaces. Dampen concrete substrate to a saturated surface dry condition. Coat substrate with bonding agent.

G. The patching material must be applied within the working time of the bonding agent. Use bonding agent only on surfaces not requiring formwork or when the patching material can be applied within manufacturer's recommended working time.

H. Prepare the cement mortar per manufacturer's recommendations. Apply mortar with a spatula pressed tight against existing surfaces and filling all voids. Build up mortar to original lines in one or more layers, with each layer thickness not to exceed that recommended by the manufacturer, and finished smooth with a steel trowel.

3.04 PRESSURE INJECTION OF CRACKS

A. Drilling Injection Holes:
   1. Pressure injection of epoxy resin: Drill holes into face of crack.
   2. Pressure injection of hydrophilic grout: Drill injection holes along the sides of the cracks set at an angle of 45-degrees from the surface of the concrete so the holes intersect the crack near the mid-section of the concrete. Alternate holes from one side of crack to the other.
   3. Minimum hole spacing should equal thickness of the concrete to be repaired.

B. Flush drilling dust out of out of injection holes by use of water and a flushing wand that reaches the back of the hole. Install injection packers or ports in the injection holes. Mechanically clean and surface seal cracks wider than 1/8-inch with hydraulic cement or epoxy gel adhesive.

C. Thoroughly flush cracks with potable water prior to grout injection.

D. Inject chemical grout, maintaining slow, steady pressure until crack is filled. In slabs, injection shall start at the first packer or port that was flushed with water. In walls, injection shall start at the lowest packer or port. Move to next adjacent packer or port when the injection material appears from adjacent packers or ports. Reinject first packer or port after pumping a number of locations.

E. Remove injection packers or ports and patch injection holes with patching mortar. Remove excess cured grout, hydraulic cement, or epoxy gel and clean surface.

3.05 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcing placement and supports.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond to patching material.

C. Accurately position, support, and secure reinforcement against displacement by construction or patching operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.

D. Place reinforcement to obtain minimum coverings for reinforcement protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during patching operations. Set wire ties to direct ends into concrete, not toward exposed surfaces.

3.06 SURFACE FINISHES

A. Patching: Provide finish to match adjacent concrete surfaces unless otherwise noted.

3.07 CURING AND PROTECTION

A. Protect freshly placed material from premature drying and excessive cold or hot temperatures.

B. Patching up to 2 Inches Deep: Perform curing as recommended by patching mortar manufacturer.

C. Patching over 2 Inches Deep: Perform curing of Class A concrete as specified in ACI 306 for cold weather placement and ACI 305 for hot weather placement.

3.08 REPAIR OF DEFECTS

A. Repair patch areas that lack uniformity or have honeycomb, rock pockets, voids over 1/4-inch in diameter, and holes left by tie rods and bolts.

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Aluminum railings.

1.02 ACTION SUBMITTALS

A. Product Data:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Handrail brackets.
   3. Bituminous paint.
   4. Nonshrink, nonmetallic grout.
   5. Anchoring cement.
   6. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.03 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
   1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
   2. Anchors and related fastener hardware shall be 316 stainless steel.

2.02 ALUMINUM RAILINGS

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.
   1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B210/B210M, Alloy 6063-T832.

E. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.

F. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.03 FASTENERS

A. Fastener Materials:
   1. Aluminum Railing Components: Type 304 stainless steel fasteners.

B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
   1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

2.05 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 welds; utilitarian appearance not subject to view, partially dressed weld with spatter removed.

D. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

H. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
   1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
   2. Coordinate anchorage devices with supporting structure.

2.06 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Mill Finish: AA-M12, nonspecular as fabricated.

C. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.
   1. Fit exposed connections together to form tight, hairline joints.
   2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
   3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels. Provide non-shrink grout or aluminum shims as required to plumb and align railing to be installed on uneven surfaces.
   4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint. Provide non-metallic washers between anchor nuts and aluminum base.

3.02 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

END OF SECTION

SECTION 06 61 00 - FRP FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. FRP gratings and frames.

B. Related Documents: Drawings and general provisions of Contract, including General Conditions and Division 1, apply to Work of this Section.

1.02 DEFINITIONS

A. Definitions in ASTM E 985 for railing related terms apply to this Section.

B. Pultrusion: Process of pulling fiberglass rovings (strands), mats, and other forms of reinforcements such as woven fiberglass through baths of thermosetting liquid resin, and then through a heated forming die (made of steel) to form a completed composite fiberglass structural shape.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following FRP fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each FRP fabrication.

B. Design Criteria:
   1. Refer to Design Criteria on Sheet S-001 for Load Requirements.
   2. All FRP connections shall be 316 Stainless Steel
   3. All primary and secondary supports shall be stainless steel, designed and furnished by the FRP manufacturer.
   4. All perimeter edge support angles shall be FRP.

1.04 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00 – Submittals, Working Drawings, and Samples covering the items included under this Section. Shop Drawing submittals shall include:
   1. Shop Drawings detailing fabrication and erection of each FRP fabrication indicated. Include signed and sealed plans, elevations, sections, and details of FRP fabrications and their connections by the qualified licensed Delegate Engineer. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
   2. Product Data for products used in miscellaneous FRP fabrications including paint products and grout.
   3. Where installed FRP fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for

structural analysis that has been signed and sealed by the qualified Delegate Engineer, licensed in the State of Michigan, responsible for their preparation.

4. Samples representative of materials and finished products as may be requested by ENGINEER.

B. Quality Control Submittals: Qualification data for firms and persons specified in "Quality Assurance" Paragraph to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects, Engineers and Owners, and other information specified.

1.05 QUALITY ASSURANCE:

A. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in Work.

1. Arrange for installation of FRP fabrications specified in this Section by same firm that fabricated them.

B. Engineer Qualifications: Professional Engineer licensed to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project shall sign and seal the shop drawings.

1.06 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which FRP fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. FRP Pultruded Grating, and Frame Materials:
    a. Fibergrate Composite Structures
    b. Strongwell
    c. American Grating
    d. Or alternative manufacturer approved by architect, design engineer, and owner.

2.02 FRP SURFACES

A. For FRP fabrications exposed to view upon completion of Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for FRP sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. FRP resin shall be a corrosion resistant, fire resistant, pultruded-type premium grade isophthalic polyester.

2.03 MATERIALS

A. Fiberglass sheet or solid fiberglass bar shall be used to fabricate the internal connectors for the square tube. The internal connectors will be 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm) with length and angularity variable to meet the requirements of each connection. Angular connections shall be fabricated from fiberglass sheet bonded together using a bisphenol A/epichlorohydrin epoxy resin with an amine-curing agent to give a minimum thickness of 1-1/2 inches. The angular connections will be fabricated to the proper dimension from the fiberglass sheets that have been bonded together.

Fiberglass sheet used for angular connections shall meet the properties specified in Table 1. Fiberglass solid bar, 1-1/2 by 1-1/2-inch, shall be used for the straight connections, and shall meet the properties specified in Table 1.

B. Rivets shall be nickel copper or nonmetallic.

C. Bolts shall be a minimum 3/8 inch (9.5 mm) diameter, 316 stainless steel. FRP bolts or fasteners are not permitted.

D. Adhesive used to bond internal connectors to fiberglass pultruded square tube shall be a bisphenol A/epichlorohydrin epoxy resin with an amine-curing agent.

2.04 FRP GRATINGS AND FRAMES

A. Glass-fiber grating frames shall be fabricated from pultruded structural angles. No metallic fasteners shall be used.

B. Glass fiber gratings shall be standard square mesh type manufactured of continuous glass fibers completely wetted with polyester resin.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and provide anchorages, setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Site.

3.02 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. All cut edges and holes shall be sealed with a compatible resin system containing an UV inhibitor.

E. All connections shall be made using a one-piece solid internal connector bonded to the interior of the square tube using an epoxy adhesive and riveted. The following types of connections are defined:
   1. All bolted connections shall have a one-piece solid internal connector bonded to the interior of the square tube through which connector holes will be drilled. A minimum 1 inch (26 mm) length of the solid internal connector will be on each side of the drilled hole.

F. Additional solid internal connector pieces can be bonded with epoxy adhesive to the interior of the square tube as desired.

3.03 INSTALLATION OF FRP BAR GRATINGS

A. Install gratings and decking to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and/or bar sizes indicated, including installation clearances and standard anchoring details.

B. Secure removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

END OF SECTION

SECTION 15 06 00 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of supports and anchors required by this Section is indicated on Drawings and/or specified in other Division 15 Sections.

B. Types of supports and anchors include the following:
   1. Horizontal piping hangers and supports.
   2. Vertical piping clamps.
   3. Hanger rod attachments.
   4. Building attachments.
   5. Saddles and shields.
   6. Spring hangers and supports.
   7. Miscellaneous materials.
   8. Anchors.
   9. Equipment supports.

C. Supports and anchors furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 15 Sections.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Manufacturer's assembly type Shop Drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.
   2. Submit manufacturer's technical product data, including installation instructions, for each type of support and anchor.

B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 016000, operation and maintenance manuals for items included under this Section. Include maintenance data and parts list for each type of support and anchor.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:
   1. Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.

C. Manufacturers Standardization Society of the Valves and Fittings Industry, Inc. (MSS) Standard Compliance:

1. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
2. Select and apply pipe hangers and supports complying with MSS SP-69.
3. Fabricate and install pipe hangers and supports complying with MSS SP-89.
4. Terminology used in this Section is defined in MSS SP-90.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Hangers and Supports:
      a. B-Line Systems, Inc.
      b. Carpenter and Patterson, Inc.
      c. Corner & Lada Co., Inc.
      d. Elcen Metal Products Co.
      e. Fee & Mason Mfg. Co., Div. Figgie International.
      f. Anvil International.
   2. Saddles and Shields:
      a. Elcen Metal Products Co.
      b. Pipe Shields, Inc.

2.02 MATERIALS

A. Hangers, supports, anchors, fasteners and related hardware shall be 316 stainless steel or FRP construction in corrosive environments unless otherwise herein or on the drawings.

2.03 HORIZONTAL PIPING HANGERS AND SUPPORTS

A. Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper piping systems.
   1. Adjustable Steel Clevis Hangers: MSS Type 1.
   2. Pipe Hangers: MSS Type 5.
   3. Adjustable Band Hangers: MSS Type 9.
   4. Adjustable Roller Hangers: MSS Type 43.
   5. Pipe Roll Stands: MSS Type 44.
   6. Pipe Rolls and Plates: MSS Type 45.
   7. Adjustable Pipe Roll Stands: MSS Type 46.

2.04 VERTICAL PIPING CLAMPS

A. Except as otherwise indicated, provide factory fabricated vertical piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product

information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper piping systems.

1. Two-Bolt Riser Clamps: MSS Type 8.

2.05 HANGER-ROD ATTACHMENTS

A. Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper piping systems.

1. Steel Turnbuckles: MSS Type 13.
2. Malleable Iron Sockets: MSS Type 16.
3. Steel Weldless Eye Nuts: MSS Type 17.

2.06 BUILDING ATTACHMENTS

A. Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper piping systems.

1. Concrete Inserts: MSS Type 18. Inserts for concrete shall be galvanized steel, 316 stainless steel or galvanized malleable iron.
   Inserts shall be 316 stainless steel for all applications in wastewater treatment and water treatment process areas unless otherwise noted on drawings.
2. Top Beam Clamps: MSS Type 25.
3. Steel Brackets:
   a. Side Beam Brackets: MSS Type 34.

2.07 SADDLES AND SHIELDS

A. Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

C. Protection Shields: MSS Type 40, of length recommended by manufacturer to prevent crushing of insulation.

D. Thermal Hanger Shields: Constructed of 360-degree insert of high density, 100 psi, waterproof calcium silicate, encased in 360-degree sheet metal shield. Provide assembly of same thickness as adjoining insulation.

2.08 SPRING HANGERS AND SUPPORTS

A. Except as otherwise indicated, provide factory-fabricated spring hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit piping systems in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select spring hangers and supports to suit pipe size and loading.
   1. Restraint Control Devices: MSS Type 47.
   2. Spring Cushion Hangers: MSS Type 48.

2.09 MISCELLANEOUS MATERIALS

A. Metal Framing: Provide products complying with NEMA Standard ML 1.

B. Steel Plates, Shapes, and Bars: Provide products complying with ANSI/ASTM A 36.

C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1 part cement to 3 parts sand, by volume, with minimum amount of water required for placement and hydration.

D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.

E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted 2-section outer cylinder and base with 2-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any) and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the Work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Prior to installation of hangers, supports, anchors, and associated Work, Installer shall meet at Site with CONTRACTOR, Installer of each component of associated Work, inspection and testing agency representatives (if any), Installers of other work requiring coordination with Work of this Section, and ENGINEER for purpose of reviewing material selections and procedures to be followed in performing the Work in compliance with requirements specified.

3.03 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.04 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire-water piping independently of other piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper-plated or by other recognized industry methods.

E. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
   2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
   3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31.1 Pressure Piping Codes are not exceeded.

F. Insulated Piping: Comply with the following installation requirements.
   1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.1.
   2. Shields: Where low compressive strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields. For pipe 8-inch and over, install wood insulation saddles.
   3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.05 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31.1, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31.1 and with AWS standards.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe runs between expansion loops and bends. Make provisions for pre-set of anchors as required to accommodate both expansion and contraction of piping.

3.06 EQUIPMENT SUPPORTS

A. Furnish to CONTRACTOR, scaled layouts of all required bases, with dimensions of bases, and location to column centerlines. Furnish templates, anchor bolts, and accessories necessary for base construction.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

3.07 ADJUSTING AND CLEANING

A. Adjust hangers so as to distribute loads equally on attachments.

B. Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 15 10 50 - BASIC PLUMBING PIPING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Piping materials and installation methods common to more than one Section of Division 15 and includes pipe, fitting and joining materials, piping specialties, and basic piping installation instructions.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Sections 01 33 00 and 15 05 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Submit product data on the following items:
      a. Escutcheons.
      b. Dielectric Unions and Fittings.
      c. Mechanical Sleeve Seals.

B. Quality Control Submittals: Submit welders' certificates specified in Quality Assurance below.

1.03 QUALITY ASSURANCE

A. Welder's Qualifications: All welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
   1. Welding procedures and testing shall comply with ANSI Standard B31.1.0, Standard Code for Pressure Piping, Power Piping, and The American Welding Society, Welding Handbook.

B. Soldering and Brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Mechanical Refrigeration.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube except for concrete, corrugated metal, hub-and-spigot, and clay pipe. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes. Elevate above grade and enclose with durable, waterproof wrapping. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and specialties from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

D. Store pipe in a manner to prevent sagging and bending.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Pipe Escutcheons:
      a. Chicago Specialty Mfg. Co.
      b. Grinnell.
      c. Sanitary-Dash Mfg. Co.
   2. Dielectric Waterway Fittings:
      a. Epco Sales, Inc.
      b. Victaulic Company of America.
   3. Dielectric Unions:
      a. Eclipse, Inc.
      b. Perfection Corp.
      c. Watts Regulator Co.
   4. Mechanical Sleeve Seals:
      a. Thunderline Corp.
   5. Malleable Iron Unions:
      a. Crane, No. 1259.
      b. ITT-Grinnell, Figure 470.
   6. High-Impact Thermoplastic Wall Sleeve:
      a. Thunderline.
   7. Silicone Rubber Adhesive:
      a. General Electric.

2.02 PIPE MATERIALS

A. Refer to the individual piping system specification Sections in Division 40 for specifications on piping materials required from those listed from the following.

CPVC Pipe (64.8)

Normal Service: Maximum Pressure: 100 psig
Maximum Temperature: 180 degrees F

	Size	Specifications
PIPE	1/2-inch through 8-inch	rigid chlorinated polyvinyl chloride (CPVC) compound, Type IV Grade I, with a Cell Classification of 23447 as defined in ASTM D1784
FLANGES	1/2-inch through 8-inch	CPVC, 150-pound, Schedule 80, threaded type. 316 Stainless steel hardware.
GASKETS	1/2-inch through 8-inch	1/8-inch Viton, full-face type.
FITTINGS - THREADED	1/2-inch through 8-inch	CPVC, Schedule 80 ,THREADED, ASTM F 437
LISTING		approved by NSF for use with potable water

2.03 JOINING MATERIALS

A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.

C. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.04 PIPING SPECIALTIES

A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

B. Unions: Malleable-iron, Class 150 for low-pressure service and Class 250 for high-pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

C. Dielectric Unions: Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion. Insulated and gasketed, galvanized, malleable iron unions as manufactured by Crane No. 1259, ITT - Grinnell Figure 470, or equal.

D. Dielectric Waterway Fittings: electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.

E. Sleeves: Unless otherwise shown on Drawings, at all points where pipes must pass through walls, floors or roofs of structures, CONTRACTOR shall furnish and install suitable sleeves or wall castings meeting the requirements of Section 016000.
   1. In general, the wall sleeve or casting shall be of the same material as the pipe, or standard weight steel pipe thimbles of at least one size larger than the pipe itself shall be installed. Iron pipe wall castings, wall pipe, transition sleeves and solid sleeves shall meet the requirements or AWWA Specifications C100 and shall be of the lightest class conforming to the pressure rating of the pipelines which they connect, but in no case shall be lighter than Class B. All sleeves shall be shop-coated with universal primer 2 mils minimum thickness.
   2. A high-impact thermoplastic wall sleeve as manufactured by Thunderline, may be used for low and standard temperature service.

F. Sleeve Seals: Unless otherwise shown or permitted, the space between the pipe and the sleeve shall be caulked at the inside and outside wall faces on walls exposed to earth or

water/sewage, at one face of the other walls, and at the top surface of floors and slabs. The space shall be caulked with lead and oakum as specified under Bell and Spigot Lead with an RTV-silicone rubber adhesive as manufactured by General Electric, or sealed with a rubber link seal. Rubber link seal shall be identical rubber links interconnected with bolts and elongated nuts and washers. The sealing element shall be made of synthetic rubber material especially compounded to resist aging, ozone, sunlight, and chemical action. Bolts and metal parts shall be made of galvanized or cadmium-plated steel to resist corrosion. Rubber link seal joints shall be submitted to ENGINEER for approval.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATION

A. Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

B. Piping shall be exposed, unless indicated otherwise.

C. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on Drawings.

E. Install piping far enough from slabs, beams, joists, columns, walls, and other permanent elements of the building to permit access for painting. Provide space to permit insulation applications, with 3-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

G. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.

H. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.

I. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained. Refer to Division 7 for special sealers and materials.

J. Buried Plastic Pipe: Install a yellow insulated copper tracer wire or other approved conductor adjacent to underground nonmetallic piping. The tracer wire shall terminate above ground at each end of the nonmetallic piping. The tracer wire size shall not be less than 18 AWG and insulation type shall be suitable for direct burial.

3.03 FITTINGS AND SPECIALTIES

A. Use fittings for all changes in direction and all branch connections.

B. Remake leaking joints using new materials.

C. Install unions adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2-inch and smaller connections, and elsewhere as indicated.

D. Install flanges in piping 2-1/2-inch and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.

3.04 FIELD QUALITY CONTROL

A. Testing: Refer to individual piping system Specification Sections.

END OF SECTION

SECTION 15 11 50 - PLUMBING VALVES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: General duty valves common to most mechanical piping systems.

B. Refer to system specifications for valves to be used for a given service. Then use the following tables for a complete description of each type of valve.

C. Special purpose valves are specified in individual piping system specifications.

1.02 DEFINITIONS

A. The following abbreviations are used for manufacturers' names listed in this Section:
   1. C - Crane
   2. J - Jenkins
   3. L - Lunkenheimer
   4. P - Powell
   5. S - Stockham

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with requirements of Section 013300, Shop Drawings covering the items included under this Section.
   1. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the provisions of the following:
   1. ASME B31.9, "Building Services Piping."
   2. ASME B31.1, "Power Piping."

B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves for shipping as follows:
   1. Ensure valves are dry and internally protected against rusting and corrosion.
   2. Protect valve ends against damage to threads, flange faces, and weld ends preps.
   3. Set valves in best position for handling. Set globe and gate valves closed to prevent rattling; set ball and plug valves open to minimize exposure of functional surfaces; set butterfly valves closed or slightly open; and block swing check valves in either closed or open position.

B. Storage: Use the following precautions during storage:
   1. Do not remove valve end protectors, unless necessary for inspection then reinstall for storage.
   2. Protect valves from weather; store valves indoors. Maintain valve temperature higher than the ambient dewpoint temperature. If outdoor storage is necessary, support valves off the ground or on pavement in watertight enclosures.

C. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work are listed in the valve Schedules.

2.02 VALVE FEATURES

A. Valve Design: Rising stem or rising outside screw and yoke stems.
   1. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

C. Sizes: Same sizes as upstream pipe, unless otherwise indicated.

D. Operators: Provide the following special operator features:
   1. Handwheels, fastened to valve stem, for valves other than quarter turn.
   2. Lever handles, on quarter-turn valves 6-inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
   3. Chainwheel operators, for valves 2-1/2-inch and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
   4. Gear driven operators, on quarter-turn valves 8-inch and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. End Connections: As indicated in the valve specifications.
   1. Threads: Comply with ANSI B1.20.1.
   2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
   3. Solder-Joint: Comply with ANSI B16.18. Where soldered end connections are used, use solder having a melting point below 840 degrees F for gate, globe, and check valves; below 421 degrees F for ball valves.

DIAPHRAGM AND PINCH VALVES (117)

Subsection Number	Valve Size	Specifications
117.1	All	Grinnell diaphragm valve, conventional weir, type 316 stainless steel body, iron bonnet, butt weld or flanged ends, with TFE diaphragm and EPDM backing cushion, Grinnell R-2.
117.2	All	Grinnell diaphragm valve, conventional weir, type 316 stainless steel body, type 316 stainless steel bonnet, butt weld or flanged ends, with TFE diaphragm and EPDM backing cushion, Grinnell R-2. Exterior bolts and nuts to be stainless steel
117.3	All	PVC diaphragm valve, union ends, PTFE diaphragm with O-rings. Hayward, GF

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion.

B. Examine mating flange faces for conditions which might cause leakage. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

C. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

D. Replace defective valves with new valves.

3.02 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
   1. Copper Tube Size, 2-Inch and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
   2. Steel Pipes Sizes, 2-Inch and Smaller: threaded or grooved end.
   3. Steel Pipe Sizes 2-1/2-Inch and Larger: grooved end or flanged.

3.03 VALVE INSTALLATIONS

A. General Application: Ball valves in sizes 2-inch and smaller, and butterfly valves in sizes 2-1/2-inch and larger, are to be used unless gate or globe valves are specifically designated on Drawings. Refer to piping system specification sections for specific valve applications and arrangements.

B. Locate valves for easy access and provide separate support.

C. Install valves and unions for each fixture and item of equipment to allow equipment removal without system shut down. Unions are not required on flanged devices.

D. Install three-valve bypass around each pressure reducing valve using throttling-type valves.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:
   1. Swing Check Valves: Horizontal position with hinge pin level.
   2. Wafer Check Valves: Horizontal or vertical position, between flanges.
   3. Lift Check: With stem upright and plumb.

3.04 FIELD QUALITY CONTROL

A. After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.05 ADJUSTING AND CLEANING

A. Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: General administrative, procedural requirements, and installation methods for electrical installations specified in Division 26.

B. The Drawings are schematic and are not intended to show every detail of construction.
   1. In general, conduits/raceways, transitions and offsets shown on Drawings indicate approximate locations in plan and elevation where the systems are intended to be run.
   2. CONTRACTOR shall fully coordinate electrical Work with other trades to avoid interferences.
   3. In the event of interferences, CONTRACTOR shall request clarification from ENGINEER in writing.

C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Sections, apply to Work of this Section.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with requirements of Section 01 33 00, Shop Drawings covering the items included under this Section of Work. Shop Drawing submittals shall include:
   1. Submit product data covering the items included under this Section of Work.

B. Conforming to Construction Drawings: Submit a complete set of Drawings showing the locations of the piping, ductwork, etc., as actually installed. Such Drawings shall be submitted to ENGINEER in electronic format (PDF), one full size print, and one 11x17 print.

C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01 60 00, operation and maintenance manuals for items included under this Section. Include following information for equipment items:
   1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.

1.03 RECORD DOCUMENTS

A. Prepare Record Documents in accordance with requirements in Section 01 77 00. In addition, CONTRACTOR shall submit, prior to final payment, Drawings conforming to construction records of systems it has installed. Vendor drawings shall be sized as manufacturers' standard.

B. Provide typewritten data sheets on motor control circuits with following information on each branch feeder: Load name, horsepower or KVA (transformer), fuse size, starter size, service factor of motor, motor nameplate currents, power factor correction capacitor size (if used), and thermal overload part number.

1.04 QUALITY ASSURANCE

A. National Electrical Code: Comply with NFPA 70, National Electrical Code.

B. UL Compliance and Labeling: Use products and components labeled by UL.

1.05 PERMITS, INSPECTIONS, AND LICENSES

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification. Equipment shall be packaged to prevent damage during shipment, storage, and handling. Do not install damaged units; replace, and remove damaged units from Site.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL ELECTRICAL INSTALLATION

A. Provide electrical materials and equipment enclosures appropriate for areas in which they are installed. Each area will be designated on Drawings with a type of construction such as NEMA 4, 4X, 7 or 9 if it is other than NEMA 12. An area designated by a name and elevation includes space bounded by floor, ceiling, and enclosing walls.
   1. Exception: Provide manufacturer's standard construction for indoor or outdoor application where equipment is not manufactured to NEMA specifications (e.g., switchgear, transformers, high voltage capacitors, bus duct, and light fixtures; materials and equipment used in finished areas such as offices, laboratories, etc.).

B. Provide nonmetallic electrical materials and equipment enclosures in NEMA 4X areas; watertight NEMA 4 and equipment enclosures for outdoor applications and indoor

applications below grade; explosion-proof NEC Class I, Division 1, Group D equipment for NEMA 7 areas; explosion-proof NEC Class II, Division 2, Group F equipment for NEMA 9 areas.

C. Coordinate with power company high voltage and/or low voltage metering requirements. Furnish, install, and connect metering equipment not furnished, installed or connected by power company.

D. Provide chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

E. Supporting devices and sleeves shall be set in poured-in-place concrete and other structural components as they are constructed.

F. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom possible. Locate light fixtures at approximately 8 feet above floor and where fixtures may be readily serviced.

G. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

H. Install systems, materials, and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by Drawings recognizing that portions of Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to ENGINEER.

I. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components where installed exposed in finished spaces.

J. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations.

K. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Section 08310.

L. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.02 RACEWAY INSTALLATION

A. Outdoors, use the following materials:
   1. Exposed Conduit: Rigid/Intermediate metal conduit and fittings.
   2. Conduit Used to Connect to Vibrating Equipment including transformers and hydraulic, pneumatic or electric solenoid or motor-driven equipment: Liquidtight flexible metal conduit.

B. Minimum size conduit shall be 3/4 inch unless shown otherwise.

C. Instrument Signal Conduit Requirements: Shielded signal wires for 4-20 mA type instruments or thermocouple wires assigned to the same control panel may be run in the same conduit. Shielded instrument signal wires, thermocouple wires, and shielded 2-wire intercom wires may be run in the same conduit. No other wires will be permitted in an instrument signal/2-wire intercom conduit. Conduit shall be RMC or IMC.

D. Conduit Thread Paint: Make threaded conduit joints watertight by coating threaded portions with a spray-on or brush-on zinc-bearing paint. Provide paint containing 90 percent minimum by weight of metallic zinc powder in the dried film. Clean field-cut threads of oil using the recommended solvent prior to coating threads.

E. Install expansion fittings in all exposed rigid nonmetallic conduit runs of 20 feet or more.

F. Install expansion/deflection fittings where conduit passes a building expansion joint or where conduits are attached to two structures joined by a concrete expansion joint.

G. Exposed Construction: Install conduit exposed inside buildings except for areas with finished walls (e.g., offices, laboratories, lavatories, locker rooms, etc.) unless otherwise indicated.

H. Exposed Raceways: Install parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical. Make bends and offsets so the inside diameter is not effectively reduced. Keep the legs of a bend in the same plane and the straight legs of offsets parallel. Conduits shall slope away from loads to keep moisture from entering the load. Run parallel or banked raceways together. Make bends in parallel or banked runs from the same centerline so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run, such as from wall to ceiling and that the raceways be of the same size. In other cases, provide field bends for parallel raceways. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

I. Space raceways, fittings, and boxes 0.25 inch from mounting surface in NEMA 4 and NEMA 7 areas. Spacers shall be one-piece construction of stainless steel, galvanized steel, PVC, ABS, or other noncorrosive material.

J. Sleeves: Install in concrete floor slabs except where conduit passes through a housekeeping pad. Install in exterior walls below grade.

K. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid metal conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs with floor.

L. Flexible Connections: Use short length (maximum 6 feet for lighting fixtures; maximum 3 feet for all other equipment) of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement, and all motors. Use liquidtight flexible conduit in wet locations and rated flexible connections for hazardous locations. Install separate ground conductor across flexible connections.

M. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the

raceway system. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

N. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate metal conduit, use threaded rigid metal conduit fittings. For PVC externally coated rigid metal conduit, use only factory-coated fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.

O. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL listed sealing compound. For concealed raceways, install each fitting in a flush metal box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
   1. Where conduits enter or leave hazardous locations.
   2. Where conduits enter or leave NEMA 4X areas.
   3. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
   4. Where required by the NEC.

P. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring. Provide knockout closures to cap unused knockout holes where blanks have been removed.

Q. Avoid installing boxes back-to-back in walls. Provide not less than 6-inch (150 mm) separation.

R. Fasten electrical boxes firmly and rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete masonry.

S. Provide fire-retardant barriers in all pull and junction boxes containing circuits that are otherwise continuously separated in conduit. Securely fasten these barriers within box. Size barriers so that space between barrier and box wall does not exceed 0.125 inch anywhere around the perimeter of barrier.

T. Support exposed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.

U. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from building structure.

V. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box and tighten the chase nipples so no threads are exposed.

W. Complete installation of electrical raceways before starting installation of conductors within raceways and prevent foreign matter from entering raceways by using temporary closure protection. Cap spare conduit. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

X. Install pull wires in empty raceways: Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-pound tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

3.03 WIRE AND CABLE INSTALLATION

A. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant where necessary.

B. Keep branch circuit conductor splices to minimum. Splice feeders only where indicated. Use a standard kit. No splices are allowed for instrument and telephone cables except at indicated splice points.

C. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors which are compatible with conductor material and are UL listed as pressure type connectors.

D. Provide adequate length of conductors within electrical enclosures and train conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at terminal.

E. Terminate power conductors at equipment using pressure-type terminals specifically designed for type of terminations to be made. Terminate no more than 2 conductors No. 8 AWG and smaller within the same pressure-type terminal. These 2 conductors shall be no more than 4 wire gauge sizes apart. Terminate no more than 1 conductor larger than No. 8 AWG within any pressure-type terminal.
   1. Exception: Power factor correction capacitor conductors may be terminated at the motor disconnect switch load terminals.

F. Seal wire and cable ends until ready to splice or terminate.

3.04 CUTTING AND PATCHING

A. Perform cutting and patching in accordance with requirements in Section 01 73 00. In addition, the following requirements apply.
   1. Perform cutting, fitting, and patching of electrical equipment and materials required to uncover Work to provide for installation of ill-timed Work, remove and replace Work that is either defective or does not conform to requirements of Drawings.
   2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by new Work. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and

maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.

3. Patch existing finished surfaces and building components using new materials matching existing materials.

3.05 EQUIPMENT CHECKOUT AND TESTING

A. In addition to testing recommended by equipment or material supplier and called for in equipment or material specification, perform the following.

B. Check-out Procedures. In general, check-out procedures (as listed below) which are applicable for a particular item of equipment shall be performed:

1. Vacuum interior of cubicles and remove foreign material.
2. Wipe clean with a lint-free cloth insulators, bushings, bus supports, etc.
3. Check and adjust time delay, under-voltage devices, phase relay, over-current relays, etc., as required by coordination study or ENGINEER.
4. Fill motor bearings requiring oil.
5. Check and change, as required, thermal overload heater elements to correspond with motor full-load current and service factors of installed motor.
6. Check direction of rotation of motors and reverse connections if necessary. Check rotation with motor mechanically uncoupled where reverse rotation could damage equipment.
7. Equipment with two or more sources of power connected by tie breakers, transfer switches, or generator receptacles shall be checked for rotation from each possible combination of power sources. Power sources must have the same phase sequence for each source throughout entire facility.
8. Check exposed bolted power connections for tightness.
9. Check operation of breakers, contactors, etc., and control and safety interlocks.
10. Check tightness of bolted structural connections.
11. Check leveling and alignment of enclosures.
12. Check operating parts and linkages for lubrication, freedom from binding, vibration, etc.
13. Check tightness and correctness of control connections at terminal blocks, relays, meters, switches, etc.
14. Clean auxiliary contacts and exposed relay contacts after vacuuming.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Low-Voltage Wire and Cable.
   2. Instrument Cable.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Include Shop Drawings of wires, cables, connectors, splice kits, and termination assemblies.

B. Reports of field tests prepared as noted in Section 01 60 00.

1.03 QUALITY ASSURANCE

A. UL Compliance: Provide components which are listed and labeled by UL. For cables intended for use in air handling space comply with applicable requirements of UL Standard 710, "Test Method for Fire and Smoke characteristics of cables used in Air Handling Spaces."

B. NEMA/ICEA Compliance: Provide components which comply with following standards:
   1. NEMA WC 70-1999/ICEA S-95-658-1999, Nonshielded Power Cables Rated 2,000 Volts or Less for the Distribution of Electrical Energy.

C. IEEE Compliance: Provide components which comply with the following standard.
   1. Standard 82, Test procedures for Impulse Voltage Tests on Insulated Conductors.

D. Labeling: Handwritten labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers or some type of location identifier, in sequential order, for all workstations or devices attached. Each Network cable segment shall be labeled at each end with its respective identifier.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Low-Voltage Wire and Cable:
      a. American Insulated Wire Corp.
      b. General Cable.
      c. The Okonite Co.

d. Southwire Co.

2. Connectors for Low-Voltage Wires and Cable Conductors:
   a. AMP.
   b. O-Z/Gedney Co.
   c. Square D Company.
   d. 3M Company.
3. Instrument Cable:
   a. Belden (Trade Nos. 1120A and 1118A).

2.02 LOW-VOLTAGE WIRES AND CABLES

A. Conductors: Provide stranded conductors conforming to ASTM Standards for concentric stranding, Class B. Construction of wire and cable shall be single conductor (1/c) unless multiconductor cable is shown by notation in form (x/c) where x indicates the number of separate insulated conductors per cable.

B. Conductor Material: Copper. Minimum size power wire shall be No. 12 AWG.

C. Insulation: Provide XHHW insulation for power conductors used in single- and 3-phase circuits.
   1. Provide XHHW insulation for grounding conductors installed in raceways.
   2. Provide THHN/THWN insulation for control conductors.

2.03 CONNECTORS FOR LOW-VOLTAGE WIRES AND CABLES

A. Provide UL listed factory fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types, and classes for applications and services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

2.04 INSTRUMENT CABLE

A. Instrument Cable: 600 volt minimum insulated shielded cable with two or more twisted No. 16 or No. 18AWG stranded copper conductors; PVC, nylon, or polyethylene outer jacket; and 100 percent foil shielding.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Prior to energizing, check installed 480 volt, 3-phase power circuits and higher wires and cables with a 1,000-volt megohm meter to determine insulation resistance levels to assure requirements are fulfilled. Minimum acceptable megohm meter reading is 100 megohms held at a constant value for 15 seconds. A certified copy of megohm meter tests shall be submitted to ENGINEER. Test reports shall include ambient temperature and humidity at time of testing. Notify ENGINEER 48 hours prior to test with schedule.

B. Reports (non-LAN cable): Testing organization shall maintain a written record of observations and tests, report defective materials and workmanship, and retest corrected defective items. Testing organization shall submit written reports to ENGINEER.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Product data for each type of product specified.

1.03 QUALITY ASSURANCE

A. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Slotted Metal Angle and U-Channel Systems:
      a. Allied Tube & Conduit.
      b. American Electric.
      c. B -Line Systems, Inc.
      d. Cinch Clamp Co., Inc.
      e. GS Metals Corp.
      f. Haydon Corp.
      g. Kin-Line, Inc.
      h. Unistrut Diversified Products.
   2. Conduit Sealing Bushings:
      a. Bridgeport Fittings, Inc.
      b. Cooper Industries, Inc.
      c. Elliott Electric Mfg. Corp.
      d. GS Metals Corp.
      e. Killark Electric Mfg. Co.
      f. Madison Equipment Co.
      g. L.E. Mason Co.
      h. O-Z/Gedney.
      i. Producto Electric Corp.
      j. Raco, Inc.
      k. Red Seal Electric Corp.
      l. Spring City Electrical Mfg. Co.
      m. Thomas & Betts Corp.

2.02 COATINGS

A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors, in NEMA 4 areas, or embedded in concrete shall be hot-dip galvanized.

2.03 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

B. Fasteners. Types, materials, and construction features as follows:
   1. Expansion Anchors: Carbon steel wedge or sleeve type.
   2. Toggle Bolts: Steel springhead type.
   3. Hanger Rods: 0.375-inch diameter minimum, steel.

C. Conduit Sealing Bushings: Factory fabricated, watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

D. Cable Supports for Vertical Conduit: Factory fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable iron casting with hot-dip galvanized finish.

E. U-Channel Systems: 12 gauge or 0.105-inch-thick steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacturer.

2.04 FABRICATED SUPPORTING DEVICES

A. Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.

B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

C. Pipe Sleeves: Provide a waterstop on pipe sleeves. Provide pipe sleeves of 2 standard sizes larger than conduit/pipe passing through it and of one of the following:
   1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gauge metal for sleeve diameter noted:
      a. 3-inch and smaller: 20-gauge.
      b. 4-inch to 6-inch: 16-gauge.
      c. Over 6-inch: 14-gauge.
   2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
   3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Raceways for electrical wiring. Types of raceways in this Section include the following:
   1. Intermediate metal conduit.
   2. Liquidtight flexible conduit.
   3. Rigid metal conduit.
   4. Rigid nonmetallic conduit.
   5. Conduit bodies.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Product data for the following products:
      a. Conduit.
      b. Conduit bodies.

1.03 QUALITY ASSURANCE

A. Codes and Standards:
   1. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
   2. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in Work include:
   1. Conduit:
      a. Allied Tube.
      b. Carlon.
      c. General Electric Co.
      d. Johns Manville.
      e. Occidental Coatings.
      f. Orangeburg.
      g. Perma-Cote Industries.
      h. Republic Steel.
      i. Robroy Industries.
      j. Steelduct Co.
      k. Triangle Conduit.

l. Wheatland Tube.
m. Youngstown Sheet and Tube.

2. Liquidtight Conduit:
   a. Anamet, Inc.
   b. Carlon.
   c. Electric-Flex.
   d. Thomas and Betts.
3. Conduit Bodies:
   a. Adalet-PLM.
   b. American Electric.
   c. Appleton Electric Co.
   d. Carlon.
   e. Crouse-Hinds Division, Cooper Industries, Inc.
   f. Delta Industrial Products.
   g. Killark Electric Mfg. Co.
   h. Kraloy Products Co.
   i. O-Z/Gedney Co.
   j. Perma-Cote Industries.
   k. Robroy Industries.
   l. Spring City Electrical Mfg. Co.
4. Conduit Thread Paint:
   a. CRC Chemicals, USA.
   b. Sherwin Williams.
   c. ZRC Chemical Products Co.

2.02 METAL CONDUIT AND TUBING

A. Rigid Metal Conduit: ANSI C 80.1, hot-dip galvanized.

B. Intermediate Metal Conduit: UL 1242, hot-dip galvanized.

C. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

2.03 NONMETALLIC CONDUIT AND DUCTS

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 40 or 80 PVC.

B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.04 CONDUIT BODIES

A. Provide matching gasketed covers secured with corrosion-resistant screws. Use cast covers in NEMA 4 areas and stamped steel covers in NEMA 1 and 12 areas. Use nonmetallic covers in NEMA 4X areas and threaded, ground joint covers in NEMA 7 and NEMA 9 areas.

B. Metallic Conduit and Tubing: Use metallic conduit bodies as follows:
   1. Rigid Metal Conduit: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and threaded hubs.

2. Intermediate Metal Conduit: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and threaded hubs.
3. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.
4. NEMA 7 and NEMA 9 Areas: Use materials conforming to UL standards for the area.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including, but not limited to, the following:
   1. Identification labeling for cables and conductors.
   2. Operational instruction signs.
   3. Warning and caution signs.
   4. Equipment labels and signs.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
   1. Product Data for each type of product specified.

PART 2 - PRODUCTS

2.01 ELECTRICAL IDENTIFICATION PRODUCTS

A. Colored Adhesive Marking Tape for Wires and Cables: Self-adhesive, vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

B. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with pre-printed numbers and letter.

C. Engraved, Plastic Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16 inch minimum thick for signs up to 20 square inches or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in black letters on white face and punched for mechanical fasteners.

D. Baked Enamel Warning and Caution Signs for Interior Use: Pre-printed aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

E. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, pre-printed cellulose acetate butyrate signs with 20-gauge galvanized steel backing, with colors, legend, and size appropriate to location. Provide 1/4-inch grommets in corners for mounting.

F. Fasteners for Plastic Laminated and Metal Signs: Self-tapping stainless steel screws or Number 10/32 stainless steel machine screws with nuts and flat and lock washers.

G. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18 inch minimum width, 50-pound minimum tensile strength, and suitable for a temperature

range from minus 50 to 350 degrees F. Provide ties in specified colors when used for color coding.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification Work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by Code.

B. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the Project secondary electrical .

C. Wiring Standards:
   1. 480/277 Volt, 3-Phase Power:
      a. Brown.
      b. Orange.
      c. Yellow.
      d. Grey Neutral.
   2. 208 Volt, 3-Phase Power:
      a. Black.
      b. Red.
      c. Blue.
   3. 240/120 Volt, 1-Phase Power:
      a. Black.
      b. Red.
      c. White Neutral.
   4. Motor Leads, Control Cabinet/MCC:
      a. Black, numbered L1-T1, etc.
   5. Control Wiring:
      a. Red - Control circuit wiring that is de-energized when the main disconnect is opened.
      b. Yellow - Control circuit wiring that remains energized when the main disconnect is opened.
      c. Blue - DC.
      d. Green - Ground.

D. Use conductors with color factory applied entire length of conductors except as follows:
   1. The following field applied color coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
      a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last 2 laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
      b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply 3 ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

E. Power Circuit Identification: Securely fasten identifying metal tags of aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-pound test monofilament line or one-piece self-locking nylon cable ties.

F. Install wire/cable designation tape markers at termination points, splices, or junctions in each circuit. Circuit designations shall be as indicated on Drawings.

END OF SECTION

SECTION 40 24 14 - LIQUID SODIUM HYPOCHLORITIE PIPING SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Chemical system piping, fittings, and specialties.

1.02 DEFINITIONS

A. Chemical Systems: Chemical systems shall include those listed below and as detailed on Drawings:
   1. Sodium Hypochlorite.

B. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Submittals covering the items included under this Section.
   1. Product data for each piping specialty and valve specified.

B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01 78 10, operation and maintenance data for items included under this Section.

C. Test and Inspection Report: Submit a written report to ENGINEER documenting testing and/or inspection results.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the provisions of the following:
   1. ASME B 31.9 "Building Services Piping" for materials, products, and installation.
   2. 2015 Michigan Plumbing Code.

1.05 SEQUENCING AND SCHEDULING

A. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.

B. Coordinate the installation of pipe sleeves for foundation wall penetrations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Strainers:
      a. Hayward.
      b. Chemtrol.

2.02 MATERIALS

A. Unless otherwise noted, materials shall conform to the following specifications. Refer to Section 15 10 50 for piping and Section 15 11 50 for valves listed below.

Item	Spec. No.	Remarks
Piping		
Exterior (exposed)	64.8	CPVC
Check Valves	110.7	
Diaphragm Valves	117.3	

2.03 SPECIALTIES

A. Strainers: CPVC, socket joint, Y-type, 125-lb. with CPVC screen having 1/32-inch perforations. Open area of the strainer shall be twice that of piping.

2.04 ACCESSORIES

A. Motor:
   1. Electric Motor Open-Close Service: Electric motor operators actuators for open-shut service shall meet the requirements of ANSI/AWWA C542, except as herein specified.
      a. Controls shall be "integrally mounted" as part of in the valve actuator body.
      b. The valve manufacturer shall provide the required seating, unseating dynamic torque requirements and any other trust or static loading information necessary to properly size the electric motor actuator.
      c. Electrical equipment shall be mounted in a NEMA 4X enclosure.
      d. Actuator materials of construction shall be selected by the manufacturer to be compatible with the environmental conditions that will be present at the valves installed location. Actuators installed in water treatment plants or other potable water applications shall have materials that comply with the Safe Water Drinking Act requirements including food grade lubricants.
      e. Motorized valve operators actuators shall include the motor, reversing starter with remote-off-local switch, associated gearing, limit switches, torque switches, auxiliary handwheel for manual operation, a valve mounted mechanical dial valve position indicator, Open-Close-Stop position switch or push-buttons, and accessories as listed on Valve Schedule.
      f. The motor starters shall be the solid state reversing contactor type complete with gang-operated switch, 2 mechanically interlocking solid state reversing contactors, 120 volt control power transformer when motor voltage is other than 120 volt,

thermal overload protection for each phase, and associated wiring. Operating voltage shall be 120 Volts unless indicated otherwise as shown on Valve Schedule.

g. Limit switches shall be provided at the extreme open and close position of the operator travel.

h. A local mechanical dial position indicator shall be provided on the valve operator to indicate the position of the valve.

i. Motors shall be standard-duty rated, totally enclosed nonventilated, Class B insulated, 60 hertz and with voltage and phase as noted on Valve Schedule, specially designed for valve service. The design shall combine low inertia with a high starting and stalling torque.

j. Unless indicated otherwise on Valve Schedule the actuator motors shall be sized to operate stroke valves from full open to full closed and vice versa in one to three minutes cycles under the full specified unbalance operating head stated in the Specifications and at a frequency not to exceed 60 cycles per hour. The motor winding temperature rise shall be NEMA standard for Class B insulation at the rated service factor load.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify all dimensions by field measurements. Verify that all piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

B. Examine rough-in requirements for equipment to verify actual locations of piping connections prior to installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PIPING INSTALLATION

A. Install piping with 1/32-inch per foot (1/4 percent) downward slope towards drain point.

3.03 HANGERS AND SUPPORTS

A. Hanger, supports, and anchor devices are specified in Section 15 06 00. Conform to the table below for maximum spacing of supports.

B. Install supports or hangers with the following rod sizes and maximum spacing:

Nom. Pipe Size	Max. Span-Feet	Min. Rod Size-Inches
1/2-inch	4	3/8-inch
3/4-inch	4	3/8-inch
1-inch	4	3/8-inch
1-1/2-inch	5	3/8-inch
2-inch	5	3/8-inch
3-inch	7	1/2-inch
4-inch	8	5/8-inch
6-inch	8	3/4-inch
8-inch	9	7/8-inch
10-inch	10	7/8-inch
12-inch	11	7/8-inch

3.04 FIELD QUALITY CONTROL

A. Inspect piping as follows:
   1. Do not enclose, cover, or put into operation the piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
      a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures or equipment.
      b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
   3. Reinspection: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
   4. Prepare inspection reports, signed by the plumbing official.

B. Test piping as follows:
   1. Test for leaks and defects of all new systems and parts of existing systems, which have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
   2. Leave uncovered and unconcealed all new, altered, extended, or replaced piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
   3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for a period of four hours. Leaks and loss in test pressure constitute defects which must be repaired.
   4. Repair all leaks and defects using new materials, and retest system or portion thereof until satisfactory results are obtained.
   5. Prepare reports for all tests and required corrective action.

3.05 COMMISSIONING

A. Fill the system.

B. Before operating the system perform these steps:
   1. Open valves to full open position. Close drain valves.
   2. Remove and clean strainers.

END OF SECTION

SECTION 43 41 45 - FIBERGLASS REINFORCED PLASTIC TANKS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Labor, materials, construction equipment, and miscellaneous services necessary for the construction and installation of chemical storage tanks and their accessories as shown on Drawings and specified below.

B. Chemical storage tanks furnished under this Section shall include the following:
   1. Fiberglass-Reinforced Plastic (FRP) Tanks, Sodium Hypochlorite Service.

1.02 REFERENCES

A. Reference Standards:
   1. ANSI Class 150.
   2. ASME Code.
   3. ASTM D 3299.
   4. ASTM D 3486.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section, including.
   1. Manufacturer's installation instructions. Installation instructions shall include requirements for tank mounting surface preparation to prevent failure after tank is placed in service. Instructions shall also include manufacturer’s recommendations covering proper handling, lifting, setting, anchoring, and other requirements necessary for proper tank installation and use.
   2. Corrosion charts indicating compatibility of chemical with tank resins supplied.
   3. Certification of NSF 61 compliance for materials in contact with liquid sodium hypochlorite to be used for treatment of drinking water.

B. Test and Inspection Report: Submit in accordance with Section 01 81 00, a written report to ENGINEER documenting testing and inspection results.

C. Operation and Maintenance Manuals: Submit in accordance with Section 01 78 10, operation and maintenance manuals for accessory items included under this Section.

D. Warranties: Submit in accordance with Section 01 78 00, warranties covering the items included under this Section.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of equipment, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.

B. Factory Testing: Tanks shall be pneumatically tested in accordance with ASTM D3299 at the manufacturer's fabrication facility. Submit certified test report prior to shipping.

1.05 WARRANTY

A. Special Warranty: Provide, in accordance with Section 01 78 00, warranties covering the items included under this Section of the Contract. The special warranty shall repair or replace defective components that fail in materials or workmanship within special warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
   1. Fiberglass-Reinforced Plastic Tanks; no "or-equal" or substitutions will be permitted:
      a. Plas-Tanks.
      b. Belding Tank Technologies, Inc.
      c. Tankinetics.
   2. Fixed Ladder Fall Arrest Safety System
      a. Miller Vi-go
      b. Miller GlideLoc

2.02 MANUFACTURED UNITS

A. Fiberglass-Reinforced Plastic (FRP) Tanks, Sodium Hypochlorite Service:
   1. Tanks shall be fiberglass-reinforced plastic (FRP) of a brominated vinylester resin system, Hetron 992 FR, or equal, suitable for 15 percent Sodium Hypochlorite solution. The tanks shall be manufactured to meet ASTM Standard D 3299 and capable of withstanding filling by trucks using compressed air to displace their load. Tank(s) shall have the capacity and accessories as shown on Drawings and noted in specifications.
   2. Manufacturer must be able to recommend tanks for intended service from corrosion test data developed by manufacturer, or from experience with a specific environment by a resin manufacturer or a customer's in-service experience.
   3. Tanks shall provide complete internal and external corrosion resistance, and be resistant to spillage and weather conditions.
   4. For vertical tank installations:
      a. Tank bottom shall be integrally molded with the sidewall, all in one piece and at the same time. There shall be no structural sidewall seam within 20 feet of the bottom elevation. Bottom head knuckle radius shall be a minimum of 2 inches, and shall be reinforced to a thickness equal to the combined thickness of the bottom head and the lowest course of filament winding, over a minimum height of 12 inches up the sidewall of the tank.
      b. Tank tops shall be ASME dome type with top head knuckle radius equal to 6 percent of the dome radius. Tank heads shall withstand top loads of 250 pounds in a 16-square-inch area in addition to a 20-pound-per-square-foot loading.
      c. Tanks shall be able to withstand wind loads of 100 miles per hour, empty or full, when properly anchored. Tanks shall be adequately resistant to impact loads in shipping, handling, installation, and use.

5. Tank wall shall be fabricated by chopped strand spray-up and helical filament winding utilizing a programmed carriage dispenser to apply glass and resin to a mechanically controlled, rotating mandrel. Resin and glass should be measured to ascertain proper rate and volume of materials applied. In addition to the requirements of ASTM Standard D 3299, the wall laminate shall be constructed as follows:
    a. Interior Surface Layer: Made up of one-ply “C” glass and one ply synthetic surface veil, saturated with brominated vinylester resin, and cured with a BPO/DMA cure system containing a minimum 55 percent active benzoyl peroxide. The surface shall be 30 mils thick and shall contain a minimum 80 percent resin by weight.
    b. Interior Layer: Mechanically applied chopped strand “E” glass fiber reinforcement, saturated with brominated vinylester resin, and cured with a BPO/DMA cure system containing a minimum 55 percent active benzoyl peroxide. The surface shall be 10 mils thick and shall contain a minimum 65 percent resin by weight.
    c. Structural Layer: Filament winding of continuous strand "E" glass fibers, saturated with brominated vinylester resin, and cured with a BPO/DMA cure system containing a minimum 55 percent active benzoyl peroxide. The thickness shall be based upon the tank size, design temperature and specific gravity. No allowance for the interior surface and interior layer thicknesses shall be permitted for determination of the structural layer thickness. Minimum glass content shall be 60 percent by weight.
    d. Exterior Surface Layer: Finish layer of no-air inhibited pigmented polyester resin (gel coat), pigmented white, approximately 20 mils thick, and then finished with a one ply “A” veil.
6. The first two layers shall be well wet out with no dry spots or bubble concentration. The surface shall be free of cracks and crazes. It shall have a smooth finish with an average of not over two pits per square foot, providing the pits are less than 1/8-inch diameter and not over 1/32-inch deep and are covered with sufficient resin to avoid exposure of inner surface reinforcement. Some wrinkles are permissible provided their surface is smooth and free of pits.
7. All nozzles and drains are to be chemically resistant and of conical gusset design suitable to take stresses for 360 degrees, with strengths of 1,500 foot-pounds "bending" and 2,000-foot-pounds "torque" and a standard 150 pounds ANSI (ASA) flange drilling.
8. All tanks shall be designed to withstand a 5-foot uplift without damage, caused by liquid within the containment area and the tank being empty. Provide additional tie-downs and reinforcement as required.

2.03 ACCESSORIES

A. Tank accessories shall be furnished and installed as noted on Tank Schedule and as detailed or noted on Drawings.

B. Internally Sloped Base: Each tank shall include an internally sloping base, with minimum 4-inch thickness, sloped upward at ¼-inch per foot to the furthest point on the opposite side of the tank.
    1. Refer to Section 01 23 00 Alternates for alternate bid instructions.

C. Fixed Ladders, Platform, and Guard Rail: Each vertical tank shall be provided with fiberglass access ladder meeting the requirements of Section06 61 00. The ladder, platform, and guard rail shall comply with:
    1. Michigan Building Code.
    2. BOCA Building Code.

3. Uniform Building Code.
4. Fixed ladders shall be provided with ladder fall arrest safety system; rail or self-retracting lifelines.
5. Platform shall be provided to access top of tank and all nozzles and fasteners mounted to the top of the tank. Platform and guardrails shall be fiberglass construction and meet the requirements of Section 06 61 00. Platform shall be designed to meet the same live load conditions as required for top of the tank. Platform and top of tank shall be fabricated with slip-resistant finish.
6. Guard rail shall be provided around the perimeter of the tank.

D. Anchoring:
1. Lifting lugs, hold-down lugs, anchor bolts and support saddles shall be furnished according to manufacturer's recommendations. Provide sufficient lugs, anchor bolts, and support saddles to withstand a minimum of 5psf uplift. Anchor hardware shall be 316L stainless steel. Threads shall be field coated with anti-seize.
2. Each tank shall be installed on a minimum three (3) layers of 30# roofing felt.

E. Manhole Openings:
1. Top-mounted and side-mounted manhole openings shall be 24-inch minimum diameter with bolted cover and gasket and shall be furnished as noted per Drawings and Specifications. Cover fastening hardware shall be 316 stainless steel.

F. Connections:
1. Piping connections and piping support brackets shall be of the size and location as detailed or noted on Drawings and as noted on Tank Schedule. Contractor shall coordinate nozzle and accessory gusset locations with tank supplier. Tank supplier's submittal drawings shall include detailed dimensions based on field measurements and coordination with Contractor.
2. Unless otherwise noted, the following piping connections shall be standard for all tanks:
    a. One 6-inch flanged and gusseted nozzle, top-mounted, with FRP blind flange cover, tapped for 2-inch fill line. A 3-inch, Schedule 80 CPVC fill pipe extending to 12-inches above the tank bottom shall be provided by tank manufacturer. Tank manufacturer shall also provide internal piping supports as required to securely stabilize the piping. A 1-inch air gap and funnel receptor, located above the tank overflow piping, shall be provided in the fill pipe to eliminate the possibility of back siphonage.
    b. One 4-inch-diameter flanged and gusseted, full bottom drain.
    c. One 2-inch-diameter flanged and gusseted suction nozzle, mounted 6 inches up from tank bottom.
    d. One 3-inch flanged and gusseted vent nozzle mounted on top of tank, with 3-inch, Schedule 80 CPVC gooseneck and 24 mesh screen, compatible with sodium hypochlorite.
    e. One 4-inch flanged and gusseted overflow nozzle mounted 6 inches from top of tank along straight shell.
    f. One 8-inch flanged and gusseted nozzle mounted on top of tank, with 8-inch, Schedule 80 CPVC flanged spool and tapped blind flange for level sensor. Coordinate length of spool and blind flange tap with level sensor supplier.
    g. Gaskets shall be Viton.
    h. Bolts, washers and nuts shall be 316 stainless steel.

PART 3 -EXECUTION

3.01 INSTALLATION

A. Equipment provided under this Section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions, and recommendations of equipment manufacturer as approved by ENGINEER.

B. All tanks must be unloaded, handled and installed in accordance with manufacturer's instructions. Install tanks on 6-inch concrete pad unless otherwise noted. Provide concrete knockouts where required to accommodate full bottom drain.

C. Prior to placement of tank, confirm concrete pad is level, smooth, and within 1/8-inch vertical tolerance throughout. Grind and/or fill as required to level pad. Remove debris and install a minimum three (3) layers of 30# roofing felt under entire contact area of tank base and anchoring gussets, with each layer perpendicular to the previous. Trim excess roofing felt to within ½-inch of tank base and anchoring gussets upon installation and anchoring of the tank.

3.02 FIELD QUALITY CONTROL

A. Tests: Tanks shall be hydrostatically tested to the maximum liquid level for a minimum of 2-hours and observed for leakage. Observation of test shall not begin until test water temperature has stabilized with atmospheric conditions and exterior condensation is dried.

B. Installation Check: The manufacturer shall provide the services of a factory-trained representative or by an Installer certified by manufacturer, to check the installation of all equipment installed in this Section. The services shall be as noted in Section 01 81 00.
   1. Provide letter of confirmation from manufacturer indicating CONTRACTOR installing the tank is certified.

TANK SCHEDULE

Quantity:	Two (2)
Location:	Outdoor Storage Containment Area
Type:	Vertical Fiberglass-Reinforced Plastic Tanks
Chemical Stored:	Sodium Hypochlorite, 15% solution
Specific Gravity of Chemical:	1.2
Useable Capacity*:	12,000 gal
Approximate Dimensions:	12-ft inside diameter, 15-ft sidewall
Accessories:	Walkway (including guard rail), ladder, anchors, top manhole opening, side manhole opening, connections (outlet nozzles as listed in specification), internally sloping base (alternate)
Remarks:	Refer to Section 01 23 00 Alternates for alternate bid instructions.

* Useable Capacity is calculated as the volume of liquid available between the bottom of the overflow nozzle and the bottom of the suction nozzle.

END OF SECTION