CONTRACT DOCUMENTS

MOON ROAD PUMP STATION IMPROVEMENTS

PITTSFIELD CHARTER TOWNSHIP

JUNE 2015

CONTRACT DOCUMENTS
FOR THE
PITTSFIELD CHARTER TOWNSHIP
MOON ROAD PUMP STATION IMPROVEMENTS

Project No. 2075131900

June 2015

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PART II

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PART II

DETAILED SPECIFICATIONS

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PART III

DRAWINGS

All Drawings under this Contract have the following general caption:

MOON ROAD PUMP STATION IMPROVEMENTS

Specific numbers and titles are as follows:

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GENERAL SHEETS		
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ADVERTISEMENT

PROJECT:	**MOON ROAD PUMP STATION IMPROVEMENTS**
OWNER:	PITTSFIELD CHARTER TOWNSHIP 6201 W. Michigan Avenue Ann Arbor, Michigan 48108
ENGINEER:	Stantec Consulting Michigan Inc. 3754 Ranchero Drive Ann Arbor, Michigan 48108
PRE-BID MEETING:	Tuesday, June 23, 2015 at 10:00 AM Pittsfield Charter Township Utilities Department 4467 Concourse Drive Ann Arbor, Michigan, 48108.
PROPOSALS DUE:	Tuesday, July 14, 2015 2:00 PM local time Pittsfield Charter Township 6201 W. Michigan Avenue Ann Arbor, Michigan 48108
BASIS OF PROPOSALS:	Proposals in the form of a Statement of Qualifications are solicited in accordance with the attached Instructions to Bidders.
PROJECT DESCRIPTION:	Project consists of installation of submersible pumps in an existing manhole converted to a wet well, generator and associated electrical, controls and communication systems.
QUESTIONS:	Any questions regarding the project shall be brought to the attention of **Mr. Ishwar Naik, PE** at Stantec Consulting Michigan Inc., **by fax or by email** at (734) 761-1200 or ish.naik@stantec.com. Questions by telephone call are prohibited. Questions **will not be accepted** if received less than five (5) calendar days before the bids are due.
CONTRACT SECURITY:	The successful Proponent will be required to furnish satisfactory Performance Bonds, Labor and Material Payment Bonds, Maintenance and Guarantee Bonds each in the amount of One-Hundred percent (100%) of the contract.
DOCUMENTS ON FILE:	**Pittsfield Charter Township** **6201 W. Michigan Avenue** **Ann Arbor, Michigan 48108**

Stantec Consulting Michigan Inc.
3754 Ranchero Drive
Ann Arbor, Michigan 48108

DOCUMENT FEE: Contract Documents may be obtained at the office of the ENGINEER upon the non-refundable payment of Thirty Dollars ($30.00) per CD.

Contract Documents will be available for pick up on Wednesday, June 17, 2015 after 3:00PM.

Document request shall indicate whether request is by: Prospective Proponent, Prospective Subcontractor, Prospective Supplier, or other.

PROPOSAL WITHDRAWAL: Withdrawal of any Proposal is prohibited for a period of 90 days after the actual date of the opening thereof.

OWNER'S RIGHTS: The OWNER reserves the right to accept any Proposal, to reject any or all Proposals, and to waive any irregularities in any Proposal, in the interest of the OWNER.

LIVING WAGE: Pittsfield Charter Township has a Living Wage Ordinance requiring covered vendors who execute a service or professional contract with the Township to pay their employees working under that contract, a minimum wage. The CONTRACTOR agrees to comply with applicable provisions of the Living Wage Ordinance.

NON-DISCRIMINATION: Proponents shall not discriminate against any employees or firm due to origin, race, age or physical conditions. CONTRACTOR shall be an equal opportunity employer.

Pittsfield Charter Township
OWNER

Craig Lyon
By

Director of Utilities and Municipal Services
Title

PROPOSALS

Each Proposal shall be made on a form prepared therefore by the ENGINEER and included as one of the Contract Documents and shall be submitted in a sealed envelope bound together with the other Contract Documents except the Plans, bearing the title of the Project and the name of the Bidder.

DELIVERY OF PROPOSALS

Proposals shall be delivered by the time and to the place stipulated in the Advertisement for Proposals. It is the sole responsibility of the Bidder to see that his Proposal is received in proper time. Any Proposal received after the bid date and time specified in the Advertisement shall be returned to the Bidder unopened.

OPENING

Proposals will be opened and publicly read aloud at the time and place set forth in the Advertisement.

WITHDRAWAL BEFORE OPENING

Any Bidder may withdraw his Proposal, either personally or by telegraph or written request, at any time prior to the scheduled time for Opening of Proposals.

DISCREPANCIES

In case of a difference between the stipulated amounts in the Proposal written in words and the stipulated amounts written in figures, the stipulated amounts written in words shall govern.

MODIFICATIONS

Proposals shall not contain any recapitulations of the work to be done. Alternate proposals will not be considered unless expressly requested. Oral proposals or modifications will not be considered. Conditional proposals or conditions attached to proposals shall have no force or effect.

EXAMINATION OF CONTRACT DOCUMENTS

Before submitting his Bid, each Bidder should:

(a) examine the Contract Documents thoroughly;
(b) visit the site to familiarize himself with local conditions that may in any manner affect performance of the work;
(c) familiarize himself with Federal, State, and local laws, ordinances, rules, and regulations affecting performance of the work; and
(d) carefully correlate his observations with the requirements of the Contract Documents.

Reference is made to the General Requirements (Division I) of the Specifications for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by ENGINEER in preparing the Drawings and Specifications. OWNER will make copies of such surveys and reports available to any Bidder requesting them. Before submitting his Bid, each Bidder will at his own expense make such additional survey and investigations as he may deem necessary to determine his Bid Price for performance of the work within the terms of the Contract Documents.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Article.

COMPLETE WORK REQUIRED

It is the intent of the Contract Documents to provide that the Product to be supplied under this Proposal shall be complete and ready for use in every respect. Any minor items not specifically called for in the Plans or Specifications, but which are clearly necessary, are to be included at no increase in the Contract Price.

The Proposal shall include a sum to cover the cost of all items of work to be performed such that the Product to be supplied under this Proposal shall be complete and ready for use in every respect.

SUBCONTRACTORS: MATERIAL & EQUIPMENT QUOTATIONS

The Bidder to whom an Award is made will not be entitled to additional compensation or extension of time by reason of his failure to fully understand all subproposals or quotations.

The Bidder is responsible for all coordination between subcontractors and suppliers during the bidding and construction so that a complete project is furnished for the Contract Price and within the Contract Time. The completed project includes the furnishing of all equipment, accessories, and appurtenances necessary for the proper operation and maintenance of the Project.

AWARD OF CONTRACT

OWNER reserves the right to reject any and all Bids and waive any and all informalities, and the right to disregard all nonconforming or conditional Bids or counter proposals.

In evaluating Bids, OWNER shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternates and unit prices if requested in the bid forms. He may consider the qualifications and experience of subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of subcontractors and other persons and organizations must be submitted as specified in the Supplementary Conditions or Specifications. He may conduct such investigations as he deems necessary to establish the responsibility, qualifications, and financial ability of the Bidders, proposed subcontractors and other persons and organizations to do the work in accordance with the Contract Documents to OWNER's satisfaction within the prescribed time. OWNER reserves the right to reject the Bid or any Bidder who does not pass any such evaluation to OWNER's satisfaction.

If a Contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. However, OWNER reserves the right to by-pass the low bidder and award a contract in the best interest of the OWNER.

If the Contract is to be awarded, OWNER will give the apparent successful Bidder a Notice of Award.

Simultaneous with delivery of the executed counterparts of the Agreement to OWNER, the CONTRACTOR shall deliver to OWNER the required Contract Security.

INTERPRETATIONS

All questions about the meaning or intent of the Contract Documents shall be submitted to ENGINEER in writing. Replies will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than seven (7) days prior to the date of Opening of Bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

ADDENDA

Any Addenda issued during the time of bidding or forming a part of the Contract Documents shall be included in the Proposal and shall be made a part of the Contract Documents. Receipt of each Addendum shall be acknowledged in the Proposal.

BID SECURITY

The amount and type of Bid Security is stated in the Invitation to Bid. The required security must be in the form of a certified or bank cashier's check made payable to OWNER or a Bid bond issued by a surety licensed to conduct business in the state where the Project is located and named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Department. The Bid Security of the successful Bidder will be retained until he has executed the Agreement and furnished the required Contract Security, whereupon it will be returned; if he fails to execute and deliver the Agreement and furnish the required Contract Security within ten (10) days, Sundays and legal holidays excepted, of receipt of the Notice of Award, OWNER may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom OWNER believes to have a reasonable chance of receiving the Award may be retained by OWNER until the earlier of the seventh day after the executed Agreement is delivered by OWNER to CONTRACTOR and the required Contract security is furnished. Bid Security of other Bidders will be returned within seven (7) days of the Bid Opening.

CONTRACT TIME

The number of days for the Delivery of Work (the Contract Time) is set forth in the Bid Forms and will be included in the executed Agreement. Any provisions for liquidated damages are set forth in the Contract Documents.

REQUIREMENT FOR SIGNING PROPOSALS

Proposals which are not signed by the individual making them shall have attached thereto a Power of Attorney evidencing authority to sign the Proposal in the name of the person for whom it is signed.

Proposals which are signed by a partnership shall be signed by all of the partners or by an Attorney-in-Fact. If signed by an Attorney-in-Fact, there shall be attached to the Proposal a Power of Attorney evidencing authority to sign the Proposal, executed by the partners.

Proposals which are signed for a corporation shall have the correct corporate name thereof and the signatures of the president or other authorized officers of the corporation manually written below the corporate name following the word "By". If such a Proposal is manually signed by an officer other than the president of the corporation, a certified copy of a resolution of the Board of Directors evidencing the authority of such official to sign the Proposal shall be attached to it. Such a Proposal shall also bear the attested signature of the secretary of the corporation and the impression of the corporate seal.

All Bidders shall complete the enclosed form entitled "Legal Status of Bidder".

BIDDERS INTERESTED IN MORE THAN ONE PROPOSAL

No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Proposal on this Project, unless Alternate Proposals are called for.

A person, firm, or corporation who has submitted a subproposal to a Bidder, or has quoted prices on materials and/or equipment to a Bidder, is not hereby disqualified from submitting a subproposal or quoting Prices to other Bidders.

EXECUTION OF AGREEMENT

The Bidder to whom an Award is made will be required to enter into a written Agreement in the form hereto annexed, within ten (10) days, Sundays and legal holidays excepted, after being notified of the acceptance of his Proposal and receipt by him of copies of the Contract Documents to be executed.

In case of failure to comply with this requirement, he shall be considered to have abandoned all rights and interest in the Award, his Proposal Guaranty may be declared forfeited to the OWNER and the Contract may be awarded to another.

INSURANCE

The successful Bidder will be required to carry insurance in the amounts and kinds specified in the General Conditions. Such insurance must be with companies and in a form satisfactory to the OWNER, and certificates of such insurance must be attached to each copy of the executed Contract Documents. These certificates shall contain a provision that coverages afforded under the policies will not be cancelled or materially changed unless at least thirty (30) days prior written notice has been given to the OWNER and ENGINEER, as evidenced by return receipt or registered or certified mail.

BONDS

The successful Bidder will be required to furnish for each set of the executed Contract Documents and conformed copies thereof, an original conformed Performance Bond, and Labor and Material Bond on the forms attached hereto with a surety acceptable to the OWNER, as follows:

1) Performance Bond in the amount of One Hundred Percent (100%) of the Contract Price to insure the completion of the entire Project according to the Contract Documents.

2) Labor and Material Payment Bond in the amount of One Hundred Percent (100%) of the Contract Price for the protection of the OWNER and to secure payments of all labor, materials and subcontractors according to the statute of the state at that time in effect.

3) Maintenance Bond in the amount of One Hundred Percent (100%) of the Contract Price to replace or repair any deficiencies in Labor or Material which shall occur on or before the first anniversary of final acceptance by OWNER.

COMPLIANCE WITH PERMITS

The successful Bidder shall comply with all required State and local construction permits and shall comply with all local building codes and inspection requirements.

NONDISCRIMINATION

Contracts for work under this Proposal will obligate the CONTRACTORS and Subcontractors not to discriminate in employment practices.

Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the Award of Contract.

Successful Bidders must, if requested, submit a list of all subcontractors who will perform work on the Project and written signed statements from authorized agents of the labor pools with which they will or may deal for employees on the work, together with supporting information to the effect that said labor pools' practices and policies are in conformity with Executive Order No. 11246, as amended, and that said labor pools will affirmatively cooperate in, or offer no hindrance to, the recruitment, employment, and

equal treatment of employees seeking employment and performing work under the Contract, or a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish same prior to the Award of Contract.

Successful Bidders must be prepared to comply in all respects with the Labor Standards contract provisions regarding nondiscrimination.

HEALTH AND SAFETY

The successful Bidder shall comply with the Health and Safety Regulations, Chapter XVII of Title 29 CFR, Part 1926, as promulgated by the Department of Labor and/or applicable State and local safety and health regulations. All questions regarding compliance and enforcement, as well as requests for the regulations should be directed to the Department of Labor and/or local agencies.

SOIL EROSION AND SEDIMENTATION

The successful Bidder shall comply with the provisions of the “Soil Erosion and Sedimentation Control Act” of 1972 (Michigan P.A. 347, as amended), the “Inland Lakes and Streams Act” of 1972 (Michigan P.A. 346, as amended), and be in accordance with all applicable regulations, standards, and specifications as adopted by the local enforcing agencies.

END OF SECTION

BIDDER'S QUALIFICATION AND EXPERIENCE STATEMENT

The OWNER will require supporting evidence regarding Bidder's Qualifications and competency. The Bidder will be required to furnish all of the applicable information listed below and must be submitted with the sealed bid at the time of the Bid Opening. The Qualifications and Experience certificate must be type written and signed in ink.

QUALIFICATIONS AND EXPERIENCE CERTIFICATE

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

Submitted To: _____

Address: _____

Submitted By: _____

Name: _____

Address: _____

Telephone No. _____ Fax No. _____

Principal Office: _____

Corporation: _____ Joint Venture: _____

Partnership: _____ Other: _____

Individual: _____

Name of Project: _____

Type of Work (File a separate form for each classification of work.)

General: _____ Plumbing: _____

HVAC: _____ Electrical: _____

Other: _____ (Please Specify)

ORGANIZATION

How many years has your organization been in business as a CONTRACTOR?

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

Under what other or former names has your organization operated?

If your organization is a corporation, answer the following:

Date of Incorporation: _____

State of Incorporation: _____

President's Name: _____

Vice President's Name: _____

Secretary's Name: _____

Treasurer's Name: _____

If your organization is a partnership, answer the following:

Date of Organization: _____

Type of Partnership: _____

Name(s) of General Partner(s): _____

If your organization is individually owned, answer the following:

Date of Organization: _____

Name of OWNER: _____

If the form of your organization is other than those listed above describe it and name the principals:

LICENSING

List jurisdiction and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable:

List jurisdiction in which your organization's partnership or trade name is filed:

EXPERIENCE

List the categories of work that your organization normally performs with its own forces:

On a separate sheet, list major construction projects your organization has in progress, giving the name of project, OWNER, architect/ENGINEER, contract amount, percent complete, and scheduled completion date.

On a separate sheet, list the major construction projects your organization has completed in the past five (5) years, giving the name of the project, OWNER, architect/ENGINEER, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

CLAIMS AND SUITS (if the answer to any of the questions below is yes, please attach details)

Has your organization ever failed to complete any work awarded to it? _____

Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or officers? _____

REFERENCES

Trade References: _____

Bank References: _____

Surety: _____

Name of Bonding Company:

_____

Name and Address of Agent:

_____

_____

_____

Signature: _____

Dated at: _____this_____day of_____, 20_____

Name of Organization: _____

By: _____

Title: _____

Mr/Mrs/Ms _____ being duly deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

IF THIS INFORMATION IS NOT SUBMITTED WITH THE SEALED BID AT THE TIME OF BID, THE BID WILL BE CONSIDERED INCOMPLETE.

PROPOSAL FOR
MOON ROAD PUMP STATION IMPROVEMENTS

TO THE PITTSFIELD CHARTER TOWNSHIP

The undersigned as Bidder hereby declares that this Proposal is made in good faith without fraud or collusion with any person or persons bidding on the same Contract; that he has read and examined the Advertisement, Information for Bidders, Proposal, General Conditions, Agreement, Forms of Bonds, Specifications and Plans, as prepared by the ENGINEERS, and understands all of the same; that he or his representative has made personal investigation at the site and has informed himself fully with regard to the conditions to be met in the execution of this Contract, and the undersigned proposes to furnish all labor, materials, tools, power, transportation, and construction equipment necessary for the construction of the Project and performing related work in full accordance with the aforesaid Contract Documents, including any and all addenda officially issued, the receipt of which is hereby acknowledged:

Addendum No. /Dated	Date of Receipt	Signature
_____	_____	_____
_____	_____	_____
_____	_____	_____

AWARD OF CONTRACT: The Contract(s) will be awarded to the lowest responsive, responsible Bidder based on lump sum for all work as specified.

PROPOSAL PRICE: The Bidder agrees to complete the Project for the following lump sum:

Item No.	Pump Station Name	Lump Sum Price	Gas Service Allowance	Electric Service Upgrade Allowance	Total
1.	Moon Road Pump Station		$ 10,000	$ 30,000	$

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

The undersigned further agrees that if the foregoing Proposal shall be accepted, he will, within ten (10) days (Sundays and legal holidays excepted) after receiving notice of such acceptance, enter into the attached form of Agreement and will complete the Project, ready for use, at the unit prices stated in this Proposal, and that he will furnish the OWNER satisfactory Contract Bonds and certificates of insurance coverage

The undersigned further agrees that if the foregoing Proposal shall be accepted, he will commence work immediately after the Contract has been awarded, the Agreement executed, and he has received a Notice to Proceed and he shall complete the entire work by **November 30, 2015**.

The undersigned attaches hereto his Bid Security, as required by the Advertisement and Information for Bidders, and the undersigned agrees that in case he shall fail to fulfill his obligations under the foregoing Proposal and/or shall fail to furnish bonds, as specified, the OWNER may, at its option determine that the undersigned has abandoned his rights and interests in such Contract and that his Bid Security accompanying his Proposal has been forfeited to the said OWNER, but otherwise the Bid Security shall be returned to the undersigned upon the execution of the Contract and the acceptance of the bonds.

The undersigned also agrees that for each and every calendar day that he may be in default of substantial completion of the entire work, ready for use, within the time specified in this Proposal or within the time to which said time of completion may be extended for good cause shown, the OWNER will suffer a damage of Eight Hundred Dollars ($800.00) per day, and said OWNER shall be compensated therefore at the rate as liquidated damages in accordance with Article 1-B, Liquidated Damages, of the Agreement.

The Bidder shall acknowledge that he/she is an equal opportunity employer and that they do not discriminate against other firms due to race, age, gender or physical conditions.

In submitting this bid, it is understood that the right is reserved by the OWNER to accept any bid, to reject any or all bids, and to waive irregularities in bidding in the interest of the OWNER.

The Bidder has completed the accompanying "Legal Status" form.

Dated and Signed at_____
this the _____day of _____, 20_____.

OFFICIAL ADDRESS	BIDDER'S NAME
_____	_____
_____	_____
_____	_____
	By
_____	_____
Telephone	Title

DESIGNATION OF MAJOR SUBCONTRACTORS AND SUPPLIERS

Each bidder shall set forth below: (a) the name and the location of the place of business of each subcontractor who will perform work or labor or render service to the CONTRACTOR in or about the construction of the work in an amount in excess of two percent (2%) of the CONTRACTOR's total base bid; and (b) the portion of the work which will be done by each such subcontractor.

If the CONTRACTOR fails to specify a subcontractor for any portion of the work as above stated, he agrees to perform that work himself.

The CONTRACTOR shall not, without written consent of the OWNER, make any substitution, alterations, or additions to the following list of subcontractors that is made a part of this Bid.

The qualifications of each subcontractor/supplier will be presented to the ENGINEER for review and approval after a CONTRACTOR is selected. However, specific information may be requested from the Bidder prior to a CONTRACTOR being selected in order to aid in the evaluation of a responsive responsible Bidder.

Specification Section	Portion of Work to be Done	Name of Subcontractor	Address of Shop, Mill or Office
16.01	Electrical		
16.07	Distribution Equipment		
16.12	Instrumentation and Controls		
16.13	Stanby Generator		
16.21	Sequence of Operation		
17.01A	Installation of Equipment		

Signed_____
Title_____
Bidder_____

CERTIFICATION REGARDING
DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS

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

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in transactions under federal nonprocurement programs by any federal department or agency;

(2) Have not, within the three year period preceding the proposal, had one or more public transactions (federal, state or local) terminated for cause or default; and

(3) Are not presently indicated or otherwise criminally or civilly charged by a government entity (federal, state or local) and have not , within the three period preceding the proposal, been convicted of or had a civil judgment rendered against it:

   (a) For the commission of fraud or a criminal offence in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state or local) or a procurement contract under such a public transaction;

   (b) For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or

   (c) For the commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

I understand that a false statement on this certification may be grounds for the rejection of this proposal or the termination of the award. In addition, under 18 U.S.C. § 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to five years, or both.

_____
Name and Title of Authorized Representative

_____
Name of Participant Agency or Firm

_____
Signature of Authorized Representative Date

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

NAME, ADDRESS, LEGAL STATUS,
AND SIGNATURE OF BIDDER

This Proposal is submitted in the name of:

(Print)_____

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

Street _____

City _____ State _____ Zip Code_____

Phone _____ Fax _____

The undersigned hereby declares that he has legal status checked below:

( ) INDIVIDUAL

( ) INDIVIDUAL DOING BUSINESS UNDER AN ASSUMED NAME

( ) CO-PARTNERSHIP

The Assumed Name of the Co-Partnership is registered in the County of _____, Michigan.

( ) CORPORATION INCORPORATED UNDER THE LAWS OF THE STATE OF _____. The Corporation is:

( ) LICENSED TO DO BUSINESS IN MICHIGAN

( ) NOT NOW LICENSED TO DO BUSINESS IN MICHIGAN

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

NAME AND TITLE	HOME ADDRESS
_____	_____
_____	_____
_____	_____

Signed and Sealed this _____ day of _____, 20_____.

_____

By (Signature)

_____

Printed Name of Signer

_____

Title

BID CERTIFICATION

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, equipment, or service, that it meets or exceeds all the specifications contained herein, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law, and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid, and certify that I am authorized to sign for the bidder.

_____

Bidder

_____

Signature

_____

Title

_____

Date Certified

WASHTENAW COUNTY LIVING WAGE ORDINANCE

Effective October 17, 2001 Resolution #01-234

$12.00 per hour
If the employer provides health care benefits

$14.07 per hour
If the employer does **NOT** provide health care benefits*

Effective May 1, 2015 to April 30, 2016

Employers who hold professional service or service contracts with Washtenaw County for a value of more than $10,000 in a twelve-month period of time **must pay those employees performing work on a Washtenaw County contract the above living wage.**

ENFORCEMENT

Washtenaw County may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the ordinance. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by Washtenaw County.

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, Washtenaw County has the right to modify, terminate, cancel, or suspend a contract if the Ordinance is violated.

For Additional Information or to File a Complaint

Contact:

Washtenaw County Human Resources Department

(734) 222-6800

**Health Care Benefits includes 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/hour for the average work week.*

The ordinance requires employers to display this poster where employees can readily see it.

AGREEMENT

THIS AGREEMENT, made as of the _____ day of_____, 20_____, by and between

PITTSFIELD CHARTER TOWNSHIP

hereinafter called the OWNER, and_____

_____

hereinafter called the CONTRACTOR.

WITNESSETH, that whereas the OWNER intends to construct

MOON ROAD PUMP STATION IMPROVEMENTS

hereinafter called the Project, in accordance with the Plans, Specifications and other Contract Documents prepared by STANTEC CONSULTING MICHIGAN INC., of Ann Arbor, Michigan, hereinafter called the ENGINEER.

NOW, THEREFORE, the OWNER and CONTRACTOR for the considerations hereinafter set forth, agree as follows:

I. THE CONTRACTOR AGREES to furnish all the necessary labor, materials, equipment, tools, and services necessary to perform and complete, in a workmanlike manner, all work required for the construction of the Project, in strict compliance with the Contract Documents herein mentioned, which are hereby made a part of the Contract, including the following Addenda:

ADDENDUM NO.	DATED
_____	_____
_____	_____
_____	_____

A. Contract Time: Work under this Agreement shall be commenced upon receipt of Notice to Proceed, and the entire work shall be completed by **November 30, 2015**.

If the CONTRACTOR refuses or fails to prosecute the work, or any separate part thereof, with such diligence as will insure its completion, ready for use by the date specified herein, or any extension thereof, or fails to complete said work within such time, the OWNER may, by written notice to the CONTRACTOR, terminate his right to proceed with the Project or such part of the Project as to which there has been delay. In such event the OWNER may take over the Project and prosecute the same to completion, by contract or otherwise, and the CONTRACTOR and his Sureties shall be liable to the OWNER for any excess cost occasioned the OWNER thereby. If the CONTRACTOR's right to proceed is so terminated, the OWNER may take possession of and utilize in completing the Project such materials, appliances, and plant as may be on the site of the Project and necessary therefore.

B. Liquidated Damages: If the OWNER does not terminate the right of the CONTRACTOR to proceed, the CONTRACTOR shall continue the Project, in which event the actual damages for the delay will be impossible to determine and in lieu thereof, the CONTRACTOR shall pay the OWNER the sum of Eight Hundred Dollars ($800.00) per day, as fixed, agreed and liquidated damages for each consecutive calendar day of delay until the Project is completed, accepted, and the CONTRACTOR and his Sureties shall be liable for the amount thereof: Provided, however, that the right of the CONTRACTOR to proceed shall not be terminated or the CONTRACTOR charged with liquidated damages because of any delays in the completion of the Project due to unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to acts of God or of the public enemy, acts of the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, or delays of Subcontractors due to such causes, if the CONTRACTOR shall, within ten days from the beginning of any such delay (unless the OWNER shall grant a further period of time prior to the date of final settlement of the Contract) notify the OWNER in writing of the cause of delay who shall ascertain the facts and the extent of the delay and extend the time for completing the work, when in its judgment, the finds of fact justify such an extension and its findings of fact thereon shall be final and conclusive on the parties thereto.

C. Subcontractors: The CONTRACTOR agrees to bind every subcontractor by the terms of the Contract Documents. The Contract shall not be construed as creating any contractual relation between any Subcontractor and the OWNER.

II. THE OWNER AGREES to pay and the CONTRACTOR agrees to accept, in full payment for the performance of this Contract, the Contract Amount of:

Item No.	Pump Station Name	Lump Sum Price	Gas Service Allowance	Electric Service Upgrade Allowance	Total
1.	Moon Road Pump Station		$ 10,000	$ 30,000	$

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

in accordance with the provisions of the Contract Documents.

A. Progress Payments will be made in accordance with the General Conditions.

III. CONTRACT DOCUMENTS: The Contract comprises the Contract Documents listed in the General Conditions of the Contract. In the event that any provision of one Contract Document conflicts with the provision of another Contract Document, the provision in that Contract Document first listed below shall govern, except as otherwise specifically stated:

A. Agreement (this instrument)

B. Modifications

C. Addenda to Contract Documents

D. Supplementary Conditions

E. Instructions to Bidders

F. General Conditions

G. Specifications

H. Drawings

IV. AUTHORITY AND RESPONSIBILITY OF THE ENGINEER: All work shall be done under the observation of the ENGINEER. The ENGINEER shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, rate of progress of work, interpretation of Plans and Specifications and all questions as to the acceptable fulfillment of the Contract on the part of the CONTRACTOR.

V. SUCCESSORS AND ASSIGNS: This Agreement and all of the covenants hereof shall inure to the benefit of and be binding upon the OWNER and the CONTRACTOR respectively and his partners, successors, assigns and legal representatives. Neither the OWNER nor the CONTRACTOR shall have the right to assign, transfer or sublet his interests or obligations hereunder without written consent of the other party.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed on the day and year first above written.

ATTEST

_____

_____
CONTRACTOR

_____
By

_____
Title

BUSINESS ADDRESS

_____

_____

_____
Telephone

_____
Fax

ATTEST

_____

_____
OWNER

_____
By

_____
Title

_____
Date

ATTEST

_____

_____
OWNER

_____
By

_____
Title

_____
Date

APPROVED AS TO FORM

_____
By the Attorney for

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS THAT _____

_____

as Principal, hereinafter called the CONTRACTOR, and _____

as Surety, hereinafter called Surety, are held and firmly bound unto

PITTSFIELD CHARTER TOWNSHIP

As obligee, hereinafter called the OWNER, in the amount of

_____ Dollars ($_____)

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

for the payment whereof the CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the CONTRACTOR has, by a written Agreement dated _____, entered into a Contract with the OWNER for the construction of

MOON ROAD PUMP STATION IMPROVEMENTS

in accordance with Plans and Specifications prepared by STANTEC CONSULTING MICHIGAN INC., which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the CONTRACTOR shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject to, however, to the following conditions.

A. The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

B. Whenever the CONTRACTOR shall be, and declared by the OWNER to be, in default under the Contract, the OWNER having performed OWNER's obligations there under, the Surety may promptly remedy the default, or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or

2. Obtain a bid or bids for submission to the OWNER for completing the Contract in accordance with its terms and conditions, and upon determination by the OWNER and Surety of the lowest responsible Bidder, arrange for a Contract between such Bidder and the OWNER, and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this

paragraph) 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 the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by the OWNER to the CONTRACTOR under the Contract and any amendments thereto, less the amount properly paid by the OWNER to the CONTRACTOR.

C. Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

D. No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of the OWNER.

Signed and Sealed this _____ day of _____, 20_____.

In the Presence of:

WITNESS

_____ _____
Principal

_____ _____
Title

WITNESS

_____ _____
Surety

_____ _____
Title

_____ _____
Address of Surety

_____ _____
Bond No. City Zip Code

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS that _____

_____

as Principal, hereinafter called CONTRACTOR, and _____

as Surety, hereinafter called Surety, are held and firmly bound unto

PITTSFIELD CHARTER TOWNSHIP

as Obligee, hereinafter called the OWNER for the use and benefit of claimants herein below defined, in the amount of

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

for the Payment whereof CONTRACTOR and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has, by a written Agreement dated _____ entered into a Contract with the OWNER for

MOON ROAD PUMP STATION IMPROVEMENTS

in accordance with Plans and Specifications prepared by STANTEC CONSULTING MICHIGAN INC., which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the CONTRACTOR shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

A. A claimant is defined as one having a direct contract with the CONTRACTOR or with a subcontractor of the CONTRACTOR for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental of equipment directly applicable to the Contract.

B. The above named CONTRACTOR and Surety hereby jointly and severally agree with the OWNER that every claimant as herein defined, who has not been Paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.

C. No suit or action shall be commenced hereunder by any claimant:

1. Unless claimant, other than one having a direct contract with the CONTRACTOR, shall have given written notice to any two of the following: The Principal, the OWNER, or the Surety above named, within ninety (90) days after such claimant did or

performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the CONTRACTOR, OWNER, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid Project is located, save that such service need not be made by a public officer.

2. After the expiration of one (1) year following the date on which CONTRACTOR ceased work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof; such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law county or other political subdivision of the State in which the Project, or any part thereof, is situated; or in the United States District Court for the district in which the Project, or any part thereof, is situated; and not elsewhere.

D. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and Sealed this _____ day of _____, 20_____.

In the Presence of:

WITNESS

_____ _____
Principal

_____ _____
Title

WITNESS

_____ _____
Surety

_____ _____
Title

_____ _____
Address of Surety

_____ _____
Bond No. City Zip Code

MAINTENANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we _____

_____

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

PITTSFIELD CHARTER TOWNSHIP

as Obligee, for the just and full sum of

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

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

WHEREAS, the above named Principal was awarded a Contract by the OWNER

dated the _____ day of _____, 20_____, for the construction of

MOON ROAD PUMP STATION IMPROVEMENTS

AND WHEREAS, this Contract was awarded upon the express condition that the Principal would furnish a one (1) year Maintenance Bond to repair or replace any deficiencies in Labor or Material.

NOW, THEREFORE, the condition of this obligation is such that if the above Principal shall replace such defective material and shall repair all defects due to defective workmanship which shall occur on or before the first anniversary of final acceptance by OWNER, then this obligation shall be void, otherwise to be and remain in full force, effect and virtue.

Signed and Sealed this _____ day of _____, 20_____.

In the Presence of:

WITNESS

_____ _____
Principal

_____ _____
Title

_____ _____
Surety

_____ _____
Title

_____ _____
Address of Surety

_____ _____
Bond No. City Zip Code

Table of Contents

ARTICLE 1 - DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Agreement: The written agreement between OWNER and CONTRACTOR covering the work to be performed; other Contract Documents are attached to the Agreement.

Application for Payment: The form furnished by ENGINEER which is to be used by CONTRACTOR in requesting progress payments and which is to include the schedule of values required by Paragraph 14.1 and an affidavit of CONTRACTOR that progress payments theretofore received on account of the work have been applied by CONTRACTOR to discharge in full all of CONTRACTOR's obligations reflected in prior Applications for Payment.

Bid: The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the work to be performed.

Bidder: Any person, firm, or corporation submitting a Bid for the work.

Bonds: Bid, performance and payment bonds, and other instruments of security, furnished by CONTRACTOR and his surety in accordance with the Contract Documents.

Change Order: A written order to CONTRACTOR signed by OWNER authorizing an addition, deletion, or revision in the work, or an adjustment in the Contract Price or the Contract Time issued after execution of the Agreement.

Contract Documents: The Agreement, Addenda (whether issued prior to the Opening of Bids or the execution of the Agreement), Instructions to Bidders, CONTRACTOR's bid, the bonds, the Notice of Award, these General Conditions, the Supplementary Conditions, the Specifications, Drawings, and Modifications.

Contract Price: The total monies payable to CONTRACTOR under the Contract Documents.

Contract Time: The number of days stated in the Agreement for the Completion of the Work, computed as provided in Paragraph 17.2.

CONTRACTOR: The person, firm, or corporation with whom OWNER has executed the Agreement.

Day: A calendar day of twenty-four (24) hours measured from midnight to the next midnight.

Drawings (Plans): The drawings, also commonly known or referred to as Plans, which show the character and Scope of Work to be performed and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

ENGINEER: The person, firm, or corporation named as such in the Agreement.

Field Order: A written order issued by ENGINEER which clarifies or interprets the Contract Documents in accordance with Paragraph 9.3 or orders minor changes in the work in accordance with Paragraph 10.2.

Modification: (a) A written amendment of the Contract Documents signed by both parties; (b) A Change Order; (c) A written clarification or interpretation issued by ENGINEER in accordance with Paragraph 9.3; or (d) A written order for a minor change or alteration in the work issued by ENGINEER pursuant to Paragraph 10.2. A Modification may only be issued after execution of the Agreement.

Notice of Award: The written notice by OWNER to the apparent successful Bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified, OWNER will execute and deliver the Agreement to him.

Notice to Proceed: A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform his obligations under the Contract Documents.

OWNER: A public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

OWNER'S REPRESENTATIVE: The authorized representative of OWNER who is assigned to the project site or any part thereof.

Project: The entire construction to be performed as provided in the Contract Documents.

Resident Project Representative: The authorized representative of ENGINEER who is assigned to the Project site or any part thereof.

Shop Drawings: All Drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by CONTRACTOR, subcontractor, manufacturer, supplier, or distributor and which illustrate the equipment, material, or some portion of the work.

Specifications: Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the work. The Specifications are customarily organized in 18 divisions in accordance with the Uniform System for Construction Specifications endorsed by the Construction Specifications Institute.

Subcontractor: An individual, firm, or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the work at the site.

Substantial Completion: The date as certified by ENGINEER when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it was intended; or if there be no such certification, the date when final payment is due in accordance with Paragraph 14.13.

Work: Any and all obligations, duties, and responsibilities necessary to the successful completion of the Project assigned to or undertaken by CONTRACTOR under the Contract Documents, including all labor, materials, equipment, and other incidentals, and the furnishing thereof.

ARTICLE 2 - PRELIMINARY MATTERS

Execution of Agreement

2.1. At least three counterparts of the Agreement and such other Contract Documents as practicable will be executed and delivered by CONTRACTOR to OWNER within ten days of the Notice of Award and the OWNER will execute and deliver one counterpart to CONTRACTOR within ten (10) days of receipt of the executed Agreement from CONTRACTOR. ENGINEER will identify those portions of the Contract Documents not so signed and such identification will be binding on all parties. OWNER, CONTRACTOR, and ENGINEER shall each receive an executed counterpart of the Contract Documents and additional conformed copies as required.

Delivery of Bonds

2.2. When he delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as he may be required to furnish in accordance with Paragraph 5.1.

Copies of Documents

2.3. OWNER shall furnish to CONTRACTOR up to ten copies (unless otherwise provided in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the work. Additional copies will be furnished, upon request, at the cost of reproduction.

CONTRACTOR's Pre-Start Representations

2.4. CONTRACTOR represents that he has familiarized himself with, and assumes full responsibility for having familiarized himself with the nature and extent of the Contract Documents, work, locality, and with all local conditions and Federal, State, and local laws, ordinances, rules, and regulations that may in any manner affect performance of the work, and represents that he has correlated his study and observations with the requirements of the Contract Documents. CONTRACTOR also represents that he has studied all surveys and investigation reports of subsurface and latent physical conditions referred to in the General Requirements (Division 1) of the Specifications and made such additional surveys and investigations as he deems necessary for the performance of the work at the Contract Price in accordance with the requirements of the Contract Documents and that he has correlated the results of all such data with the requirements of the Contract Documents.

Commencement of Contract Time, Notice to Proceed

2.5. The Contract Time will commence to run on the thirtieth day after the day on which the executed Agreement is delivered by OWNER to CONTRACTOR; or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed; but in no event shall the Contract Time commence to run later than the ninetieth day after the day of Bid Opening or the thirtieth day after the day on which OWNER delivers the executed Agreement to CONTRACTOR. A Notice to Proceed may be given at any time within thirty days after the day on which OWNER delivers the executed Agreement to CONTRACTOR.

Starting the Project

2.6. CONTRACTOR shall start to perform his obligations under the Contract Documents on the date when the Contract Time commences to run. No work shall be done at the site prior to the date on which the Contract Time commences to run.

Before Starting Construction

2.7. Before undertaking each part of the work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. He shall at once report in writing to ENGINEER any conflict, error, or discrepancy which he may discover; however, he shall not be liable to OWNER or ENGINEER for his failure to discover any conflict, error, or discrepancy in the Drawings or Specifications.

2.8. Within ten days after delivery of the executed Agreement by OWNER to CONTRACTOR, CONTRACTOR shall submit to ENGINEER for approval, an estimated progress schedule indicating the starting and completion dates of the various stages of the work, and a preliminary schedule of Shop Drawing submissions.

2.9. Before starting the work at the site, CONTRACTOR shall furnish OWNER and ENGINEER Certificates of Insurance as required by Article 5. Within twenty days after delivery of the executed Agreement by OWNER to CONTRACTOR, but before starting the work at the site, a conference will be held to review the above schedules, to establish procedures for handling Shop Drawings and other submissions and for processing Applications for Payment, and to establish a working understanding between the parties as to the Project. Present at the conference will be OWNER or his representative, ENGINEER, Resident Project Representatives, CONTRACTOR, and his Superintendent.

ARTICLE 3 - CORRELATION, INTERPRETATION, AND INTENT OF CONTRACT DOCUMENTS

3.1. It is the intent of the Specifications and drawings to describe a complete Project to be constructed in accordance with the Contract Documents. The Contract Documents comprise the entire Agreement between OWNER and CONTRACTOR. They may be altered only by a Modification.

3.2. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, he shall call it to ENGINEER's attention in writing at once and before proceeding with the work affected thereby; however, he shall not be liable to OWNER or ENGINEER for his failure to discover any conflict, error, or discrepancy in the Specifications or Drawings. In resolving such conflicts, errors, and discrepancies, the Documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Supplementary Conditions, Instructions to Bidders, General Conditions, Specifications, and Drawings. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings. Any work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials, or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

ARTICLE 4 - AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands

4.1. OWNER shall furnish, as indicated in the Contract Documents, and not later than the date when needed by CONTRACTOR, the lands upon which the work is to be done, rights-of-way for access thereto, and such other lands which are designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise specified in the Contract Documents. If CONTRACTOR believes that any delay in OWNER's furnishing these lands or easements entitles him to an extension of the Contract Time, he may make a claim therefor as provided in Article 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

Physical Conditions - Surveys and Reports

4.2. Reference is made to the General Requirements (Division 1) of the Specifications for identification of those surveys and investigation reports of subsurface and latent physical conditions at the Project site or otherwise affecting performance of the work which have been relied upon by ENGINEER in preparation of the Drawings and Specifications.

Unforeseen Physical Conditions

4.3. CONTRACTOR shall promptly notify OWNER and ENGINEER in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. ENGINEER will promptly investigate those conditions and advise OWNER in writing if further surveys or subsurface tests are necessary. Promptly thereafter, OWNER shall obtain the necessary additional surveys and tests and furnish copies to ENGINEER and CONTRACTOR. If ENGINEER finds that the results of such surveys or tests indicate that there are subsurface or latent physical conditions which differ materially from those intended in the Contract Documents, and which could not reasonably have been anticipated by CONTRACTOR, a Change Order shall be issued incorporating the necessary revisions.

Reference Points

4.4. OWNER shall provide engineering surveys for construction to establish reference points which in his judgment are necessary to enable CONTRACTOR to proceed with the work. CONTRACTOR shall be responsible for surveying and laying out the work (unless otherwise provided in the Supplementary Conditions), and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. He shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. CONTRACTOR shall replace and accurately relocate all reference points so lost, destroyed or moved.

4.5. All elevations shown on the Plans or referred to herein are in feet above mean sea level datum as established by the United States Geological Survey, unless otherwise noted. The CONTRACTOR shall verify all the existing structure locations and elevations at points of connection or possible interference between his work and the existing structures and shall report at once to the ENGINEER any interferences or discrepancies discovered.

4.6. The CONTRACTOR shall cause to be replaced by a Registered Land Surveyor all survey monuments and/or property irons damaged or destroyed by his operations or the operations of his Subcontractor.

ARTICLE 5 - BONDS AND INSURANCE

Performance, Payment and Other Bonds

5.1. CONTRACTOR shall furnish performance and payment bonds as security for the faithful performance and payment of all his obligations under the Contract Documents. These bonds shall be in amounts at least equal to the Contract Price, and (except as otherwise provided in the Supplementary Conditions) in such form and with such sureties as are licensed to conduct business in the state where the Project is located and are named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Department.

5.2. If the surety on any bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located, CONTRACTOR shall within five days thereafter substitute another bond and surety, both of which shall be acceptable to OWNER.

Insurance Required of the CONTRACTOR

5.3. Prior to commencement of the work, the CONTRACTOR shall purchase and maintain during the term of the Project such insurance as will protect him, the OWNER(s), OWNER'S REPRESENTATIVE, TOWNSHIP ATTORNEY and the ENGINEER(s) from claims arising out of the work described in this Contract and performed by the CONTRACTOR, Subcontractor(s), or Sub-subcontractor(s) consisting of:

5.3.1. Worker's Compensation Insurance including Employer's Liability to cover employee injuries or disease compensable under the Worker's Compensation Statutes of the states in which work is conducted under this Contract; disability benefit laws, if any; or Federal Compensation Acts such as U.S. Longshoremen or Harbor Workers, Maritime Employment, or Railroad Compensation Act(s), if applicable. Self-insurance plans approved by the regulatory authorities in the state in which work on this Project is performed are acceptable.

5.3.2. A Comprehensive General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, including the following exposures:

(a) all premises and operations;
(b) explosion, collapse, and underground damage;
(c) CONTRACTOR's Protective Coverage for independent CONTRACTORS and subcontractors employed by him;
(d) Contractual Liability for the obligation assumed in the indemnification or hold harmless agreement found in the General Conditions section of this Contract;
(e) the usual Personal Injury Liability endorsement with no exclusions pertaining to employment;
(f) products and completed operations coverage -- this coverage shall extend through the Contract Guarantee period.

5.3.3. A Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance, or use of any motor vehicle, including owned, non-owned, and hired vehicles. In light of standard policy provisions concerning:

(a) loading and unloading; and
(b) definitions pertaining to motor vehicles licensed for road use vs. unlicensed or self-propelled construction equipment, it is strongly recommended that the Comprehensive General Liability and the Comprehensive Auto Liability be written by the same insurance carrier, though not necessarily in one policy.

5.3.4. The CONTRACTOR will purchase for the OWNER an OWNER's Protective Liability policy to protect the OWNER, the ENGINEER, their consultants, agents, employees, and such public corporations in whose jurisdiction the work is located for their contingent liability for work performed by the CONTRACTOR, the Subcontractor(s), and the Sub-subcontractor(s) under this Contract.

5.3.5. The CONTRACTOR shall purchase a Builder's Risk-Installation Floater in a form acceptable to the OWNER covering property of the Project for the full cost of replacement as of the time of any loss which shall include as named insureds:

(a) the CONTRACTOR;
(b) all Subcontractors;
(c) all Sub-subcontractors;
(d) the OWNER, the ENGINEER(s) or Architect(s);

as their respective interests may prove to be at the time of loss, covering insurable property which is the subject of this Contract, whether in place, stored at the job site, stored elsewhere, or in transit at the risk of the insured(s). Coverage shall be effected on an "All Risk" form including, but not limited to, the perils of fire, wind, vandalism, collapse, theft, and earthquake, with exclusions normal to the coverage. The CONTRACTOR may arrange for such deductibles as he deems to be within his ability of self-assume, but he will be held solely responsible for the amount of such deductible and for any non-insurance penalties. Any insured loss shall be adjusted with the OWNER and the CONTRACTOR and paid to the OWNER and CONTRACTOR as trustee for the other insureds.

5.3.6. Umbrella or Excess Liability: The OWNER or its representative may, for certain projects, require limits higher than those stated in Paragraph 5.4. which follows. The CONTRACTOR is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested. Umbrella or Excess policy wording shall be at least as broad as the primary or underlying policy(ies) and shall apply both to the CONTRACTOR's general liability and to his automobile liability insurance.

5.3.7. Railroad Protective Liability: Where such an exposure exists, the CONTRACTOR will provide coverage in the name of each railroad company having jurisdiction over rights-of-way across which work under the Contract is to be performed. The form of policy and the limits of liability shall be determined by the railroad company(ies) involved. See Supplemental General Conditions for limits and coverage requested.

Limits of Liability

5.4. The required limits of liability for insurance coverages requested in Paragraph 5.3 shall be NOT LESS than the following:

5.4.1. Worker's Compensation:

Coverage A - Compensation	Statutory
Coverage B - Employer's Liability	$500,000

5.4.2. Comprehensive General Liability:

Bodily Injury - Each Occurrence	$1,000,000
Bodily Injury - Aggregate (Completed Operations)	$1,000,000
Property Damage - Each Occurrence	$500,000
Property Damage - Aggregate	$1,000,000
or Combined Single Limit	$2,000,000

5.4.3. Comprehensive Automobile Liability:

Bodily Injury	$500,000
Property Damage	$200,000
or Combined Single Limit	$1,000,000

5.4.4. OWNER's Protective:

Bodily Injury - Each Occurrence	$1,500,000
Property Damage - Each Occurrence	$500,000
Property Damage - Aggregate	$1,000,000
or Combined Single Limit	$2,000,000

5.4.5. Builder's Risk-Installation Floater: Replacement Cost at Time of Loss

5.4.6. Umbrella or Excess Liability: $3,000,000

Insurance - Other Requirements

5.5. The following conditions shall also be required in regard to insurance coverage.

5.5.1. Notice of Cancellation or Intent Not to Renew: Policies will be endorsed to provide that at least 30 days written notice of cancellation or of intent not to renew shall be given to the OWNER and to the ENGINEER.

5.5.2. Evidence of Coverage: Prior to commencement of the work, the CONTRACTOR shall furnish to the OWNER, Certificates of Insurance in force on the OWNER's form of certificate provided. Other forms of certificate are acceptable only if:

(a) they include all of the items prescribed in the OWNER's form of certificate, including agreement to cancellation provisions outlined in Paragraph 5.5.1. above; and
(b) they have written approval of the OWNER and the ENGINEER. The OWNER reserves the right to request complete copies of policies if deemed necessary to ascertain details of coverage not provided by the certificates. Such policy copies shall be "originally signed copies," and so designated.

5.5.3. Evidence of Insurance Required for the CONTRACTOR:

(1) Worker's Compensation and Employer's Liability Comprehensive General Liability including:

(a) all premises and operations;
(b) explosion, collapse, and underground damage;
(c) CONTRACTOR's Protective;
(d) Contractual Liability for obligations assumed in the Indemnification-Hold Harmless Agreement of this Contract;
(e) Personal Injury Liability;
(f) products and completed operations;

(2) Comprehensive Automobile Liability including owned, non-owned, and hired vehicles

(3) Umbrella or Excess Liability

5.5.4. Evidence of Insurance Required for the OWNER:

(a) OWNER's Protective Liability which names as insured(s) the OWNER, OWNER'S REPRESENTATIVE the ENGINEER(s), their consultants, agents, employees, and such public corporations in whose jurisdiction the work is located.

5.5.5. Evidence of Insurance Required for the CONTRACTOR and the OWNER:

(a) Builder's Risk-Installation Floater which names as insured(s) the OWNER; OWNER'S REPRESENTATIVE; the ENGINEER(s); their consultants, agents, and employees; the CONTRACTOR and all Subcontractors.

5.5.6. Qualification of Insurers: In order to determine financial strength and reputation of insurance carriers, all companies providing the coverages required shall be licensed or approved by the Insurance Bureau of the State of Michigan and shall have a financial rating not lower than XI and a Policyholder's service rating no lower than B+ as listed in A.M. Best's Key Rating Guide, current edition. Companies with ratings lower than B+:XI will be acceptable only upon written consent of the OWNER.

Additional Bonds and Insurance

5.6. Prior to delivery of the executed Agreement by OWNER to CONTRACTOR, OWNER may require CONTRACTOR to furnish such other bonds and such additional insurance, in such form and with such sureties or insurers as OWNER may require. If such other bonds or such other insurance is specified by written instructions given prior to Opening of Bids, the premiums shall be paid by CONTRACTOR; if subsequent thereto, they shall be paid by OWNER (except as otherwise provided in Article 11).

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence

6.1. CONTRACTOR shall supervise and direct the work efficiently and with his best skill and attention. He shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but he shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence, or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be responsible to see that the finished work complies accurately with the Contract Documents.

6.2. CONTRACTOR shall keep on the work site at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials, and Equipment

6.3. CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the work and perform construction as required by the Contract Documents. He shall at all times maintain good discipline and order at the site.

6.4. CONTRACTOR shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation, and completion of the work.

6.5. All materials and equipment shall be new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

6.6. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, or processors, except as otherwise provided in the Contract Documents.

Substitute Materials or Equipment

6.7. Whenever a material, article, or piece of equipment is identified on the drawings or Specifications by reference to brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality, and function may be considered.

The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalog number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the Contract Price or Contract Time.

Concerning Subcontractors

6.8. CONTRACTOR shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. A Subcontractor or other person or organization identified in writing to OWNER and ENGINEER prior to the Notice of Award will be deemed acceptable to OWNER and ENGINEER. Acceptance of any Subcontractor, other person, or organization by OWNER or ENGINEER shall not constitute a waiver of any right of OWNER or ENGINEER to reject defective work or work not in conformance with the Contract Documents. If OWNER or ENGINEER after due investigation has reasonable objection to any Subcontractor, other person or organization proposed by CONTRACTOR after the Notice of Award, CONTRACTOR shall submit an acceptable substitute and the Contract Price shall be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order shall be issued. CONTRACTOR shall not be required to employ any

Subcontractor, other person or organization against whom he has reasonable objection. CONTRACTOR shall not without the consent of OWNER and ENGINEER make any substitution for any CONTRACTOR, other person, or organization who has been accepted by OWNER and ENGINEER unless ENGINEER determines that there is good cause for doing so.

Nothing contained in these Contract Documents shall create any contractual relationship between the OWNER or ENGINEER and any Subcontractor or Sub-Subcontractor.

6.9. CONTRACTOR shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that he is responsible for the acts and omissions of persons directly employed by him. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any Subcontractor or other person or organization having a direct contract with CONTRACTOR, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any monies due any Subcontractor or other person or organization, except as may otherwise be required by law. OWNER or ENGINEER may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR on account of specific work done in accordance with the Schedule of Values.

6.10. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the work among Subcontractors or delineating the work to be performed by any specific trade.

6.11. CONTRACTOR agrees to bind specifically every Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER.

6.12. All work performed for CONTRACTOR by a Subcontractor shall be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with Article 5 of these General Conditions, except such rights as they may have to the proceeds of such insurance held by OWNER as trustee under Paragraph 5.3.5.

Patent Fees and Royalties

6.13. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. CONTRACTOR shall indemnify and hold harmless OWNER, TOWNSHIP ATTORNEY and ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorney's fees) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the work or resulting from the incorporation in the work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

Permits

6.14. CONTRACTOR shall obtain and pay for all construction permits and licenses and shall pay all governmental charges and inspection fees necessary for the prosecution of the work, which are applicable at the time of his Bid. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall also pay all public utility charges.

Laws and Regulations

6.15. CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the work. CONTRACTORS and its subcontractors, consultants, and agents retained to perform work shall comply with:

(a) Titles VI and VII of the Civil Rights Act (42 U.S.C. §§ 2000d et. seq.) and the United States Department of Justice Regulations (28 C.F.R. Part 42) issued pursuant to these Titles.

(b) The Age Discrimination Act of 1985 (42 U.S.C. § 6101-07).

(c) Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794).

(d) The Americans with Disabilities Act of 1990 (42 U.S.C. § 12101 et. seq.)

(e) The Michigan Civil Rights Act (P.A. 1976 No. 453) and the Persons with Disabilities Civil Rights Act (P.A. 1976 No. 220).

If CONTRACTOR observes that the Specifications or Drawings are at variance therewith, he shall give ENGINEER prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate Modification. If CONTRACTOR performs any work knowing it to be contrary to such laws, ordinances, rules, and regulations, and without such notice to ENGINEER, he shall bear all costs arising therefrom; however, it shall not be his primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules and regulations.

Taxes

6.16. CONTRACTOR shall pay all sales, consumer use, and other Federal, State and Local taxes required to be paid by him in accordance with the law of the place where the work is to be performed.

Use of Premises

6.17. CONTRACTOR shall confine his equipment, the storage of materials and equipment, and the operations of his workmen to areas permitted by law, ordinances, permits, or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment. CONTRACTOR shall restore the areas to their original condition.

6.18. CONTRACTOR shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the work to stresses or pressures that will endanger it.

Record Drawings

6.19. CONTRACTOR shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These shall be available to ENGINEER and shall be delivered to him for OWNER upon completion of the Project. (Note: Further provisions in respect of such record Drawings may be included in the General Requirements (Division 1).)

Safety and Protection

6.20. CONTRACTOR shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. He shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

(a) all employees on the work and other persons who may be affected thereby;
(b) all the work and all materials or equipment to be incorporated therein, whether in storage on or off the site;
(c) other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for its safety and protection. He shall notify OWNERS of adjacent utilities when prosecution of the work may affect them. All damage, injury or loss to any property referred to in Paragraph 6.20(b) or 6.20(c) caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR; except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR. CONTRACTOR's duties and responsibilities for the safety and protection of the work shall continue until such time as all the work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with Paragraph 14.13 that work is acceptable.

6.21. CONTRACTOR shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to OWNER.

6.22. Neither OWNER nor ENGINEER shall be responsible for safety on the job. It is the CONTRACTOR's sole responsibility to comply with the rules and regulations of the Occupational Safety and Health Act (OSHA).

Emergencies

6.23. In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, CONTRACTOR without special instruction or authorization from ENGINEER or OWNER, is obligated to act, at his discretion, to prevent threatened damage, injury, or loss. He shall give ENGINEER prompt written notice of any significant changes in the work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved. If CONTRACTOR believes that additional work done by him in an emergency which arose from causes beyond his control entitles him to an increase in the Contract Price or an extension of the Contract Time, he may make a claim therefor as provided in Articles 11 and 12.

Shop Drawings and Samples

6.24. After checking and verifying all field measurements, CONTRACTOR shall submit to ENGINEER for approval, in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 2.8) five copies (or at ENGINEER's option, one reproducible copy) of all Shop Drawings, which shall have been checked by and stamped with the approval of CONTRACTOR and identified as ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction, and the like to enable ENGINEER to review the information as required.

6.25. CONTRACTOR shall also submit to ENGINEER for approval with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of CONTRACTOR, identified clearly as to material, manufacturer, any pertinent catalog numbers, and the use for which intended.

6.26. At the time of each submission, CONTRACTOR shall in writing call ENGINEER's attention to any deviations that the Shop Drawing or sample may have from the requirements of the Contract Documents.

6.27. ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make any corrections required by ENGINEER and shall return the required number of correct copies of Shop Drawings and resubmit new samples, until approved. CONTRACTOR shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by ENGINEER on previous submissions. CONTRACTOR's stamp of approval on any Shop Drawing or sample shall constitute a representation to OWNER and ENGINEER that CONTRACTOR has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.

6.28. Where a Shop Drawing or sample submission is required by the Specifications, no related work shall be commenced until the submission has been approved by ENGINEER. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by CONTRACTOR at the site and shall be available to ENGINEER.

6.29. ENGINEER's approval of Shop Drawings or samples shall not relieve CONTRACTOR from his responsibility for any deviations from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to such deviation at the time of submission and ENGINEER has given written approval to the specific deviation, nor shall any approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings.

(Note: Further provisions in respect to Shop Drawings and samples may be included in the General Requirements (Division 1).)

Cleaning

6.30. CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the work, and at the completion of the work he shall remove all waste materials, rubbish, and debris from and about the premises as well as all tools, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents. (Note: Further provisions in respect of cleaning may be included in the General Requirements (Division 1).)

Indemnification

6.31. CONTRACTOR shall indemnify and hold harmless OWNER, TOWNSHIP ATTORNEY and ENGINEER and their agents, directors, officers, and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense is:

(a) attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom; and
(b) caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

6.32. In any and all claims against OWNER, TOWNSHIP ATTORNEY, or ENGINEER or any of their agents or directors, officers, and employees by any employee of CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.31 shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR, or any Subcontractor under Worker's Compensation Acts, disability benefit acts, or other employee benefit acts.

6.33. The obligations of CONTRACTOR under Paragraph 6.30 shall not extend to the liability of ENGINEER, his agents or directors, officers, and employees arising out of:

(a) the preparation of approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
(b) the giving of or the failure to give directions or instructions by ENGINEER, his agents or directors, officers and employees provided such giving or failure to give is the primary cause of injury or damage.

ARTICLE 7 - WORK BY OTHERS

7.1. OWNER may perform additional work related to the Project by himself, or he may let other direct contracts therefor which shall contain General Conditions similar to these. CONTRACTOR shall afford the other CONTRACTORS who are parties to such direct contracts (or OWNER, if he is performing the additional work himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his work with theirs.

7.2. If any part of CONTRACTOR's work depends for proper execution or results upon the work of any such other CONTRACTOR (or OWNER), CONTRACTOR shall inspect and promptly report to ENGINEER in writing any defects or deficiencies in such work that render it unsuitable for such proper execution and results. His failure so to report shall constitute an acceptance of the other work as fit and proper for the relationship of his work except as to defects and deficiencies which may appear in the other work after the execution of his work.

7.3. CONTRACTOR shall do all cutting, fitting, and patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and of the other contractors whose work will be affected.

7.4. If the performance of additional work by other CONTRACTORS or OWNER is not noted in the Contract Documents prior to the execution of the contract, written notice thereof shall be given to CONTRACTOR prior to starting any such additional work. If CONTRACTOR believes that the performance of such additional work by OWNER or others involves him in additional expense or entitles him to an extension of the Contract Time, he may make a claim therefor as provided in Articles 11 and 12.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.1. OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an ENGINEER against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER. Any dispute in connection with such appointment shall be subject to arbitration.

8.3. OWNER shall furnish the data required of him under the Contract Documents promptly and shall make payments to CONTRACTOR promptly after they are due as provided in Paragraphs 14.4 and 14.13.

8.4. OWNER's duties in respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of surveys and investigation reports of subsurface and latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by ENGINEER in preparing the Drawings and Specifications.

8.5. OWNER's responsibilities in respect of liability and property insurance are set forth in Article 5.

8.6. In addition to his rights to request changes in the work in accordance with Article 10, OWNER (especially in certain instances as provided in Paragraph 10.4) shall be obligated to execute Change Orders.

8.7. OWNER's responsibility in respect of certain inspections, tests, and approvals is set forth in Paragraph 13.2.

8.8. In connection with OWNER's right to stop work or suspend work, see Paragraphs 13.8 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

OWNER's Representative

9.1. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in Articles 1 through 17 of these General Conditions and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site

9.2. ENGINEER will make periodic visits to the site to observe the progress and quality of the executed work and to determine, in general, if the work is proceeding in accordance with the Contract Documents. He will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the work. His efforts will be directed toward providing assurance for OWNER that the completed Project will conform to the requirements of the Contract Documents. On the basis of his on-site observations as an experienced and qualified design professional, he will keep OWNER informed of the progress of the work and will endeavor to guard OWNER against defects and deficiencies in the work of CONTRACTORS.

Clarifications and Interpretations

9.3. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents (in the form of Drawings or otherwise) as he may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification and interpretation entitles him to an increase in the Contract Price, he may make a claim therefor as provided in Article 11.

Rejecting Defective Work

9.4. ENGINEER will have authority to disapprove or reject work which is "defective" (which term is hereinafter used to describe work that is unsatisfactory, faulty, or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of the inspection, test, or approval referred to in Paragraph 13.2 or has been damaged prior to approval of final payment). He will also

have authority to require special inspection or testing of the work as provided in Paragraph 13.7, whether or not the work is fabricated, installed, or completed.

Shop Drawings, Change Orders, and Payments

9.5. In connection with ENGINEER's responsibility for Shop Drawings and samples, see Paragraphs 6.23 through 6.28 inclusive.

9.6. In connection with ENGINEER's responsibility for Change Orders, see Articles 10, 11, and 12.

9.7. In connection with ENGINEER's responsibilities in respect of Applications for Payment, etc., see Article 14.

Resident Project Representatives

9.8. If the OWNER authorizes the ENGINEER, the ENGINEER shall provide one or more full-time resident project representatives to assist the ENGINEER in carrying out his responsibilities at the site. The duties, responsibilities, and limitation of authority of any such resident project representative shall be to endeavor to further protect the OWNER against defects and deficiencies in the work. But the furnishing of such resident project representatives shall not make the ENGINEER responsible for construction means, methods, techniques, sequences, or procedures or for any safety precautions or programs in connection with the work.

Decisions on Disagreements

9.9. ENGINEER will be the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder. In his capacity as interpreter and judge he will exercise his best efforts to insure faithful performance by both OWNER and CONTRACTOR. He will not show partiality to either and will not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes, and other matters relating to the execution and progress of the work or the interpretation of or performance under the Contract Documents shall be referred to ENGINEER for decision, which he will render in writing within a reasonable time.

Limitations on ENGINEER's Responsibilities

9.10. Neither ENGINEER's authority to act under this Article 9 or elsewhere in the Contract Documents nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any materialman, fabricator, supplier, or any of their agents or employees or any other person performing any of the work.

9.11. ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, and he will not be responsible for CONTRACTOR's failure to perform the work in accordance with the Contract Documents.

9.12. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or any Subcontractors, or any of his or their agents or employees, or any other persons at the site or otherwise performing any of the work.

ARTICLE 10 - CHANGES IN THE WORK

10.1. Without invalidating the Agreement, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the work; these will be authorized by Change Orders. Upon receipt of a Change Order, CONTRACTOR shall proceed with the work involved. All such work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the

Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 11 or Article 12 on the basis of a claim made by either party.

10.2. ENGINEER may authorize minor changes or alterations in the work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. If CONTRACTOR believes that any minor change or alteration authorized by ENGINEER entitles him to an increase in the Contract Price, he may make a claim therefor as provided in Article 11.

10.3. Additional work performed by CONTRACTOR without authorization of a Change Order will not entitle him to an increase in the Contract Price or an extension of the Contract Time, except in the case of an emergency and as provided in Paragraphs 10.2 and 13.7.

10.4. OWNER shall execute appropriate Change Orders prepared by ENGINEER covering changes in the work to be performed as provided in Paragraph 4.3, and work performed in an emergency as provided in Paragraph 6.23 and any other claim of CONTRACTOR for a change in the Contract Time or the Contract Price which is approved by ENGINEER.

10.5. It is CONTRACTOR's responsibility to notify his Surety of any changes affecting the general Scope of Work or change in the Contract Price and the amount of the applicable bonds shall be adjusted accordingly. CONTRACTOR shall furnish proof of such adjustment to OWNER.

ARTICLE 11 - CHANGE OF CONTRACT PRICE

11.1. The Contract Price constitutes the total compensation payable to CONTRACTOR for performing the work. All duties, responsibilities, and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to OWNER and ENGINEER within fifteen days of the occurrence of the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-five days of such occurrence unless ENGINEER allows an additional period of time to ascertain accurate cost data. Any claims, not delivered to OWNER or ENGINEER within forty-five days or within any additional period allowed by ENGINEER in writing, shall be forfeited by the CONTRACTOR and shall not be honored by the OWNER. All claims for adjustments in the Contract Price shall be determined by ENGINEER if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

11.3. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

(a) where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved;
(b) by mutual acceptance of a lump sum;
(c) on the basis of the Cost of the Work (determined as provided in Paragraph 11.4.).

Cost of the Work

11.4. The term Cost of the Work means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the work. Except as may be otherwise agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5.

11.4.1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the work under schedules of job classifications agreed upon by OWNER and CONTRACTOR: Payroll costs for employees not employed full time on the work shall be apportioned on the basis of their time spent on the work. Payroll costs shall include, but not be limited to salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, worker's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing work after regular working hours, on Sunday or legal holidays shall be included in the above to the extent authorized by the OWNER.

11.4.2. Cost of all materials and equipment furnished and incorporated in the work, including costs of transportation and storage thereof, and manufacturers' field services required in connection therewith: All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3. Payments made by CONTRACTOR to the Subcontractors for work performed by Subcontractors: If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to him and shall deliver such bids to OWNER who will then determine with the advice of ENGINEER, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Cost of the Work shall be determined in accordance with Paragraphs 11.4 and 11.5. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. Costs of special consultants (including, but not limited to, ENGINEERS, architects, testing laboratories, surveyors, lawyers, and accountants) employed for services specifically related to the work.

11.4.5. Supplemental costs including the following:

(a) The proportion of necessary transportation, traveling and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the work;
(b) Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR;
(c) Sales, use or similar taxes related to the work, and for which CONTRACTOR is liable, imposed by any governmental authority;
(d) Deposits lost for causes other than CONTRACTOR's negligence, royalty payments and fees for permits and licenses;
(e) Losses, damages and expenses, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the execution of and to the work, provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, he shall be paid for his services a fee proportionate to that stated in Paragraph 11.6.2;
(f) The cost of utilities, fuel and sanitary facilities at the site;
(g) Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the work;
(h) Cost of premiums for bonds and insurance which OWNER is required to pay.

11.5. The term Cost of the Work shall not include any of the following:

11.5.1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general mangers, ENGINEERS, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in his principal or a branch office for general administration of the work and not specifically included in the schedule referred to in Subparagraph 11.4.1. -- all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.

11.5.2. Expenses of CONTRACTOR's principal and branch offices other than his office at the site.

11.5.3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the work and charges against CONTRACTOR for delinquent payments.

11.5.4. Cost of premiums for all bonds and for all insurance policies whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except as otherwise provided in Subparagraph 11.4.5(h).).

11.5.5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

11.5.6. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.4.

11.5.7. Temporary shut down of work due to unknown existing condition. CONTRACTOR shall not charge OWNER for equipment of labor for idled operations due to unforeseen condition at the work site.

CONTRACTOR's Fee

11.6. The CONTRACTOR's Fee which shall be allowed to CONTRACTOR for his overhead and profit shall be determined as follows:

11.6.1.A fixed mutually acceptable. If no mutually acceptable fixed fee can be agreed upon, then,

11.6.2.A fee based on the following percentages of the various portions of the Cost of the Work:

(a) for costs incurred under Paragraphs 11.4.1. and 11.4.2.; the CONTRACTOR's Fee shall be ten (10) percent;
(b) for costs incurred under Paragraph 11.4.3., the CONTRACTOR's Fee shall be five (5) percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to the Subcontractor as a fee for overhead and profit shall be ten (10) percent; and
(c) no fee shall be payable on the basis of costs itemized under Paragraphs 11.4.4., 11.4.5., and 11.5.

11.7. The amount of credit to be allowed by CONTRACTOR to OWNER for any such change which results in a net decrease in cost, will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any.

11.8. Whenever the cost of any work is to be determined pursuant to Paragraphs 11.4 and 11.5, CONTRACTOR will submit in form prescribed by ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowances

11.9. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the work so covered to be done by such materialmen, suppliers, or Subcontractors and for such sums within the limit of the allowances as ENGINEER may approve. Upon final payment, the Contract Price shall be adjusted as required and an appropriate Change Order issued. CONTRACTOR agrees that the original Contract Price includes such sums as he deems proper for costs and profit on account of cash allowances. No demand for additional cost or profit in connection therewith will be allowed.

ARTICLE 12 - CHANGE OF THE CONTRACT TIME

12.1. The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to OWNER and ENGINEER within fifteen days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five days of such occurrence unless ENGINEER allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by ENGINEER if OWNER and CONTRACTOR cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

12.2. The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR if he makes a claim therefor as provided in Paragraph 12.1. Such delays shall include, but not be restricted to, acts or neglect by any separate CONTRACTOR employed by OWNER, fires, floods, labor disputes, epidemics, abnormal weather conditions, or Acts of God.

12.3. All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

ARTICLE 13 - WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

Warranty and Guarantee

13.1. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all materials and equipment will be new unless otherwise specified and that all work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents and of any inspections, tests, or approvals referred to in Paragraph 13.2. All unsatisfactory work, all faulty or defective work, and all work not conforming to the requirements of the Contract Documents at the time of acceptance thereof or of such inspections, tests, or approvals, shall be considered defective. Prompt notice of all defects shall be given to CONTRACTOR. All defective work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13.

Tests and Inspections

13.2. If the Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any work to specifically be inspected, tested, or approved by some public body, CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing, or approval. All other inspections, tests and approvals required by the Contract Documents shall be performed by organizations acceptable to OWNER and CONTRACTOR and the costs thereof shall be borne by CONTRACTOR unless otherwise specified.

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the work for all inspections, tests, or approvals. If any such work required so to be inspected, tested, or approved is covered without written approval of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation, and such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of his intention to cover such work and ENGINEER has not acted with reasonable promptness in response to such notice.

13.4. Neither observations by ENGINEER, nor inspections, tests, or approvals by persons other than CONTRACTOR shall relieve CONTRACTOR from his obligations to perform the work in accordance with the requirements of the Contract Documents.

Access to Work

13.5 ENGINEER and his representatives and other representatives of OWNER will at reasonable times have access to the work. CONTRACTOR shall provide proper and safe facilities for such access and observation of the work and also for any inspection or testing thereof by others.

Uncovering Work

13.6. If any work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for his observation and replaced at CONTRACTOR's expense.

13.7. If any work has been covered which ENGINEER has not specifically requested to observe prior to its being covered, or if ENGINEER considered it necessary or advisable that covered work be inspected or tested by others, CONTRACTOR at ENGINEER's request shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the work in question, furnishing all necessary labor, material, and equipment. If it is found that such work is defective, CONTRACTOR shall bear all the expenses of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if he makes a claim therefor as provided in Articles 11 and 12.

OWNER May Stop the Work

13.8. If the work is defective, or CONTRACTOR fails to supply sufficient skilled workmen or suitable materials or equipment, or if CONTRACTOR fails to make prompt payments to Subcontractors or for labor, materials, or equipment, OWNER may order CONTRACTOR to stop the work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work

13.9. If required by ENGINEER prior to approval of final payment, CONTRACTOR shall promptly, without cost to OWNER and as specified by ENGINEER, either correct any defective work, whether or not fabricated, installed or completed, or, if the work has been rejected by ENGINEER, remove it from the site and replace it with non-defective work. If CONTRACTOR does not correct such defective work or remove and replace such rejected work within a reasonable time, all as specified in a written notice from ENGINEER, OWNER may have the deficiency corrected or the rejected work removed and replaced. All direct and indirect costs of such correction or removal and replacement, including compensation for additional professional services, shall be paid by CONTRACTOR, and an appropriate deductive Change Order shall be issued. CONTRACTOR shall also bear the expenses of making good all work of others destroyed or damaged by his correction, removal or replacement of his defective work.

One-Year Correction Period

13.10. If, after the approval of final payment and prior to the expiration of one year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such defective work, or, if it has been rejected by OWNER, remove it from the site and replace it with nondefective work. If CONTRACTOR does not promptly comply with the terms of such instructions, OWNER may have the defective work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by CONTRACTOR.

Acceptance of Defective Work

13.11. If, instead of requiring correction or removal and replacement of defective work, OWNER (and, prior to approval and final payment, also ENGINEER) prefers to accept it, he may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by CONTRACTOR to OWNER.

Neglected Work by CONTRACTOR

13.12. If CONTRACTOR should fail to prosecute the work in accordance with the Contract Documents, including any requirements of the progress schedule, OWNER, after seven days written notice to CONTRACTOR may, without prejudice to any other remedy he may have, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against CONTRACTOR if ENGINEER approves such action, in which case a Change Order shall be issued incorporating the necessary revisions in the Contract Documents including an appropriate reduction in the Contract Price. If the payments then or thereafter due CONTRACTOR are not sufficient to cover such amount, CONTRACTOR shall pay the difference to OWNER.

ARTICLE 14 - PAYMENTS AND COMPLETION

Schedules

14.1. At least ten days prior to submitting the first application for a progress payment, CONTRACTOR shall submit a progress schedule, a final schedule of Shop Drawing submissions and a schedule of values of the work. These schedules shall be satisfactory in form and substance to ENGINEER. The schedule of values shall include quantities and unit prices aggregating the Contract Price, and shall subdivide the work into component parts in sufficient detail to serve as the basis for progress payments during construction. Upon approval of the schedules of values by ENGINEER, it shall be incorporated into the form of Application for Payment furnished by ENGINEER.

Application for Progress Payment

14.2. At least ten days before each progress payment falls due (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the work completed as of the date of the application and accompanied by such data and schedules as ENGINEER may reasonably require. If payment is requested on the basis of material and equipment not incorporated in the work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by such data, satisfactory to

OWNER, as will establish OWNER's title to the material and equipment and protect his interest therein, including applicable insurance. Each subsequent Application for Payment shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the work have been applied to discharge in full all of CONTRACTOR's obligations reflected in prior Applications for Payment. Except where greater retention is necessary pursuant to definite circumstances specifically provided for in the construction contract, the following schedule of retained amounts from progress payments shall be followed:

(a) Not more than 10% of the dollar value of all work in place until work is 50% in place.
(b) After the work is 50% in place, additional retainage shall not be withheld unless the OWNER determines that the CONTRACTOR is not making satisfactory progress, or for other specific cause relating to the CONTRACTOR's performance under the Contract. If the OWNER so determines, the OWNER may retain not more than 10% of the dollar value of work more than 50% in place.
(c) The retained funds shall not exceed the pro rata share of the OWNER's matching requirement under the construction contract and shall not be co-mingled with other funds of the OWNER and shall be deposited in an interest bearing account in a regulated financial institution in this state wherein all such retained funds are kept by the OWNER which shall account for both retainage and interest on each construction contract separately. An OWNER is not required to deposit retained funds in an interest bearing account if the retained funds are to be provided under a state or federal grant and the retained funds have not been paid to the OWNER.
(d) Except as provided in 14.2.6 and 14.2.7, retainage and interest earned on retainage shall be released to the CONTRACTOR together with the final progress payment.
(e) At any time after 94% of work under the Contract is in place and at the request of the original CONTRACTOR, the OWNER shall release the retainage plus interest to the original CONTRACTOR only if the original CONTRACTOR provides to the OWNER an irrevocable letter of credit in the amount of the retainage plus interest, issued by a bank authorized to do business in this state, containing terms mutually acceptable to the CONTRACTOR and the OWNER.

14.2.1. If a dispute regarding a matter described in 14.2.2. arises, the CONTRACTOR and the OWNER shall designate an agent who has background, training, and experience in the construction of facilities similar to that which is the subject of the Contract, as follows:

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

14.2.2. The OWNER may request dispute resolution by the agent regarding the following:

(a) at any time during the term of the Contract, to determine whether there has been a delay for reasons that were within the control of the CONTRACTOR, and the period of time that delay has been caused, continued, or aggravated by actions of the CONTRACTOR.
(b) at any time after 94% of work under the Contract is in place, whether there has been an unacceptable delay by the CONTRACTOR in performance of the remaining 6% of work under the Contract. The agent shall consider the terms of the Contract and the procedures normally followed in the industry and shall determine whether the delay was for failure to follow reasonable and prudent practices in the industry for completion of the project.

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

14.2.4. The agent may request and shall receive all pertinent information from the parties and shall provide an opportunity for an informal meeting to receive comments, documents, and other relevant information in order

to resolve the dispute. The agent shall determine the time, place, and procedure for the informal meeting. A written decision and reasons for the decision shall be given to the parties within 14 days after the meeting.

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

14.2.6. If the dispute resolution results in a decision:

(a) that there has been a delay as described in 14.2.2.(a), all interest earned on retained funds during the period of delay shall become the property of the OWNER;
(b) that there has been unacceptable delay as described in 14.2.2.(b), the OWNER may contract with a subsequent contractor to complete the remaining 6% of the work under the Contract, and interest earned on retained funds shall become the property of the OWNER. A subsequent contractor under this subdivision shall be paid by the OWNER from the following sources until each source is depleted, in the order listed below:

(1) the dollar value of the original Contract, less the dollar value of funds already paid to the original CONTRACTOR and the dollar value of work in place for which the original CONTRACTOR has not received payment;
(2) Retainage from the original CONTRACTOR, or funds made available under a letter of credit provided under 14.1.(e);
(3) interest earned on retainage from the original CONTRACTOR, of funds made available under a letter of credit provided under 14.1.(e).

14.2.7. If the OWNER contracts with a subsequent CONTRACTOR as provided in 14.2.6.(b), the final progress payment shall be payable to the original CONTRACTOR within the time period specified in 14.4.1. The amount of the final progress payment to the original CONTRACTOR shall not include interest earned on retained funds. The OWNER may deduct from the final progress payment all expenses of contracting with the subsequent CONTRACTOR. This act shall not impair the right of the OWNER to bring an action or to otherwise enforce a performance bond to complete work under a construction Contract.

CONTRACTOR's Warranty of Title

14.3. CONTRACTOR warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

Approval of Payments

14.4. ENGINEER will, within ten days after receipt of each Application for Payment, either indicate in writing his approval of payment and present the application to OWNER, or return the application to CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the application. OWNER shall, after presentation to him of an approved Application for Payment, pay CONTRACTOR the amount approved by ENGINEER as provided under 14.4.1.

14.4.1. Each progress payment requested, including reasonable interest if requested under 14.4.2. shall be paid within thirty (30) days after receipt by the OWNER of the Application for Payment.

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

14.5. ENGINEER's approval of any payment requested in an Application for Payment will constitute a representation by him to OWNER, based on ENGINEER's on-site observations of the work in progress as an experienced and qualified design professional and on his review of the Application for Payment and the accompanying data and schedules that the work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the work is in accordance with the Contract Documents (subject to an evaluation of the work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in his approval); and that CONTRACTOR is entitled to payment of the amount approved. However, by approving any such payment ENGINEER will not thereby be deemed to have represented that he made exhaustive or continuous on-site inspections to check the quality or the quantity of the work, or that he has reviewed the means, methods, techniques, sequences, and procedures of construction, or that he has made any examination to ascertain how or for what purpose CONTRACTOR has used the monies paid or to be paid to him on account of the Contract Price, or that title to any work, materials, or equipment has passed to OWNER free and clear of any liens.

14.6. ENGINEER's approval of final payment will constitute an additional representation by him to OWNER that the conditions precedent to CONTRACTOR's being entitled to final payment as set forth in Paragraph 14.13 have been fulfilled.

14.7. ENGINEER may refuse to approve the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to OWNER. He may also refuse to approve any such payment, or, because of subsequently discovered evidence of the results of subsequent inspections or tests, nullify any such payment previously approved, to such extent as may be necessary in his opinion to protect OWNER from loss because:

(a) The work is defective, or completed work has been damaged requiring correction or replacement;
(b) Claims or liens have been filed or there is reasonable cause to believe such may be filed;
(c) The Contract Price has been reduced because of Modifications;
(d) OWNER has been required to correct defective work or complete the work in accordance with Paragraph 13.11; or
(e) Of unsatisfactory prosecution of the work, including failure to furnish acceptable submittals or to clean up.

Substantial Completion

14.8. Prior to final payment, CONTRACTOR may, in writing to OWNER and ENGINEER, certify that the entire Project is substantially complete and request that ENGINEER issue a Certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Project to determine the status of completion. If ENGINEER does not consider the Project substantially complete, he will notify CONTRACTOR in writing giving his reasons therefor. If ENGINEER considers the Project substantially complete, he will prepare and deliver to OWNER a tentative Certificate of Substantial Completion which shall fix the date of Substantial Completion and the responsibilities between OWNER and CONTRACTOR for maintenance, heat, and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within the Contract Time. OWNER shall have seven days after receipt of the tentative certificate during which he may make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Project is not substantially complete, he will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR consideration of OWNER's objections, ENGINEER considers the Project substantially complete, he will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive Certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as he believes justified after consideration of any objections from OWNER.

14.9. OWNER shall have the right to exclude CONTRACTOR from the Project after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization

14.10. Prior to final payment, OWNER may request CONTRACTOR in writing to permit him to use a specified part of the Project which he believes he may use without significant interference with construction of the other parts of the Project. If CONTRACTOR agrees, he will certify to OWNER and ENGINEER that said part of the Project is substantially complete and request ENGINEER to issue a Certificate of Substantial Completion for that part of the Project which is substantially complete. Within a reasonable time thereafter OWNER, CONTRACTOR and ENGINEER shall make an inspection of that Part of the Project to determine its status of completion. If ENGINEER does not consider that it is substantially complete, he will notify OWNER and CONTRACTOR in writing giving his reasons therefor. If ENGINEER considers that part of the Project to be substantially complete, he will execute and deliver to OWNER and CONTRACTOR a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before final payment and fixing the responsibility between OWNER and CONTRACTOR for maintenance, heat and utilities as to that part of the Project. OWNER shall have the right to exclude CONTRACTOR from any part of the Project which ENGINEER has so certified to be substantially complete, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Final Inspection

14.11. Upon written notice from CONTRACTOR that the Project is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies.

Final Application for Payment

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, and other documents -- all as required by the Contract Documents -- he may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by such data and schedules as ENGINEER may reasonably require, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all liens arising out of the Contract Documents and the labor and services performed and the materials and equipment furnished thereunder. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material, and equipment for which a lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the work for which OWNER or his property might in anyway be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor, materialman, fabricator, or supplier fails to furnish a release or receipt in full, CONTRACTOR may furnish a bond or other collateral satisfactory to OWNER to indemnify him against any lien.

Approval of Final Payment

14.13. If, on the basis of his observation and review of the work during construction, his final inspection and his review of the final Application for Payment -- all as required by the Contract Documents -- ENGINEER is satisfied that the work has been completed and CONTRACTOR has fulfilled all of his obligations under the Contract Documents, he will, within ten days after receipt of the final Application for Payment, indicate in writing his approval of payment and present the application to OWNER for payment. Thereupon ENGINEER

will give written notice to OWNER and CONTRACTOR that the work is acceptable subject to the provisions of Paragraph 14.16. Otherwise, he will return the application to CONTRACTOR, indicating in writing his reasons for refusing to approve final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the application. OWNER shall within ten days of presentation to him of an approved final Application for Payment, pay CONTRACTOR the amount approved by ENGINEER.

14.14. If after Substantial Completion of the work, final completion thereof is materially delayed through no fault of CONTRACTOR, and ENGINEER so confirms, OWNER shall upon certification by ENGINEER and without terminating the Agreement make payment of the balance due for that portion of the work fully completed and accepted. If the remaining balance for work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the work fully completed and accepted shall be submitted by the CONTRACTOR to the ENGINEER prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment except that it shall not constitute a waiver of claims.

CONTRACTOR's Continuing Obligation

14.15. CONTRACTOR's obligation to perform the work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any progress or final payment by ENGINEER, nor the issuance of a Certificate of Substantial Completion, nor any payment by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Project or any part thereof by OWNER, nor any act of acceptance by OWNER nor any failure to do so, nor any correction of defective work by OWNER shall constitute an acceptance of work not in accordance with the Contract Documents.

Waiver of Claims

14.16. The making and acceptance of final payment shall constitute:

(a) A waiver of all claims by OWNER against CONTRACTOR other than those arising from unsettled liens, from defective work appearing after final inspection pursuant to Paragraph 14.11, or from failure to comply with the requirements of the Contract Documents or the terms of any special guarantees specified therein; and
(b) A waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

OWNER May Suspend Work

15.1. OWNER may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which shall fix the date on which work shall be resumed. CONTRACTOR shall resume the work on the date so fixed. CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if he makes a claim therefor as provided in Articles 11 and 12.

OWNER May Terminate

15.2. If CONTRACTOR is adjudged bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for CONTRACTOR or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable material or equipment, or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction, or if he

disregards the authority of ENGINEER, or if he otherwise violates any provision of the Contract Documents, then OWNER may, without prejudice to any other right or remedy and after giving CONTRACTOR and his Surety seven days' written notice, terminate the services of CONTRACTOR and take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by CONTRACTOR, and finish the work by whatever method he may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Project, including compensation for additional professional services, such excess shall be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER shall be determined by ENGINEER and incorporated in a Change Order.

15.3. Where CONTRACTOR's services have been so terminated by OWNER, said terminations shall not affect any rights of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by OWNER due CONTRACTOR will not release CONTRACTOR from liability.

15.4. Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may without cause and without prejudice to any other right or remedy elect to abandon the Project and terminate the Agreement. In such case, CONTRACTOR shall be paid for all work executed and any expense sustained plus a reasonable profit.

CONTRACTOR May Stop Work or Terminate

15.5. If, through no act or fault of CONTRACTOR, the work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted, or OWNER fails to pay CONTRACTOR any sum approved by ENGINEER within thirty days of its approval and presentation, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, terminate the Agreement and recover from OWNER payment for all work executed and any expense sustained plus a reasonable profit. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or OWNER has failed to make any payment as aforesaid, CONTRACTOR may upon seven days' notice to OWNER and ENGINEER stop the work until he has been paid all amounts then due.

ARTICLE 16 - OFFICE SPACE

16.1. The CONTRACTOR shall establish and maintain, at his own expense, office headquarters at the site of the Project. Telephone and fax service shall be provided. At the office headquarters shall be kept a complete set of the Contract Documents and Shop Drawings.

16.2. The CONTRACTOR shall arrange office space for the ENGINEER in a separate building or in a room completely partitioned off from the CONTRACTOR's office, if in the same building. The CONTRACTOR shall provide adequate heating and lighting telephone and fax service within the ENGINEER's office.

ARTICLE 17 - MISCELLANEOUS

Giving Notice

17.1. Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to him who gives the notice.

Computation of Time

17.2. When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

General

17.3. All monies not paid when due hereunder shall bear interest at the maximum rate allowed by law at the place of the Project.

17.4. All Specifications, Drawings and copies thereof furnished by ENGINEER shall remain his property. They shall not be used on another Project, and, with the exception of those sets which have been signed in connection with the execution of the Agreement, shall be returned to him on request upon completion of the Project.

17.5. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by Paragraphs 6.30, 13.1, 13.10, and 14.3 and the rights and remedies available to OWNER and ENGINEER thereunder, shall be in addition to and shall not be construed in any way as a limitation of any rights and remedies available to them which are otherwise imposed or available by law, by special guarantee, or by other Provisions of the Contract Documents.

17.6. Should OWNER or CONTRACTOR suffer injury or damage to his person or property because of any error, omission, or act of the other or of any of his employees or agents or others for whose acts he is legally liable, claim shall be made in writing to the other party within a reasonable time of the first observance of such injury or damage.

17.7. The Contract Documents shall be governed by the law of the place of the Project.

END OF SECTION

Pittsfield Charter Township

6201 West Michigan Avenue, Ann Arbor, MI 48108
Phone: (734) 822-3101 • Fax: (734) 944-8024
Website: www.pittsfield-mi.gov

Mandy Grewal, Supervisor

Mandy Grewal
Township Supervisor
supervisor@pittsfield-mi.gov

Alan Israel
Township Clerk
clerk@pittsfield-mi.gov

Patricia Tupacz Scribner
Township Treasurer
treasurer@pittsfield-mi.gov

CONTRACT ADDENDUM

THIS ADDENDUM is made this _____ day of _____, _____ 2015, by Pittsfield Charter Township, located at 6201 W. Michigan Avenue, Ann Arbor, MI 48108-9721 ("the Township"), and _____ ("the Contractor) to a contract between the parties dated _____ for (list the services to be provided) _____ ("the Contract").

The expressed terms of the Contract notwithstanding, the Township and the Contractor agree to the following amendments, which supersede any conflicting terms of the contract and shall become part of the agreement between the parties.

1. ***INSURANCE:*** The Contractor shall maintain Commercial General Liability insurance with coverage of at least $1,000,000.00 per occurrence, Automobile Liability insurance with a combined single limit of $1,000,000.00 per accident, Worker's Compensation coverage of $500,000.00 per employee and, if applicable, Professional Liability insurance of $1,000,000.00 per claim ($2,000,000.00 aggregate per year) during the term of this Addendum.

The Contractor shall add the Township to its existing policies as an additional insured party. Prior to the effective date of the Contract, a certificate issued by the insurance company shall be delivered to the Clerk stating that the Township is an insured party under the policy and provide that the policy shall not be terminated or the Township removed as an insured party without thirty (30) day written notice being mailed to the Township. In the event such coverage is not provided or lapses during the term of the Contract and this Addendum, then the Township may, at its option, terminate the Contract and this Addendum. A breach of this provision shall be a material breach of the Contract.

2. ***TERMINATION*:** Either party may terminate the Contract on 30 days prior written notice to the other party.

3. ***INDEMNIFICATION:*** The Contractor shall protect, defend indemnify and hold harmless the Township, its officers, agents, servants, volunteers and employees from any and all liabilities, claims, actions, causes of action, demands, obligations, liens, and any and all other claims or damages of any kind whatsoever, including legal fees and related costs which may result from injury or death to any persons, including the Contractor's own employees, and for loss or damage to any property, including property owned or in the care, custody or control of Pittsfield Charter Township in connection with or in any way incident to or arising out of the occupancy, use, service, operations, performance or nonperformance of work in connection with the Contract resulting in whole or in part from negligent acts or omissions of the Contractor, any subcontractor, or any employee, agent or representative of the Contractor or any subcontractor.

4. ***COMPLIANCE WITH LAWS AND REGULATIONS:*** The Contractor shall comply with all federal, state and local regulations, including but not limited to all applicable OSHA/MIOSHA requirements and the Americans with Disabilities Act.

5. ***IRAN ECONOMIC SANCTIONS ACT:*** The Contractor certifies that it is not an Iran linked business as defined by the Michigan Iran Economic Sanctions Act (Michigan Compiled Laws §129.311-16).

6. ***INTEREST OF CONTRACTOR AND TOWNSHIP:*** The Contractor promises that it has no interest which would conflict with the performance of services required by this contract. The Contractor also promises that, in the performance of this contract, no officer, agent, employee of the Township, or member of its governing bodies, may participate in any decision relating to this contract which affects his/her personal interest or the interest of any corporation, partnership or association in which he/she is directly or indirectly interested or has any personal or pecuniary interest. This paragraph does not apply if all parties are in compliance with the provisions of Michigan Compiled Laws §15.323.

7. ***EQUAL EMPLOYMENT OPPORTUNITY:*** The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, sex, height, weight, or marital status (except as it relates to a bona fide occupational qualification reasonably necessary to the normal operation of the business). A breach of this provision shall be a material breach of the Contract.

8. ***LIVING WAGE:*** The Township has a Living Wage Ordinance requiring covered vendors who execute a service or professional contract with the Township to pay their employees working under that contract, a minimum wage. The Contractor agrees to comply with applicable provisions of the Living Wage Ordinance.

9. ***CHOICE OF LAW AND FORUM:*** This Contract is to be interpreted by the laws of the State of Michigan. The parties agree that the proper forum for litigation arising out of this contract is in Washtenaw County, Michigan.

ATTESTED TO:

_____	Pittsfield Charter Township
(Contractor Name)	
By:_____	By:_____
(Representative Name) (DATE)	Mandy Grewal (DATE)
Its: _____	Supervisor
	By:_____
	Alan Israel (DATE)
	Clerk

NON-IRAN LINKED BUSINESS CERTIFICATION

This Proposal is submitted in the name of:

(Print Company Name)

The undersigned hereby certifies in accordance with Public Act 517 of the Public Acts of 2012 that it is not an Iran-linked business.

Signed and Sealed this _____ day of _____, 20___.

By _____
(Signature)

_____
(Printed Name of Signature)

_____
(Title)

IRAN ECONOMIC SANCTIONS ACT
Act 517 of 2012

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

The People of the State of Michigan enact:

129.311 Short title.

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.312 Definitions.

Sec. 2. As used in this act:

(a) "Energy sector of Iran" means activities to develop petroleum or natural gas resources or nuclear power in Iran.

(b) "Investment" means 1 or more of the following:

(*i*) A commitment or contribution of funds or property.

(*ii*) A loan or other extension of credit.

(*iii*) The entry into or renewal of a contract for goods or services.

(c) "Investment activity" means 1 or more of the following:

(*i*) A person who has an investment of $20,000,000.00 or more in the energy sector of Iran.

(*ii*) A financial institution that extends $20,000,000.00 or more in credit to another person, for 45 days or more, if that person will use the credit for investment in the energy sector of Iran.

(d) "Iran" means any agency or instrumentality of Iran.

(e) "Iran linked business" means either of the following:

(*i*) A person engaging in investment activities in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers or products used to construct or maintain pipelines used to transport oil or liquefied natural gas for the energy sector of Iran.

(*ii*) A financial institution that extends credit to another person, if that person will use the credit to engage in investment activities in the energy sector of Iran.

(f) "Person" means any of the following:

(*i*) An individual, corporation, company, limited liability company, business association, partnership, society, trust, or any other nongovernmental entity, organization, or group.

(*ii*) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in section 1701(c)(3) of the international financial institutional act, 22 USC 262r(c)(3).

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

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.313 Ineligibility of Iran linked business to submit request for proposal bid; certification.

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

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.314 Effect of false certification.

Sec. 4. If a public entity determines, using credible information available to the public, that a person has submitted a false certification under section 3(2), the public entity shall provide the person with written notice of its determination and of the intent not to enter into or renew a contract with the person. The notice shall include information on how to contest the determination and specify that the person may become eligible for a

future contract with the public entity if the person ceases the activities that cause it to be an Iran linked business. The person shall have 90 days following receipt of the notice to respond in writing and to demonstrate that the determination of false certification was made in error. If a person does not make that demonstration within 90 days after receipt of the notice, the public entity may terminate any existing contract and shall report the name of the person to the attorney general together with information supporting the determination.

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.315 Civil action; penalty.

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.316 Conditional effect.

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

History: 2012, Act 517, Eff. Apr. 1, 2013.

PART II

DETAILED SPECIFICATIONS

1.00 GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this Contract consists of improvements to an sanitary lift station including demolishing existing below grade can type pump station, alterations to the existing concrete wet wells to provide protective wet well coatings and facilitate the installation of new submersible solids handing pumps, electrical, controls and other associated improvements as shown in the Contract Drawings and described in the Specifications.

B. Contract Drawings are included which give specific locations for all work under this Contract.

C. OWNER shall furnish submersible pumps, slide rails, mating elbows, and a hatch for installation by the CONTRACTOR. See Shop Drawings appended to these specifications for details of the equipment furnished by the OWNER.

1.02 CONSTRUCTION WATER

A. Water for construction is not available at the construction site. The CONTRACTOR shall be responsible for obtaining all water necessary for construction.

1.03 CONSTRUCTION POWER

A. Electrical power to be used during construction is available from the OWNER and may be obtained from the existing facilities. The CONTRACTOR shall be responsible for providing all necessary meters, disconnections and transformers. A separate meter shall be installed by the CONTRACTOR for the purpose of establishing compensation for electrical power usage.

1.04 NOTIFICATION OF UTILITIES

A. The CONTRACTOR shall notify all utilities prior to any excavation. Information regarding size and location is available from the utility.

B. MISS DIG - MISS DIG System, Inc. is a Michigan Non-Profit Corporation that operates as the Underground Utility Safety Notification System for the entire state of Michigan**.** The CONTRACTORS shall contact "MISS DIG" not less than 72 hours before starting construction for assistance in locating utilities or for any work to be done on utilities. The toll free phone number is 800-482-7171 and web site address is http://www.missdig.org.

1.05 MAINTENANCE OF EXISTING SEWER FLOW (BYPASS PUMPING)

A. The CONTRACTOR shall be responsible for providing and maintaining a bypass pumping system to continuously maintain pumping operation while the stations are out of service for the construction of the improvements. The bypass pumping system must work automatically and send out an alarm signal to CONTRACTOR's and OWNER's personnel in the event of a pump failure. CONTRACTOR shall be responsible for monitoring and maintaining the system on a 24 hour per day basis during bypass pumping operation. The CONTRACTOR is responsible for all temporary power and wiring for the bypass pumping system.

B. The CONTRACTOR shall provide solids handling pumps suitable for pumping wastewater and each capable of pumping peak design flows as specified below:

1. Moon Road Pump Station – 200 gpm at 72 feet of TDH.

C. The CONTRACTOR shall provide one primary and one backup pump for bypass pumping .The primary pump shall be run off of a temporary power supply from the existing DTE transformer. Coordination for temporary power with DTE in addition to any fees and other costs associated with the temporary power supply are the responsibility of the CONTRACTOR. At a minimum, the backup bypass pump shall be diesel powered or run off a diesel generator to assure continuous pumping ability in the event of an electrical outage.

D. Refer to the Contract Drawings for temporary suction manhole and discharge manhole and/or connection locations.

E. The CONTRACTOR shall install sewer balls or other suitable means of stopping sanitary flow in order to keep the existing wet wells dry to facilitate the coating work.

F. All pumps, pipes, hoses, fittings, the automatic alarm system, diesel fuel, and all other components of the bypass pumping system shall be provided by the CONTRACTOR for a complete and operational system.

G. The CONTRACTOR shall submit to the ENGINEER for his approval written documentation of the proposed plan for maintaining flow, including curves for the proposed pumps and details of the proposed alarm system. No work shall commence until the ENGINEER has approved this plan.

1.06 WORK SCHEDULE

A. The CONTRACTOR shall provide a detailed work schedule. The schedule shall be complete, shall describe intermediate project milestones, and shall show in detail the manner in which he proposes to complete the work under this Contract. The purpose of the schedule is to assist the OWNER in notifying the public of inconveniences and to determine if the CONTRACTOR is reasonably proceeding with the work to assure completion within the specified time.

1.07 CONSTRUCTION SEQUENCE

A. The CONTRACTOR shall be responsible for maintaining the ability to pump sewage at the pump station at all times during construction operations that interrupt the pumping capability of the existing facility. Any temporary piping, pumping, or other work necessary to accomplish the proposed work shall be the responsibility of the CONTRACTOR.

B. The CONTRACTOR shall coordinate and schedule his work with the OWNER when his operation may affect the operation of the existing treatment facilities.

C. Prior to commencing the work, the CONTRACTOR shall provide the ENGINEER a detailed schedule of the proposed work. The schedule shall include a list of tasks required to complete the work; their relevancy to each other; expected duration; and completion dates.

1.08 CONSTRUCTION PERMITS

A. The CONTRACTOR will be required to follow the requirements established by all permits necessary for the construction of this project. The following is a list of all permits that must be obtained prior to the beginning of construction.

1. Permit for Sewerage System, Part 41, Michigan Department of Environmental Quality (MDEQ).This permit has been obtained by the OWNER and is available from the ENGINEER.

2. The application for Washtenaw County ROW permit has been filed for by the OWNER. The permit shall be pulled and the fees paid for by the CONTRACTOR. CONTRACTOR shall comply with the requirements set for in the permit (see Appendix B).

3. The application for working in the R.O.W. of Michigan Avenue has been filed with MDOT and MDOT requirements have been incorporated in the documents; however, this does not relieve the CONTRACTOR from meeting MDOT requirements.

4. Electrical Permit from Pittsfield Township.

1.09 SOIL AND CONCRETE TESTING

A. Construction testing (concrete, asphalt, compaction, etc.) shall be provided by the OWNER.

B. The OWNER shall provide and pay for the service of an independent materials testing laboratory to provide material and compaction testing. The type and minimum frequency of testing shall be as follows:

1. Utility Trenches and Backfill for Underground Structures

- Sieve analysis per source
- Proctor per source
- Compaction testing at 50' intervals per lift, as required

2. Concrete Structures

- Slump, minimum 50 CYD or load
- Air entrainment, minimum 50 CYD or load
- Comprehensive strength, minimum 50 CYD or load

C. The ENGINEER shall determine the exact location of all tests.

D. The CONTRACTOR shall coordinate with the ENGINEER for scheduling with the testing firm. A minimum of 48 hours notice for testing shall be required.

1.10 DUST CONTROL

A. All haul roads, detour roads, and other public and private roads, driveways and parking lots used by the CONTRACTOR must be maintained in a dust free condition during the life of this Contract. The control of the dust shall be accomplished by the application of dust control materials and methods of application as approved and as directed by the ENGINEER. Such dust control materials shall be applied as often as is necessary to control the dust.

B. Cost of providing dust control shall be incidental to the Contract.

C. Should the CONTRACTOR be negligent of his duties in providing dust control, the OWNER may, with or without notice, cause the same to be done and deduct the cost of such work from any monies due or to become due the CONTRACTOR under this Contract, but the performance of such work by the OWNER, or at his insistence, shall service in no way to release the CONTRACTOR from his liability for dust control.

1.11 PROJECT PROGRESS MEETING

A. It shall be the responsibility of the CONTRACTOR to have a representative present at each meeting. The meetings shall be held monthly, or as directed by the OWNER.

1.12 STAGING, STORAGE AND LAY DOWN AREA

A. The CONTRACTOR shall confine his activity within the area defined by easement and shall not infringe on the private property. The CONTRACTOR shall make his own arrangements for storage lay down areas and for loading and unloading of material and equipment.

1.13 AUDIO VIDEO DVD COVERAGE

A. The CONTRACTOR shall furnish to the OWNER, two color audio-video DVD recordings of the project site. It is recommended that the CONTRACTOR maintain and additional copy for record.

1. The DVD shall be for recording all areas proposed for improvement and for all areas requiring protection from construction activities. Areas requiring recording include, but are not limited to, the following:

    a. Existing station site.
    b. Existing fencing.
    c. Existing vegetation and landscaping.
    d. Existing pavement in vicinity of access drive locations for the stations.
    e. Existing mailboxes, culverts, guy wires, power poles, transformers and other items.
    f. Any other features impacted the construction activities, including the access drive and areas used for staging and storage of materials.

2. Audio on the DVD shall referenced camera locations, and items in frame. Recording shall pan to abandoned structures to establish points of reference and to help correlate between DVD recording and the site plan.

B. The audio-video taping shall be DVD and of such quality to accurately describe the existing conditions. The DVD shall be produced one (1) week prior to the placement of materials or equipment in the construction area. The DVD shall be of commercial quality.

C. The DVD must be recorded while the visibility is clear and at no time will it be allowed during periods of ground cover.

D. The DVD shall be continuous running and shall include date, time, and location at appropriate intervals. The location shall be easily referenced to the Contract Drawings.

1.14 POWER OUTAGE

A. The CONTRACTOR shall coordinate all power outages at the pump station and PNC bank that is on the same service as the pump station.

B. One week notice must be given for any power outages.

C. Power outage shall be limited to 2 hours during non-work hours.

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Schedule of Values

B. Initial Application of Payment

C. Application for Payment

D. Application for Payment at Substantial Completion

E. Final Payment Application

F. Change Procedures

1.02 RELATED SECTIONS

A. Section 1.33 - Submittal Procedures

1.03 SCHEDULE OF VALUES

A. Submit typed schedule for review and approval. The approved schedule of values will be used to prepare future Applications for Payment.

B. Submit Schedule of Values in triplicate to the ENGINEER within 15 days after date of OWNER-CONTRACTOR Agreement for approval.

C. Format: Identify each line item with number and title of the major specification Section.

D. Include within each line item, a direct proportional amount of CONTRACTOR's overhead and profit.

E. Revise schedule to list approved Change Orders, with each Application for Payment.

F. Include the following Project Identification on the Schedule of Values:

1. Project Name and Location
2. Name of OWNER and ENGINEER
3. Project Number
4. CONTRACTOR's Name and Address
5. Date of Submittal

G. Arrange Schedule of Values in a tabular form with separate rows for each Specification Section and separate columns for each major structure of area of Work. Additionally, separate line items for the following shall be included:

1. Mobilization
2. Bonds & Insurance
3. Allowances
4. Start-Up, Testing, Debugging
5. Project Close-Out

H. Provide a breakdown of the Contract Price in sufficient detail to facilitate continued evaluation of Application for Payment and progress reports. Break principal subcontract amounts down into several line items.

I. For each part of the Work where an Applicant for Payment may include materials for 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.

J. Update and resubmit schedule of values when change orders result in a change in the contract price.

1.04 INITIAL APPLICATION FOR PAYMENT

A. 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

1.05 APPLICATIONS FOR PAYMENT

A. Submit five (5) copies of each application.

B. Content and Format: Utilize Schedule of Values and Change Orders for listing items in Application for Payment.

C. Payment Period: Payments made according to the schedule described in the General Conditions and or in accordance with the OWNER's requirements.

D. With each copy of the applications submit Waiver of Lien from all subcontractors or suppliers for work included in Application for Payment, other than the first pay application.

E. Submit a completed CONTRACTOR's Declaration with each Application for Payment.

1.06 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Following issuance of Certificate of Substantial Completion, submit an Application for Payment.

B. Administrative actions and submittals that shall proceed or coincide with this application include:

1. Occupancy permits and similar approvals (if applicable).
2. Warranties (guarantees) and maintenance agreements.
3. Test records.
4. Maintenance instructions; O&M manuals.
5. Meter readings.
6. Start-up performance reports and inspection reports.
7. Changeover information related to OWNER's occupancy, use, operation and maintenance.

8. Final cleaning.
9. Application for reduction of retainage, and consent of surety.
10. Advice on shifting insurance coverages.
11. List of incomplete work, recognized as exceptions to ENGINEER's Certificate of Substantial Completion.
12. As-Built Drawings.

1.07 FINAL PAYMENT APPLICATION

A. 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. Proof that taxes, fees, and similar obligations have been paid.
6. Removal of temporary facilities and services.
7. Removal of surplus materials, rubbish, and similar elements.
8. Change of locks to OWNER's access.
9. CONTRACTOR's waivers of liens for project.

1.08 CHANGE PROCEDURES

A. The ENGINEER will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by the General Conditions and Supplemental General Conditions by issuing supplemental instructions.

B. The ENGINEER may issue a Field Bulletin which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. CONTRACTOR will prepare and submit a detailed estimate within ten days.

C. The CONTRACTOR may propose changes by submitting a request for change to the ENGINEER describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other CONTRACTORS.

D. Any quote provided for review and approval shall include, as a minimum, the job classifications involved, the related hourly rates, the estimated overtime involved, the estimated hours (regular and overtime) involved, the material costs, and all related cost figures. The OWNER reserves the right to request clarifications, and accepts no additional responsibilities due to the CONTRACTOR's failure to satisfy this clause.

E. Stipulated Sum/Price Change Order: will be based on Field Bulletin and CONTRACTOR's fixed price quotation or CONTRACTOR's request for a Change Order as approved by ENGINEER.

F. Work Directive Change: ENGINEER may issue a directive, signed by the OWNER, instructing the CONTRACTOR to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

G. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. ENGINEER will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

H. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

I. Execution of Change Orders: ENGINEER will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

NOT USED

END OF SECTION

1.00 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for processing allowances. Utilities and their installation are shown and specified in the Contract Documents by allowances.

B. The allowances are intended to cover the required labor and materials by the utility company to provide a complete and operating system. Additionally, CONTRACTOR shall be responsible for all coordination with the utility company including the associated restoration.

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 the CONTRACTOR shall notify all utility companies and begin coordination efforts in order to avoid delay in performance of the work.

B. Use allowances only as directed for OWNER's purposes, and only by Change Orders which designate amounts to be charged to the allowance.

C. 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 the General Conditions.

D. At project closeout, any amounts remaining in allowances will be credited to OWNER by Change Order.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

3.01 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.

3.02 LUMP SUM ALLOWANCE FOR NATURAL GAS SERVICE CONSTRUCTION

A. Natural gas service relocation for the pump station generator is to be provided by the utility company by relocating the service locations, meters and related work. A total allowance of $10,000 for natural gas service relocations 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: MichCon.

3.03 LUMP SUM ALLOWANCE FOR ELECTRICAL MODIFICATIONS

A. Utility company is expected to relocate underground primary cables and related work and service connection to provide power to the pump station. Refer to Electrical Drawing for additional details of. For further information, contact Detroit Edison Company (734) 332-3112. An allowance of $30,000 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.

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Coordination and Project Conditions

B. Field Engineering

C. Pre-Construction Conference

D. Site Mobilization Meeting.

E. Progress Meetings

F. Pre-installation Meetings

1.02 COORDINATION AND PROJECT CONDITIONS

A. Coordinate with utility companies for construction of utilities to the construction site.

B. Coordinate construction operations included under different Section 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.

C. 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.

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. Request of information.
6. Project closeout activities.

E. Coordinate scheduling, submittals, and Work of the various sections of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

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

G. Check motor voltages and control characteristics.

H. Coordinate controls, interlocks, wiring of switches, and relays.

I. Coordinate wiring and control diagrams.

1.03 PRE-CONSTRUCTION CONFERENCE

A. OWNER 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, CONTRACTOR and its superintendent, major Subcontractors, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matter 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. Coordination with other construction work and other CONTRACTORS.
5. Procedures for processing field decisions and Change Orders.
6. Procedures for processing Applications for Payment.
7. Distribution of Contract Documents.
8. Submittal of Shop Drawings, Product Data, and Samples.
9. Preparation of record documents
10. Use of the premises.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. CONTRACTOR's Quality Assurance Plan.
14. Safety procedures.
15. First Aid.
16. Security.
17. Housekeeping.
18. Working hours.
19. Stormwater Management and Soil Erosion Control Provisions.
20. Utility Contacts.

1.05 SITE MOBILIZATION MEETING

A. OWNER will schedule a conference at the project site prior to the CONTRACTOR's occupancy.

B. Attendance required by the OWNER, CONTRACTOR's Superintendent, and the major subcontractors.

C. CONTRACTOR shall submit a site plan identifying the CONTRACTOR's limits of work, trailer and storage area locations, for coordination with other work.

D. Agenda:

1. Use of premises by OWNER and CONTRACTOR.
2. OWNER's requirements.
3. Construction facilities and controls.

4. Temporary utilities.
5. Survey.
6. Security and housekeeping procedures.
7. Schedules.
8. Procedures for maintaining record documents.
9. Inspection and acceptance of equipment put into service during the construction period.
10. Site safety.

1.06 PROGRESS MEETINGS

A. The ENGINEER shall schedule and administer meetings throughout progress of the Work.

B. In coordination with the OWNER and the CONTRACTOR, the ENGINEER shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record and distribute the minutes.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, OWNER, ENGINEER as appropriate to agenda topics for each meeting.

D. Agenda:

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

E. The ENGINEER shall record minutes and distributes copies within five days after meeting to participants, with copies to the CONTRACTOR, OWNER, participants, and those affected by decisions made.

F. The CONTRACTOR shall revise the construction schedule as needed after each progress meeting.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

NOT USED

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures

B. Certifications

C. Shop Drawings

D. Product Data

E. Samples

F. Manufacturers' Instructions

G. Manufacturers' Field Reports

H. Construction Schedule

I. Submittal Schedule

1.02 SUBMITTAL PROCEDURES

A. 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. Resubmittals should have the same number as the original, plus a letter designation for each Resubmittal (i.e., 7-A, 7-B, etc.).

B. 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.

C. Include the following information on the label for processing and recording action taken.

1. Project name.
2. Date.
3. Name and address of ENGINEER.
4. Name and address of CONTRACTOR.
5. Name and address of subcontractor.
6. Name and address of supplier.
7. Name of manufacturer.
8. Number and title of appropriate specification sections.
9. Drawing number and detail references, as appropriate.

D. Schedule submittals to expedite the Project, and deliver to ENGINEER at business address. Coordinate submission of related items. Coordinate related activities that require sequential activity.

E. Review and approve shop drawings, project data, and samples before submitting them.

F. Verify field measurements, field construction criteria, catalog numbers, and similar data. Indicate on the submission exactly what was verified.

G. Any markings done by CONTRACTOR shall be done in a color other than red. Red is reserved for ENGINEER's marking.

H. The number of copies to be submitted will be determined at the pre-construction conference. Reproducible 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.

I. Coordinate each submittal with the requirements of the Contract Documents.

J. Provide space for CONTRACTOR and ENGINEER review stamps.

K. Apply CONTRACTOR's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

L. Submit the number of copies that the CONTRACTOR requires, plus three copies that will be retained by the OWNER and ENGINEER.

M. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

N. No claim will be allowed for damages or extension of time because of delays in the work resulting from rejection of material or from revision and resubmittal of Shop Drawings, project data, or samples.

O. 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.

P. ENGINEER reserves the right to withhold action on submittal required coordination with other submittals until related submittals are received.

Q. Do not install materials or equipment which require submittals until the submittals are returned with ENGINEER's/OWNER's stamp and initials or signature indicating approval. The OWNER shall have final approval authority.

R. CONTRACTOR's responsibility of errors, omissions, and deviations from requirements of Contract Documents in submittals is not relieved by the ENGINEER's review.

S. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with requirements.

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

U. Submittals not requested in conformance with this Specification will not be recognized or processed.

V. Revise and resubmit as required, identify all changes made since the previous submittal.

W. In the event that more than two re-submittals of any submittal is necessary to achieve conformance to the Contract requirements, CONTRACTOR shall be charged for excess engineering. The OWNER shall deduct these charges from the CONTRACTOR's final payment. Charges will be $115.00/hr. minimum 4 hours, for each additional submittal of an item. A tabulated record of such charges will be provided for the CONTRACTOR's review prior to the processing of the final payment.

X. Submit new project data and samples when the initial submittal is returned disapproved.

1.03 CERTIFICATIONS

A. When specified in individual Specification Sections, submit certification by the manufacturer, installation/application subcontractor, or the CONTRACTOR to ENGINEER, in quantities specified for Product Data.

B. Indicate that the material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certifications may be recent or previous test results of the material or product, but must be acceptable to ENGINEER.

1.04 SHOP DRAWINGS

A. Shop Drawings: Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 1.70.

B. 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.

C. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates, and similar Drawings. Include the following information:

1. Dimension.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurements.

D. 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.

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

F. 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.

G. 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.

H. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.05 PRODUCT DATA

A. Product Data: Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Provide copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 1.70.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 1.70.

1.06 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 or 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. Refer to other specifications sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

E. 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.

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

G. Maintain sets of samples, as returned, at the site, for quality comparisons throughout the course of construction.

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

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

1.07 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to ENGINEER for delivery to OWNER in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Refer to Section 1.40 - Quality Requirements, Manufacturers' Field Services article.

1.08 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the OWNER.

B. Submit report in duplicate, within 30 days of observation, to ENGINEER and OWNER for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.09 CONSTRUCTION SCHEDULE

A. Bar Chart Schedule:

1. Prepare a fully developed, horizontal bar chart type construction schedule. Submit within 30 days of the date established for commencement of the work.

2. Provide a separate item bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated on schedule of values.

3. Prepare schedule of sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for entire construction period.

4. 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.

5. Coordinate construction schedule with schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other schedules.

6. Indicate completion in advance of the date established for substantial completion. Indicate substantial completion of 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 two weeks following the meeting or activity.

1.10 SUBMITTAL SCHEDULE

A. After development and acceptance of the construction schedule, prepare a complete schedule of submittals. Submit a submittal 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 parities 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 two weeks following the meeting or activity.

2.00 PRODUCTS

NOT USED

3.00 EXECUTIONS

3.01 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 the requirements of the Contract Documents; final acceptance will depend upon the compliance.

2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted" that part of the work covered by the submittal may proceed, provided it complies with notation or correction 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 the 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. Additional Information Needed: When submittal is marked "Submit Specified Item" CONTRACTOR shall submit requested information.

5. 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".

6. 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.

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Quality Control and Control of Installation

B. References

C. Testing and Inspection Services

D. Manufacturer's Field Services

1.02 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturer's instructions, including each step in sequence.

C. Should manufacturer's instructions conflict with Contract Documents, request clarification from ENGINEER before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

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

1.03 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Should specified reference standards conflict with Contract Documents, request clarification from the ENGINEER before proceeding.

C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the ENGINEER shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TESTING AND INSPECTION SERVICES

A. OWNER will employ and pay for specified services of an independent firm to perform testing and inspection.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by the ENGINEER. Refer also to testing requirements in Section 3.30 – Concrete.

1. Laboratory: Authorized to operate in location in which project is located.
2. Laboratory Staff: Maintain a full time specialist on staff to review services.
3. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections and source quality control may occur on or off the project site. Perform off-site testing as required by the ENGINEER or the OWNER.

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

E. CONTRACTOR shall coordinate with ENGINEER and/or OWNER; cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify ENGINEER and independent firm 48 hours prior to expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR's use.

F. Testing and employment of testing agency or laboratory shall not relieve CONTRACTOR of obligation to perform Work in accordance with requirements of Contract Documents.

G. The same independent firm on instructions by the ENGINEER shall perform re-testing or re-inspection required because of non-conformance to specified requirements. Payment for re-testing or re-inspection will be charged to the CONTRACTOR by deducting testing charges from the Contract Sum/Price.

H. Testing Agency Responsibilities:

1. Test samples of mixes submitted by CONTRACTOR.
2. Provide qualified personnel at site. Cooperate with ENGINEER and CONTRACTOR in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify ENGINEER and CONTRACTOR of observed irregularities or non-conformance of Work or products.
6. Perform additional tests required by ENGINEER.

I. Agency Reports: After each test, promptly submit two copies of report to ENGINEER and to CONTRACTOR. When requested by ENGINEER, provide interpretation of test results. Include the following:

1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

J. Limits On Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume any duties of CONTRACTOR.
4. Agency or laboratory has no authority to stop the Work.

1.05 MANUFACTURER'S FIELD SERVICES

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

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

C. Refer to Section 1.33 - Submittal Procedures, Manufacturer's Field Reports article.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

NOT USED

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Basic Product Requirements

B. Product Options

C. Product Substitution Procedures

D. Product Delivery Requirements

E. Product Storage and Handling Requirements

1.02 BASIC PRODUCT REQUIREMENTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for similar components.

1.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.04 PRODUCT SUBSTITUTION PROCEDURES

A. The Contract form “Designation of Major Subcontractors and Suppliers” specify requirements for submitting requests for Substitutions during the bidding period to requirements specified in this section.

B. Substitutions may be considered when a product becomes unavailable through no fault of the CONTRACTOR.

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

D. A request constitutes a representation that the CONTRACTOR:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the Substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to OWNER.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse OWNER for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit Shop Drawings, Product Data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. The ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject request.

1.05 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.06 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation and degradation of Products.

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

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained under acceptable condition.

2.00 PRODUCTS

NOT USED.

3.00 EXECUTION

NOT USED.

END OF SECTION

1.00 GENERAL

1.01 PROJECT CLOSE-OUT PROCEDURES INCLUDE

A. Final Cleaning

B. Starting of Systems

C. Demonstration and Instructions

D. Project Record Documents

E. Operation and Maintenance Data/Manuals

F. Spare Parts and Maintenance Products

G. Product Warranties and Product Bonds

H. Equipment Maintenance Schedule

1.02 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed. Work has been inspected, and that work is complete in accordance with Contract Documents and ready for ENGINEER's review.

B. Substantial Completion

1. Before requesting inspection for Certification of Substantial Completion, complete the following. List exceptions in the request.

a. 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.

b. 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.

c. Advise OWNER of pending insurance changeover requirements.

d. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

e. Obtain and submit releases enabling OWNER unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificate, and similar releases.

f. Complete final cleanup requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

2. Inspection Procedures: On receipt of a request for inspection, ENGINEER will either proceed with inspection or advise CONTRACTOR of unfilled requirements.

    a. ENGINEER will prepare the Certificate of Substantial Completion following inspection or advise CONTRACTOR of construction that must be completed or corrected before the certificate will be issued.

    b. ENGINEER will repeat inspection when requested and assured that the work has been substantially completed.

    c. Results of completed inspection will form the basis of requirements for final acceptance.

3. Date of Substantial Completion will begin the warranty period.

C. Final Acceptance

1. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

    a. 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.

    b. Submit an updated final statement, accounting for final additional changes to the contract price.

    c. 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.

    d. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion, or when OWNER took possession of and responsibility for corresponding elements of the work.

    e. Submit consent of surety to final payment.

    f. Submit a final liquidated damages settlement statement.

    g. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

    h. Submit record drawings, maintenance manuals, damage or settlement survey, property survey, and similar final record information.

    i. Deliver tools, spare parts, extra stock, and similar items.

    j. Make final changeover of permanent locks and transmit keys to OWNER. Advise OWNER's personnel of changeover in security provisions.

    k. 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.

2. Re-inspection Procedure: ENGINEER will inspect the work upon receipt of notice that work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to ENGINEER.

    a. Upon completion of re-inspection, ENGINEER will prepare a certificate of final acceptance or advise CONTRACTOR of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

    b. If necessary, re-inspection will be repeated.

D. All items listed in Section 1.20 required prior to Final Payment Application must be fulfilled.

1.03 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean all equipment and fixtures using cleaning materials and methods appropriate for the surface and material being cleaned.

C. Clean debris from drainage systems.

D. Clean site; sweep paved areas, rake clean landscaped surfaces.

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

1.04 STARTING OF SYSTEMS

A. Prior to start-up of each piece of equipment, the following will be required:

1. CONTRACTOR Inspection

    a. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

    b. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

    c. Verify that wiring and support components for equipment are complete and tested.

    d. Provide written documentation attesting to this inspection prior to contacting the manufacturer for their own inspection. Submit a written report in accordance with Section 1.30 that equipment or system has been properly installed and is functioning correctly.

2. Manufacturer Inspection

    a. Following the CONTRACTOR's inspection, the manufacturer, when specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

b. Manufacturer to provide written report that equipment or system has been properly installed and is functioning correctly.

c. Manufacturer's inspection shall not occur simultaneously with the CONTRACTOR'S inspection.

B. Coordinate schedule for start-up of various equipment and systems. Provide start-up schedule for ENGINEER's review and OWNER's approval.

C. Notify ENGINEER 14 days prior to start-up of each item.

D. Following acceptable CONTRACTOR inspection and manufacturer inspection, execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.

1.05 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to OWNER's personnel at least two weeks prior to date of final inspection. A training schedule must be provided to the OWNER so that adequate time is given to coordinate required personnel.

B. Training of the OWNER's personnel will be permitted only after start-up and after the OWNER's personnel has had some meaningful time to gain experience with the equipment.

C. Unless identified in the individual specification section, the manufacturer will not be permitted to perform start-up and training during the same site visit.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with OWNER's personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time and location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.06 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. Record information concurrent with construction progress, not less than weekly.

E. 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.

F. 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 underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
4. Measured locations of concealed conduit.
5. Field changes of dimension and detail.
6. Details not on original Contract Drawings.

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

H. Submit documents to ENGINEER with claim for final Application for Payment.

1.07 OPERATION AND MAINTENANCE DATA/MANUALS

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

a. Significant design criteria.
b. List of equipment.
c. Parts list for each component.
d. Operating instructions.

e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
g. Internal wiring and piping diagrams.

3. Part 3: Project documents and certificates, including the following:

a. Shop Drawings and product data.
b. Certificates.
c. Photocopies of warranties and bonds.

F. Submit draft copy of completed volumes in final form 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with ENGINEER comments. Revise content of all document sets as required prior to final submission.

G. Submit five (5) sets of revised final volumes, within 10 days after final inspection.

1.08 SPARE PARTS AND MAINTENANCE PRODUCTS

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

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

C. Cover and protect parts from moisture.

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

E. 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.

1.09 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify that documents are in proper form, contain full information, and are notarized.

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

E. Submit prior to final Application for Payment.

F. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with OWNER's permission, submit documents within ten days after acceptance.

2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

3. 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.

G. 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.

1.10 EQUIPMENT 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 in standard manufacturer format for all equipment.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

NOT USED

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall provide all labor, materials, tools and equipment necessary for the preparation and completion of the site of the project.

1.03 WORK AREA AND STORAGE OF MATERIALS

A. The working area shall be organized in an orderly manner with storage and tool sheds, offices and sanitary facilities, parking areas for employees, and all other necessary facilities developed and maintained by the CONTRACTOR. The CONTRACTOR shall keep the site and all haul roads reasonably clean and dust free.

B. All materials, supplies and equipment, whether furnished by the CONTRACTOR or by the OWNER shall be delivered, stored and handled as to prevent the inclusion of foreign materials and/or damage by water, freezing, breakage or other causes. The ENGINEER may require the CONTRACTOR to provide an enclosed storage shed for the storage of the above mentioned materials, supplies and equipment. Packaged materials shall be delivered in the original unopened containers and shall be stored until ready for use. All materials which have been stored shall meet the requirements of the Specifications at the time they are used in the project.

C. Where the CONTRACTOR is required to do work within the rights-of-way under the jurisdiction of governmental bodies, he shall meet the requirements of said governmental bodies for the work and storage within their jurisdiction. Such requirements must be met as a minimum requirement, and if the specifications given herein impose further limitations on the work, they shall also be met as the required work standard.

1.04 EXISTING PUBLIC UTILITIES

A. Existing public utilities and underground structures, such as pipe lines, electric conduits, sewers and water lines are shown on the Plans. The information shown is believed to be reasonably correct and complete; however, neither the correctness nor the completeness of such information is guaranteed.

B. The CONTRACTOR shall conduct his operations so as not to damage any existing utility whether shown in the Plans or not. The CONTRACTOR shall correct, at his own expense, any injury caused during the operations of his subcontractors or suppliers.

C. If the CONTRACTOR desires, or is required by the utility companies, to relocate or protect any power or telephone poles to facilitate his work, any expense encountered from such relocation shall be borne by the CONTRACTOR.

1.05 NOTIFICATION TO UTILITIES

A. Prior to the start of any operations in the vicinity of any utilities, the CONTRACTOR shall notify the utility companies and request that they stake out the locations of the utilities in question.

1.06 SANITARY REQUIREMENTS

A. The CONTRACTOR shall provide adequate sanitary facilities for all persons employed on the project. The sanitary facilities shall conform in every way to the requirements of the "General Safety Rules and Regulations for the Construction Industry."

1.07 UTILITIES

A. The CONTRACTOR shall make all necessary arrangements for the provisions of all utility services, temporary or permanent, required under this contract. The CONTRACTOR shall pay all costs for such connections and services.

B. All utility services shall be inspected by and shall meet the requirements of the applicable codes and governmental bodies.

1.08 PUMPING AND DRAINAGE

A. Adequate pumping and drainage facilities shall be provided and water, from whatever source, entering the work during any stage of construction shall be removed promptly and disposed of in a manner satisfactory to the ENGINEER. All pumping and drainage shall be done with no damage to property or structures and without interference with the right of the public, owners of private property, pedestrians, vehicular traffic, or the work of other CONTRACTORS. Dewatering shall be done in such a manner that the soil under or adjacent to existing structures shall not be disturbed, removed or displaced.

B. The overloading or obstructing of existing drainage facilities shall not be permitted, and the CONTRACTOR shall be solely responsible for any damages caused to such existing drainage facilities during his operations.

1.09 WINTER CONSTRUCTION

A. The ENGINEER shall have permissive authority over the work which is proposed to be done during the winter months. The CONTRACTOR shall provide adequate weather protection, temporary heating and take any other measures which are necessary to insure that the work performed during the winter months is properly installed and protected against damage from freezing.

2.00 PRODUCTS

Not Applicable

3.00 EXECUTION

3.01 CONTROL OF WATER POLLUTION AND SILTATION

A. General Requirements

1. The CONTRACTOR shall conduct his work in a manner to comply with the Soil Erosion and Sedimentation Control Act of 1972, (MICH P.A. 347) that will not cause damaging siltation or pollution of the water in streams, rivers, lakes and reservoirs. The ENGINEER shall advise the Department of Natural Resources of the proposed work. All work of water pollution and siltation control is subject to inspection by the Department of Natural Resources.

2. All applicable regulations of fish and wildlife agencies and statutes relating to the prevention and abatement of pollution shall be complied with in the performance of the Contract.

3. Construction operations shall be conducted in such manner as to reduce erosion to the practicable minimum and prevent damaging siltation to streams or lakes. The area of erodible land exposed to the elements by grading operations, including gravel pits, waste or disposal areas and haul roads, at any one time shall be subject to approval of the ENGINEER and the duration of such exposure prior to final trimming and finishing of the areas shall be as short as practical. The ENGINEER shall have full authority to order the suspension of grading and other operations pending adequate and proper performance of trimming, finishing and maintenance work or to restrict the area of erodible land exposed to the elements.

4. Gravel or stone, consisting of durable particles of rock and containing only negligible quantities of fines, shall be used for construction pads, haul roads and temporary roads in or across streams.

5. The disturbance of lands and waters that are outside the limits of construction as staked is prohibited, except as found necessary and approved by the ENGINEER.

6. The CONTRACTOR shall conduct his work in such manner as to prevent the entry of fuels, oils, bituminous materials, chemicals, sewage or other harmful materials into streams, rivers, lakes or reservoirs.

7. Water from aggregate washing or other operations containing sediment shall be treated by filtration, by use of a settling basin or other means to reduce the sediment content to a level acceptable to the Department of Natural Resources.

8. All waterways shall be cleared as soon as practical of falsework, piling, debris or other obstructions placed during construction operations not a part of the finished work. Care shall be taken during construction and removal of such barriers to minimize the muddying of a stream.

B. Temporary Control Requirements

1. The CONTRACTOR shall provide temporary soil erosion and sedimental controls according to current local soil conservation district soil erosion and sedimentation control standards and specifications or revisions thereof.

2. Permanent soil erosion control measures for all slopes, channels, ditches or any disturbed land area shall be completed within 15 calendar days after final grading or the final earth change has been completed or where significant earth change activity ceases, temporary soil erosion control measures shall be implemented within 30 calendar days. All temporary soil erosion control measures shall be maintained until permanent soil erosion control measures are implemented.

3.02 FINISH GRADING, TOP SOIL

A. After all backfilling and rough grading has been completed and thoroughly compacted, the entire disturbed area at the site shall be graded to smooth, even surfaces as shown by the proposed new contours shown on the Plans. The portion of the disturbed area where no new contours are shown shall be graded to smooth, even surfaces approximating the original surfaces.

B. All debris and larger stones and sticks and the like shall be removed and disposed of and the entire disturbed area made ready for the addition of top soil and seeding.

C. After all construction has been completed; the CONTRACTOR shall spread 4 inches of approved top soil over all graded areas. The stockpiled material may be used for this purpose. If there is not sufficient top soil on the site, the CONTRACTOR shall secure and deliver to the site whatever amount is required at his own expense.

END OF SECTION

1.00 GENERAL

1.01 SUMMARY

A. Section Includes: Selective Demolition Work requires selective removal and off-site disposal of following:

1. The top portions of the existing pump station structures and portion of the Moon Road wetwell structure, as shown in the Drawings.

2. Site features including fencing, concrete, generators and related items as shown in the Drawings.

3. Removal and protection of existing fixtures and equipment items shown or marked as “remove and salvage”.

1.02 DEFINITIONS

A. Remove or Demolish: Remove and dispose of items shown or scheduled. Discard demolished or removed items except for those shown to remain, those shown as reinstalled, those shown as salvaged, and historical items that are to remain OWNER’s property.

B. Remove and Salvage: Items shown as “remove and salvage” remain OWNER’s property. Carefully remove and clean salvage items, pack or crate to protect against damage.

C. Existing to Remain: Protect construction or items shown to remain against damage during selective demolition operations. When permitted by ENGINEER, CONTRACTOR may elect to remove items to suitable, protected storage location during selective demolition and properly clean and reinstall items in their original locations.

1.03 SUBMITTALS

A. Submit schedules listed below to ENGINEER and OWNER.

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

2. Inventory list of removed existing equipment not reused in Contract Work. Submit lists to OWNER. OWNER to determine or select items for retention by OWNER.

3. Inventory list of removed and salvaged items.

4. Inventory list of OWNER-removed items.

5. Interruption of utility service.

6. Coordination for shutoff, capping, and continuation of utility service

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Demolition operations shall comply with OSHA and EPA requirements and EPA notification regulations insofar as they apply to demolition Work under this Contract.

2. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Facility Access:

1. Do not close, block or obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction.

a. Use alternative routes around closed or obstructed routes if required by governing regulations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Disassemble or cut large equipment items into smaller pieces to promote safe removal and transportation

1. Transport and unload items requested by OWNER at designated Site within distance of 5 miles.

2. Haul away and dispose of debris and materials neither retained by OWNER, nor reused or reinstalled.

3. Arrange for disposal areas.

4. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

B. Unloading Salvage Items: Where shown on Drawings as “Remove and Salvage,” carefully remove shown items, clean, store and turn over to OWNER and obtain receipt. OWNER will designate site for receiving items.

C. Handling: CONTRACTOR shall take every precaution to prevent spillage of materials being hauled in public streets.

1. It shall be CONTRACTOR's responsibility to immediately clean spillage that may accidentally occur.

2. Do not burn removed material on or within Project Site.

1.06 PROJECT CONDITIONS

A. Materials Ownership:

1. Salvage Materials: Demolished materials shall become CONTRACTOR’s property, except for items or materials shown as reused, salvaged, reinstalled, or otherwise shown to remain OWNER’s property. Remove demolished material promptly from Site with further disposition at CONTRACTOR’s option.

2. Transport items of salvageable value to CONTRACTOR to CONTRACTOR’s area as they are removed. Storage or sale of demolition items on-site is not allowed.

B. Environmental Requirements: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practicable level. Comply with governing regulations relating to environmental protection. Do not use water

when it may create hazardous or objectionable conditions including ice, flooding, and pollution.

C. OWNER assumes no responsibility for actual condition of items or structures scheduled for demolition.

1.07 SEQUENCING

A. Conduct selective demolition work in manner that minimizes need for disruption or interference of OWNER's normal on-Site operations.

1.08 SCHEDULING

A. Schedule: Submit schedule showing proposed methods and sequence of operations for selective demolition work to OWNER's representative for review before commencement of Work.

B. Arrange selective demolition schedule so as not to interfere with OWNER's on-site operations.

C. Give minimum of 72 hours advance notice to OWNER of demolition activities, which affect OWNER's normal operations.

D. Give minimum of 72 hours advance notice to OWNER if shutdown of service is necessary during changeover.

2.00 PRODUCTS

NOT USED

3.00 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Before beginning selective demolition work inspect areas of Work. Survey existing conditions and correlate with requirements shown to determine extent of selective demolition required. Photograph existing structure surfaces, equipment, or surrounding properties, which could be misconstrued as damage resulting from selective demolition work. File with OWNER's representative before starting Work.

B. Inventory and record condition of items scheduled as "remove and reinstall or items scheduled as "remove and salvage."

C. Verify disconnection and capping of utilities within the affected area of Work.

D. If unanticipated mechanical, electrical, or structural elements conflict with intended function or design, investigate, and measure nature and extent of conflicts. Promptly submit detailed written reports to OWNER's Representative. Pending receipt of directive from OWNER's Representative, rearrange selective demolition schedule to continue general job progress without delay.

3.02 UTILITY SERVICES

A. Where utility services are scheduled for removal, relocation, or abandonment, install bypass connections and temporary service to maintain continuity of services to other building parts before proceeding with selective demolition.

B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

C. Maintain existing utilities shown as remaining. Keep in service, and protect existing utilities against damage during selective demolition operations.

D. Locate, identify, stub off and disconnect utility services that are not to remain active.

1. OWNER will arrange to shut off designated utilities when requested by CONTRACTOR.

2. Arrange to shut off utilities with utility companies.

E. Cut off pipe or conduit in walls or partitions scheduled for removal. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.03 PREPARATION

A. Protect existing finish work that remains in place and becomes exposed during demolition operations.

B. Provide weatherproof closures for exterior openings resulting from demolition Work. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

C. Remove protection at completion of Work.

3.04 DEMOLITION

A. Special Techniques: Demolish concrete in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or removal methods that do no crack or structurally disturb adjacent slabs, walls and partitions.

B. Completely fill below-grade areas and voids resulting from Demolition Work.

1. Provide suitable backfill material as specified in Section 2.04.

3.05 REPAIR\RESTORATION

A. Repair damages caused by demolition more extensive than required.

B. Return concrete structures and surfaces to condition existing before commencing selective demolition Work.

C. Repair adjacent construction or surfaces soiled or damaged by selective demolition Work.

D. Promptly repair damages caused to adjacent facilities by demolition Work at no cost to OWNER.

3.06 CLEANING

A. CONTRACTOR shall maintain an order of neatness and good housekeeping comparable to that observed by OWNER.

B. Keep tools, scaffolding, and other demolition equipment in neat and orderly arrangement.

C. Remove dirt and debris resulting from CONTRACTOR's demolition operations from Site daily. Dirt and debris shall not collect or interfere with OWNER's facility operations.

D. Upon completion of demolition Work, remove tools, equipment, and demolished materials from Site. Remove protection and leave interior areas broom clean.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall perform all excavation and backfilling necessary to complete the work. This shall include the excavation of earth and rock, the removal and disposal of unsuitable material, dewatering, placement of suitable fill and backfill material, pipe boring and jacking, all quality assurance testing, and the restoration and final grading for all earth surfaces.

1.02 WORK WITHIN RIGHTS-OF-WAY

A. Where the governmental bodies having jurisdiction of the streets or rights-of-way have specific specifications relating to the requirements for work within their jurisdiction, such requirements must be met as a minimum requirement, and if these Specifications impose further limitation on the work, they shall also be met as the required work standard.

B. During all operations of the CONTRACTOR in the streets and roadways, the CONTRACTOR shall maintain barricades, lights, and warning signs as required by the agency having jurisdiction.

1.03 WORK WITHIN EASEMENTS

A. During construction within any easements, the CONTRACTOR shall confine himself to the limits shown on the Plans. He shall notify property owners in advance of moving equipment on easements and use of the access routes which will be designated by the OWNER. The OWNER will cooperate in working out the details of access. The topsoil over the trench shall be removed and carefully replaced upon completion of the work. The backfill of the trench in the easement may be left slightly high to provide for any slight residual settlement. Any trees, shrubs, or bushes removed shall be replaced per the approved landscape plan.

2.00 PRODUCTS

2.01 BACKFILL MATERIAL

A. For areas not requiring "granular backfill" material, backfill shall be of the excavated material, with the exception that materials such as soft clay, topsoil, muck, cinders, vegetable matter, refuse, boulders and other objectionable and non-packing earth shall be excluded from the backfill and removed from the site. Stone larger than 3 inches in any dimension shall be excluded from the backfill and removed from the site by the CONTRACTOR.

B. Where "granular material" backfill is required as specified herein, backfill material shall be defined as a material meeting granular material Class II as defined in 2003 MDOT 902.08.

3.00 EXECUTION

3.01 GENERAL EXCAVATION

A. Excavation shall be performed by any practicable method consistent with the integrity and protection of the work and neighboring structures, workmen, and the public. Topsoil shall be separately removed and stockpiled for reuse.

B. All excavation, except where necessary to tunnel or bore and jack under roads, railroads, tree roots and other obstructions within the limits indicated on the Plans, may be open cut from the surface. Tunneling or boring under trees shall be considered as incidental to construction and will not be considered as cause for request for additional payment.

C. Foreign material or unsuitable foundation material encountered such as wood, boulders, etc., which obstruct the excavation, shall be removed. Such materials found at the bottom of the excavation shall be removed and the foundation restored with approved materials.

D. If excess excavation is made or the material becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be filled with selected material solidly tamped into place, in not more than 6-inch layers to the satisfaction of the ENGINEER, before the construction work proceeds. At the direction of the ENGINEER, the excess excavation may be filled with 2000 psi concrete at the CONTRACTOR's expense.

E. The excavation shall be kept dry during the work. Where water is encountered in the excavation, it shall be removed by pumping or well points. All necessary precautions shall be taken to prevent damage to existing wells and to completed or partially completed structures. The CONTRACTOR shall be responsible for all damages caused by him due to inadequate or improper protection.

3.02 EXCAVATION FOR SEWERS AND FORCE MAINS

A. Trenches shall be excavated to the depth required with allowance for bedding the pipe. The trench shall be cut wider and deeper at each pipe joint location to provide for properly completing the pipe joint and to relieve the joint of all loadings.

B. The width of the trench at the top of a rigid pipe shall be sufficient to allow the pipe to be laid and jointed properly and shall provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted.

C. The width of the trench at the top of a flexible pipe backfill shall be sufficient to allow the pipe to be laid and jointed properly with the minimum net clearance of 12 inches and a maximum net clearance of 18 inches on each side of the barrel of the pipe.

D. Where the conditions of the ground require, or where the work is in close proximity of existing structures, the sides of excavation shall be securely held by bracing and/or sheeting which may be removed in units when the level of the backfill has reached a point where it is safe to pull the sheeting without disturbing the protected feature. No sheeting, bracing, or other timber shall be left in the excavation upon the completion of the main or other structures, except with the specific review and direction of the ENGINEER.

E. Other underground mains, sewers or structures encountered in the excavation shall be adequately supported during the CONTRACTOR's operations, and before backfilling, shall be given permanent support as directed by the ENGINEER to meet the standards or requirements of the owning utility or agency.

F. Water, sewer, gas and other utility services disturbed by the CONTRACTOR in his operations shall be repaired or replaced in a manner equal to the original condition by the CONTRACTOR at his own expense. Where these services are encountered and are undamaged, they shall be supported and/or protected by the CONTRACTOR at his expense against later settlement and/or damage after backfill. The CONTRACTOR shall consult the agency or the utility firm having jurisdiction over any duct line, gas main, etc., which may cross the excavation to determine method of supporting such duct or pipe.

G. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve manhole covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clean, or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed except as otherwise provided for herein on a temporary basis.

H. Where utilities and roads are to be constructed alongside each other, station numbers shall be the same for the utilities and the road.

3.03 EXCAVATION FOR STRUCTURES

A. Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for form construction and for practicable construction methods to be followed.

B. Excavation shall be on all sides of an existing structure.

C. Material removed during the excavation for new structures is not suitable for use as backfill around the structures and shall be hauled away and disposed of by the CONTRACTOR.

D. Requirements for excavation of sewers and water mains shall also apply to this Section.

3.04 SHORING, SHEETING AND BRACING

A. Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained, and except as shown or specified otherwise, removed by the CONTRACTOR.

B. All sheet piling, shoring, sheeting and bracing shall be designed by a Professional Engineer engaged by the CONTRACTOR with demonstrated competence and experience in such work. The sheeting system shall be designed to prevent bottom failure and hydrostatic uplift within the excavation. Provision shall also be made in the design for lateral pressures due to side slope and construction equipment or other surcharge loads, as applicable.

C. The CONTRACTOR shall provide to the ENGINEER for his review, design calculations and arrangement Drawings of the sheeting system prior to ordering any materials for bracing, sheeting, etc., and prior to the commencement of the excavation.

D. All materials, except as otherwise specified, used for sheeting and sheet piling, lagging, braces, shores, and stringers, or waling strips shall be of approved quality and dimensions throughout.

E. Materials for sheeting systems shall be furnished and driven or set in place by the CONTRACTOR, where necessary or wherever ordered by the ENGINEER, whether the same is or is not considered necessary by the CONTRACTOR. If, in the opinion of the ENGINEER, the materials furnished by the CONTRACTOR are not of proper quality or sufficient size or not properly placed to ensure the safety of the work or of adjacent structures and property, the CONTRACTOR shall, upon notice from the ENGINEER to that effect, forthwith procure, furnish and set in place or drive other and satisfactory materials, or place the material in a satisfactory manner; and if he shall fail or neglect to do so, the ENGINEER may order all or any part of the work to be stopped until such materials so used are furnished and placed; and the CONTRACTOR shall not be entitled to claim, demand, or receive any compensation for larger size or better quality or different disposal of materials ordered by the

ENGINEER, nor any compensation for allowance of any kind whatsoever for or on account of any damage or delay resulting from such stoppage of work.

F. Steel sheet piling may be either new or used. It shall be of adequate strength, straight and properly braced. Steel sheet piling shall be of the interlocking type. Friction in the interlocks shall not be assumed to contribute to the strength of the sheet piling.

G. The design, planning, installation and removal, if required, of all sheet piling, shoring, sheeting, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

H. Steel sheet piling for the excavation shall be driven straight and in-line. The piling shall be supported aboveground, before driving, by a guide frame at least 20 ft high which will keep the piling accurately in the required position and vertical. Each piece of piling shall be driven only a few feet at a time and driving shall proceed continuously around the perimeter so that the piles shall reach their full penetration together.

I. Walers and bracing shall be supplied and installed as required to complete the sheeting system. Walers and braces shall be of adequate strength for the load imposed. Splices in walers shall develop the full strength of the member in bending, shear, and axial compression.

J. If bracing members are to be removed during construction, the timing and procedure for removal shall not induce excessive stresses in the permanent structures or in steel sheet piling and bracing members.

K. If the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the CONTRACTOR shall secure written acceptance of the ENGINEER prior to the installation of such bracing.

L. In trenching operations the use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench racing will not be permitted. The use of a traveling shield for sewer construction shall require that the device be approved for use by a professional engineer. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

M. The neglect, failure, or refusal of the ENGINEER to order the use of sheeting, or sheet piling or steel, or to order the same to be left in place, or the giving or failure to give of any order or directions as to the manner or methods of driving or placing sheeting, sheet piling, bracing, shores, etc., shall not in any way relieve the CONTRACTOR of any or all obligations under this Contract. Sheeting left in place shall be cut off one (1) ft below existing grade.

N. The rules of the OSHA and the State Department of Labor with respect to excavation and construction shall at all times be strictly observed.

3.05 GENERAL BACKFILLING

A. For all areas, unless otherwise noted, backfilling shall consist of placing excavated material as defined in Paragraph 2.01.A. of this Section, in 12-inch lifts to finish grade. Compaction of backfill shall be such as to obtain 90% of the maximum density.

B. Under pavements, curb, paved driveways, and sidewalks, and where pipe is within a one on one influence of pavement, compaction testing shall be performed by an independent testing laboratory. Testing shall be performed at intervals of one test per lift per 50 feet of trench or as determined necessary by the ENGINEER.

3.06 BACKFILLING FOR SEWERS AND FORCE MAINS

A. Backfilling shall consist of placement of the prescribed materials from a level 12 inches above the crown of the pipe. Placement shall be as follows:

1. Under gravel driveways, gravel roads and shoulders, the backfill shall be granular material which shall be solidly compacted by mechanical tamps in layers of not more than 12 inches loose thickness with backfilling carried up to within 12 inches of finished grade. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content.

2. Under pavements, curb, paved driveways, and sidewalks, the backfill shall be granular material compacted in layers not to exceed 12 inches loose thickness with backfilling carried up to subgrade. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content. After a period of about 60 days or less, if the backfill compaction is satisfactory to the ENGINEER, to provide for any slight settlement, the CONTRACTOR shall retrim neatly any broken edges of pavement and replace the top surface of the backfill within the pavement area with pavement surface equal to that surface which was removed. The pavement shall be replaced in accordance with the standard specifications of the agency having jurisdiction.

3. Backfill around lift stations, or buried underground structures shall be granular material compacted in 12-inch lifts. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content.

4. For all other areas, backfilling shall consist of placing excavated material as defined in Paragraph 2.01.A. of this Section, in 12-inch lifts to finish grade. Compaction of backfill shall be such as to obtain 90% of the maximum unit density as determined at the optimum moisture content.

5. Pea gravel or crushed stone used for bedding shall be separated from the sand backfill with a non-woven geotextile fabric. The fabric shall be Amoco 4551, or approved equal.

3.07 FILLING AND BACKFILLING FOR STRUCTURES

A. Embankments underlying structural footings, streets and drives, sidewalks and around structures shall be granular material meeting the requirements of the Michigan Department of Transportation for granular material compacted to 95% density.

B. Under all interior and exterior floor slabs, an 8-inch thick granular cushion shall be placed. This material shall be clean mineral aggregate meeting the following gradation requirements:

Passing the No. 4 Sieve	100%
Passing the No. 200 Sieve	0-3%

C. Where embankment material is placed to achieve a new surface elevation, the top 4 inches shall be approved topsoil either salvaged from the site or hauled in by the CONTRACTOR.

3.08 GRADING

A. The CONTRACTOR shall grade the site to restore the existing elevations. All disturbed areas beyond the grading limits shall be restored to prior condition.

B. Surplus excavated material not needed for embankment shall be disposed of by the CONTRACTOR. Headwalls, culverts, drains, sewers and appurtenances filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, repaired, or replaced at his expense.

C. All temporary earth changes shall be in conformance with the Soil and Erosion Control Act.

3.09 RESTORATION

A. Headwalls, culverts, and drainage systems filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, re-laid or rebuilt with new materials to a condition equal to the original state, and of thickness equal to the original structure and to the original line and grade at the CONTRACTOR's expense.

B. Where the excavation is located beside a ditch and/or where an existing ditch is filled or disturbed in the CONTRACTOR's operations, the CONTRACTOR shall clean, repair, or replace the ditch with properly pitched bottom and side slopes and of section and capacity not less than the original section.

C. Where excavation has been through lawn areas, the CONTRACTOR shall restore the disturbed area by placing topsoil and seeding or sodding over the final backfill material.

D. The CONTRACTOR shall remove excess dirt and other construction material from the site of the work and leave the site in a condition equal to its original state.

E. The final condition of the streets and roadways shall be subject to the approval of the governmental body having jurisdiction thereof, as well as review by the ENGINEER.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Furnish all labor, tools, equipment and materials to construct all storm sewers, and drainage structures as herein specified. No sewers shall be accepted until the sewer system has passed the system acceptance tests.

1.02 TESTING

A. General

1. The CONTRACTOR shall furnish all equipment and personnel to conduct system acceptance tests as specified herein on all completed sewers. All tests shall be conducted under the supervision of the ENGINEER. No acceptance tests shall be conducted until the entire sewer system is constructed or just prior to placing the line in service providing the sewer pipe has been installed for not less than 30 days.

B. Test for Alignment

1. All sewers shall be laid accurately to the line and grade designed by the ENGINEER. The sewers will be tested for alignment by shining a light through the pipe at a manhole and viewing the light from an adjacent manhole. Any section of sewer in which a light cannot be seen from one manhole to the next shall be corrected to the satisfaction of the ENGINEER to pass this test.

C. Material Tests

1. The CONTRACTOR shall have tests of pipe strength made by an independent testing laboratory. Tests of up to 4 lengths of sewer pipe per hundred lengths may be required to show compliance with the Specifications. All pipe delivered to the job site shall be accompanied with a manufacturer's certificate of compliance to the Specifications.

D. Submittals

1. The CONTRACTOR shall submit Shop Srawings, or data sheets for all castings, steps and manholes.

2. The CONTRACTOR shall submit certification letters for all pipes. All letters must contain the following: CONTRACTORS name, project name, Township name, current date, certification of pipe provided and letterhead of the certifying company.

2.00 PRODUCTS

2.01 PIPE

A. Reinforced concrete pipe and manhole tees shall be no less than the latest revision of ASTM C76, with the class designation as shown on the Plans or in the Proposal.

B. Concrete pipe shall have tongue and groove gasketed premium joints.

C. Corrugated steel pipe shall meet the requirements of AASHO M-190 for coated pipe latest revision. Minimum gage thickness shall be as shown on the Plans.

2.02 REINFORCED CONCRETE MANHOLES

A. Manholes shall conform to the current ASTM Specifications for precast reinforced concrete Manhole Sections, serial designation C478. Manhole section joints shall conform to ASTM Designation C990. All cones shall be eccentric with an offset step configuration. Concrete adjustment rings or riser rings shall not be used for adjusting the height of the structure.

B. All manhole component parts shall have the name of the manufacturer stenciled on the inside. The lettering or logo shall be a minimum of 4 inches high.

2.03 MORTAR FOR MANHOLES

A. Mortar for plastering manholes and drainage structures shall be made of one part Portland cement and two parts fine aggregate.

2.04 BRICK AND BLOCK

A. Brick for brick and mortar structures shall conform to the current ASTM Specification C32. Block for block and mortar structures shall conform to the current ASTM Specification C135.

B. The concrete block masonry used to construct manhole and catch basin walls shall be solid curved blocks with the inside and outside surfaces curved to the required radii. The blocks shall have tongue and groove or other approved type of joint at the ends so that the units interlock to form a strong, rigid structure. Curved blocks shall have the inside and outside surfaces parallel.

C. The block shall not exceed 18 inches in length or 8 inches in depth (height). No block shall be less than 6 inches in width (thickness). All blocks in one structure shall be of the same height dimension. The blocks shall be designed for length so that only full-length or half-length blocks are required to lay the circular wall of any one course.

D. Blocks intended for use in the cones or tops of manholes and catch basins shall have such shape as may be required to form the structure as shown on the Plans with inside and outside joint not to exceed 1/4-inch in thickness.

2.05 STRUCTURE FRAMES AND COVERS

A. Structures frames and covers shall weigh not less than 350 lbs. Each frame and cover shall have machined bearing surfaces and shall be suitably notched for convenient removal of the cover. Each solid manhole cover shall be marked Storm Sewer with letters integrally cast into the cover.

B. Covers shall be as follows:

1. For use on manholes: East Jordan 1040Z, with Type B cover, or equal.

2. For use on drainage structures in paved areas: East Jordan 1040Z, with Type M1 cover, or equal.

3. For use on drainage structures in curbed areas: East Jordan 7045 or 7065, or equal.

4. For use on drainage structures in landscaped areas: East Jordan 1040Z, with Type 02 Beehive grate, or equal.

C. All frames and covers shall be coated by the manufacturer with coal tar pitch varnish or other asphaltum coating reviewed by the ENGINEER.

2.06 MANHOLE STEPS

A. Steps shall be plastic coated steel. They shall be M.A. Industries PS1-PF for precast manholes, PS1-B for block manholes, or equal.

2.07 DRAINAGE STRUCTURES

A. All manholes and catch basins shall be precast unless otherwise specified.

B. Manhole and catch basin bottoms shall be concrete and top of slab shall have a troweled finish.

C. Upon approval by the ENGINEER, the manhole and catch basin walls may be constructed of concrete block masonry or concrete manhole pipe conforming to the requirements of the specifications previously listed. Construction shall be in accordance with the details for "Catch Basin and Storm Sewer Manhole" shown on the Plans.

D. A plaster coat of mortar 1/2-inch in thickness shall be applied to the inside and outside surface of all manholes and catch basins constructed with concrete block masonry or sewer brick. The inside coat of mortar shall be applied in a smooth, neat workmanlike manner.

E. Final adjustment of the top of manholes and catch basins, so that the manhole or catch basin cover is at finished elevations as shown on the Plans or meets the finished surface, may be accomplished with sewer brick conforming to the previously listed Specifications. The total height of brick for this purpose shall not exceed 9 inches. The total chimney height shall not exceed 18 inches.

F. All block and brick masonry units shall be laid in a full bed of mortar. The inside joints of the block masonry construction shall be tooled in a neat and workmanlike manner.

3.00 EXECUTION

3.01 EXCAVATION AND BACKFILL

A. All excavation and backfill 12 inches above the crown of pipe shall conform to Section 2.04, Earthwork of these specifications.

B. The trench shall be backfilled closely behind the pipe laying. Unless otherwise directed or permitted by the ENGINEER, the backfilling shall follow and be completed to the top of the trench within four pipe lengths behind pipe laying.

3.02 BEDDING

A. Concrete pipe shall be laid on a compacted granular material placed on the bottom of the trench to a depth of not less than 4 inches. Where indicated on the Plans or required by the ENGINEER, concrete encasement or cradle shall be used.

B. For all pipes, compacted aggregate material shall be placed at the sides of the pipe in 12-inch lifts and cover not less than 12-inches above the crown of the pipe.

C. "Granular Material" shall be MDOT class II, placed in not more than 6-inch layers and compacted to not less than 90% standard density.

3.03 PIPE INSTALLATION

A. All pipe shall be laid true to the required lines and grades. All trenches when pipe laying is in progress, shall be kept dry, and all pipes and fittings shall be uniformly supported on a properly trimmed bedding with holes at each joint to receive bells. All pipe shall be laid with bells uphill.

B. The grade as shown on the profiles is that of the pipe invert and that to which the work must conform. The grade shall be kept by laser or other tools which shall be furnished by the CONTRACTOR at his expense. Each pipe shall be laid accurately to the line and grade as shown on the Plans and in such manner as to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the invert. The interior of sewers shall, as the work progresses, be cleaned of all dirt, cement, debris and other superfluous materials of every description. Bulkheads shall be used to keep foreign materials out of the open end of the sewer when work is not in progress.

C. The location of the piping as shown on the Plans has been determined to avoid, insofar as possible, interference with trees or structures or fixtures above ground and other underground mains, services, utilities or structures. Any change in location or alignment of piping, which may be found more feasible or practicable as the work progresses, shall be made by the CONTRACTOR, as the ENGINEER may direct.

D. All pipe shall be carefully lowered and moved into position in trench or vault in a controlled manner such as will prevent damage to the pipe and any coatings or lining. An excessive amount of scratching on the surface of the concrete pipe will be considered cause for rejection.

E. All cutting of the pipe shall be done in a neat workmanlike manner with the least amount of waste and without damage to existing or new lines. A fine toothsaw, tubing cutter or similar tool may be used to cut concrete pipe. Cuts must be square. Ragged edges shall be removed with a cutting tool or file.

F. Breaks in pipe or joints shall be repaired to the satisfaction of the ENGINEER and at the expense of the CONTRACTOR.

3.04 CONNECTIONS TO EXISTING MANHOLES

A. When a sewer is connected to an existing manhole, a hole adequate to receive the new pipe shall be cored into the manhole.

B. If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brick work shall be cleaned, pointed and given a 1/2-inch mortar coat on the outside surface.

C. For connections to existing precast reinforced concrete manholes, a hole shall be cored into the concrete manhole wall to receive the pipe. Reinforcing steel shall not be cut out shall be bent and replaced in the area that is to be patched. A form shall be constructed over the area of pipe penetration. The formed area shall then be filled with concrete.

D. Closure of the manhole wall shall be made watertight using concrete.

3.05 ANIMAL GRATES

A. Animal grates shall be required on all end sections greater than 12-inch diameter.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all labor, materials, tools and equipment necessary to construct the various pavements and walks as described herein and/or shown on the Plans.

B. This work shall include, but not necessarily be limited to, the following:

1. Aggregate Paving
2. Bituminous Paving
3. Concrete Paving
4. Concrete Curb
5. Concrete Walk

C. Where MDOT occurs in statements in this Section, it shall mean Michigan Department of Transportation Standard Specifications for Construction, 2012 Edition.

1.02 RELATED WORK

A. Removal of the items listed in Subsection 1.01.B, if existing, is described in Section 2.03 - Demolition.

B. Preparation of a stabilized subgrade is described in Section 2.04 - Earthwork.

2.00 PRODUCTS

2.01 SUBBASE

A. Subbase shall meet the requirements of MDOT Specification 902.08, Class II and Washtenaw County Standards where applicable.

2.02 AGGREGATE BASE COURSE

A. Aggregate shall meet the requirements of MDOT Specification 902.06, 21AA series, Limestone where applicable.

2.03 AGGREGATE SURFACE COURSE

A. Aggregate shall meet the requirements of MDOT Specification 902.06, 23A series, Limestone where applicable.

2.04 BITUMINOUS BASE

A. Bituminous base courses shall meet the requirements of the Washtenaw County Department of Public Services Special Provisions and the Plans.

2.05 BITUMINOUS SURFACE

A. Bituminous surface courses shall meet the requirements of the Washtenaw County Department of Public Services Special Provisions and the Plans.

2.06 PRIME AND BOND COATS

A. Prime and bond coats shall meet the requirements of MDOT Specification 904 and Washtenaw County Standards.

2.07 CONCRETE PAVEMENT

A. Concrete shall meet the requirements of MDOT Specification 601, Grade HE.

2.08 CONCRETE CURB

A. Concrete curb shall meet the requirements of MDOT Specification 601, Grade P1 and Washtenaw County Standards where applicable. When curb is integral with concrete pavement, grade of concrete shall match that of the concrete pavement.

2.09 CONCRETE SIDEWALK

A. Concrete sidewalk shall meet the requirements of MDOT Specification 601, Grade P1 and Washtenaw County Standards where applicable.

3.00 EXECUTION

3.01 AGGREGATE PAVEMENT

A. Aggregate base course shall be compacted to the depth as shown on the Plans, and shall conform to MDOT Specification 302 and Washtenaw County Standards.

B. Aggregate surface courses shall be compacted to 95% density, 12 inches in depth unless otherwise shown on the Plans and shall conform to MDOT Specification 306 and Washtenaw County Standards.

3.02 BITUMINOUS PAVEMENT

A. Bituminous paving shall consist of a bituminous base placed on a prepared subgrade and a bituminous surface course, as detailed on the Plans.

B. Bituminous base courses shall conform to MDOT Specification 502 through 504 and Washtenaw County Standards.

C. Bituminous leveling and surface courses shall conform to MDOT Specification 502 through 504 and Washtenaw County Standards.

D. For bituminous patching within the Washtenaw County Right-of-Way, the County may require a concrete base in lieu of an asphalt base. If required, the concrete base shall meet all requirements of the Concrete Pavement portion of these specifications.

3.03 PRIME COAT

A. Prime coat shall be applied on a prepared aggregate base at a rate of 0.25 gallons per square yard.

3.04 BOND COAT

A. Bond coat shall be applied to an asphalt base course at a rate of 0.10 gallons per square yard.

3.05 CONCRETE PAVEMENT

A. Concrete paving shall consist of a concrete section placed on prepared subgrade, as detailed on the Plans.

B. Subbase material, when necessary as shown on plans, shall be evenly spread and compacted to 95% of Maximum Unit Weight on the prepared subgrade. If existing subgrade is to be utilized, it shall be fine graded and re-compacted prior to paving.

C. Concrete pavement shall conform to MDOT Specification 602.

3.06 CONCRETE CURB

A. Concrete curb shall conform to MDOT Specification 803 and Washtenaw County Standards where applicable and be sized equal to that removed.

3.07 CONCRETE WALKS

A. Concrete sidewalks, ramps, walkways, and steps shall conform to MDOT Specification 803 and MDOT Detail R-28, most current version. When it is necessary for sidewalk ramps to be replaced, the ramps must be made handicap accessible per Detail R-28 with the use of inset truncated dome inserts. No concrete stamping of truncated domes will be allowed for this project.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Under this Section the CONTRACTOR shall furnish all labor, materials, and equipment necessary to establish temporary vegetative ground cover and permanent seeding, sodding, planting, and riprap. Temporary measures shall be utilized to stabilize erosive or sediment-producing areas during the construction period.

B. The lawn operations shall not be started until all CONTRACTOR's on the site have fully completed their work. Any lawn areas damaged by other trades performing work at the site under separate contracts shall be fully repaired or replaced at the expense of the CONTRACTOR.

1.02 TEMPORARY REQUIREMENTS

A. All areas subjected to erosion for up to 12 months, and all areas where temporary seeding will be required to produce sufficient growth to retard erosion prior to the establishment of finished grade or permanent vegetation shall be implemented in the manner prescribed in this Section. Temporary seeding and mulching shall not be paid separately but considered incidental to the work.

1.03 PERMANENT REQUIREMENTS

A. The CONTRACTOR shall permanently prepare, fertilize, and seed or sod or riprap the areas designated on the Plans or disturbed by the CONTRACTOR. Sod shall be placed on areas having a slope of 3:1 (three horizontal and one vertical) or steeper. Grass seed shall be placed on areas having a slope flatter than 3:1. Sod may be placed in other areas at the CONTRACTOR's own option and expense. Riprap shall be placed where shown on the Plans or required by the ENGINEER.

B. Seeding and sodding shall be accomplished within the following schedule:

Dates to sod	May 1 - Oct 30
Dates to seed	Apr 20 - Jun 1 Aug 10 - Oct 1

C. The CONTRACTOR is responsible for planting of correct grades and alignment, and all plants shall be set so that when settled they will bear the same relationship to finish grade as they did before being transplanted. No filling will be permitted around trunks or stems. Roots of bare-rooted plants shall not be allowed to mat together but shall be spread and arranged in their natural position and have planting mixture worked in among them. All broken or frayed roots shall be cut off.

1.04 MAINTENANCE AND GUARANTEE

A. The CONTRACTOR shall assume responsibility for maintaining his work to the end of the guarantee period. During this period, the CONTRACTOR shall make a minimum of one maintenance trip every four weeks during the growing season and as many more as necessary to keep the plantings in a thriving condition.

B. Lawn maintenance shall begin immediately after the grass seed or sod is in and continue until provisional acceptance with the following requirements:

1. Lawns shall be protected and maintained by watering, mowing, and reseeding as necessary for at least 30 days and as much longer as necessary to establish a uniform, weed free stand of the specified grasses and until specific lawn acceptance has been made. Maintenance includes deposition of additional topsoil and re-sodding as may be required to correct all settlement and erosion up to the date of final acceptance.

2. At the time of the first cutting, mower blades shall be set at 2-1/2 inches high. All lawns shall receive at least three (3) mowings before acceptance.

C. Maintenance of trees shall consist of pruning, cultivating, weeding, watering, keeping guying taut, and trees erect, raising tree balls which settle below grade, and to furnish and apply such sprays as are necessary to keep the planting free of insects and diseases.

D. The CONTRACTOR agrees to guarantee all plants for one year from time of planting. This guarantee includes furnishing new plants as well as labor and material for installation of replacements. All replacement plants shall be guaranteed and maintained for an additional period of one year. Any tree over four inches in caliper shall be guaranteed for two years.

E. The CONTRACTOR shall not assume responsibility for damages or loss of plants or trees caused by fire, flood, lightning storms, freezing rains, winds over 60 miles per hour or vandalism.

F. Inspection of the plantings will be made jointly by the CONTRACTOR and ENGINEER at the completion of planting. All plants not in a healthy, growing condition shall be removed and replaced with plants of like kind, size and quality as originally specified before the close of the next planting season.

G. At the end of the guarantee period, the CONTRACTOR shall remove all guying, staking, wrapping, and saucers from the site.

2.00 PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be loam without admixture of sticks and other extraneous material. A certified analysis of the topsoil from each source shall be submitted to the ENGINEER for approval before delivery to the site. If deficiencies in the topsoil are found as a result of this analysis, they shall be corrected at no expense to the OWNER.

2.02 FERTILIZER

A. Commercial fertilizer shall be 20-10-10. It shall be delivered to the site in original unopened containers which shall bear the manufacturer's guaranteed statement of analysis. Fertilizer shall be stored in weatherproof locations in such a manner that it will be kept dry and its effectiveness not impaired.

2.03 SEED

A. Temporary seeds and their spreading rates shall be as follows:

1. April 1 to August 15:
   Spring oats or barley, at 2 lbs/1000 sq ft, or 3 bu/acre;
   Domestic rye grass, at .5 lb/1000 sq ft, or 20-25 bu/acre.

2. June - July:
   Sudangrass, at 1 lb/1000 sq ft, or 30-40 lbs/acre.

3. August 1 to October 15:
   Rye, at 1lbs/1000 sq ft, or 2-3 bu/acre; Perennial Ryegrass, at .5 lb/1000, or 20-25 lbs/acre.

4. September 20 to October 15:
   Wheat, at 3 lbs/1000 sq ft, or 2-3 bu/acre

B. Permanent seed shall be a mixture proportioned for spreading, as follows:

1. 65% Kentucky Bluegrass, 95% pure with an 80% germination factor.

2. 25% Pennlawn Fescue, 97% pure with an 80% germination factor.

3. 10% Domestic Ryegrass, 97% pure with a 90% germination factor.

C. Weed seed content shall not exceed 0.30 of 1% of the permanent grass mixture.

D. Grass seed shall be fresh, clean, new-crop seed. The CONTRACTOR shall furnish to the ENGINEER the dealer's guaranteed statement of the composition of the mixture and the percentages of purity and germination of each variety.

2.04 SOD

A. Sod shall be 100% Kentucky Bluegrass, strongly rooted with no bent grass, temporary grasses, or pernicious weeds. It shall be mowed to a height not to exceed 3 inches before lifting and shall be of uniform thickness with not over 1-1/2 inches nor less than 1 inch of soil.

2.05 MULCH

A. Threshed straw, oats, wheat, barley or rye, not chopped in short lengths, shall be spread as a mulch over all seeded areas at the rate of two tons (dry weight) per acre.

2.06 PLANTS

A. Plant materials shall conform to the sizes given in the Plant List on plans and shall be sound, healthy, vigorous, and free from plant diseases and insect pests or their eggs and shall have normal healthy root systems. All measurements, such as spread, ball size, number of canes, quality designations, etc., shall be in accordance with the latest edition of "American Standards for Nursery Stock." Trees shall be calipered six inches above the ground. Trees planted in rows shall be uniform in size and shape.

B. Plant substitutions will be permitted only upon submission of proof that specified plants are not obtainable and with the authorization of the ENGINEER to provide for the use of the nearest equivalent, size and variety of plants. All requests for price adjustments due to substitutions will be submitted in writing to the ENGINEER or OWNER for review along with a request for use of the substitutions.

2.07 PLANT SETTING MIXTURE

A. The material which is used for tamping around the balls and roots in the process of planting shall be prepared on the site by mixing four parts topsoil to one part peat, adding five pounds of super-phosphate to each cubic yard of the mixture. Peat shall be granulated raw peat or

baled peat, containing not more than 9% mineral on a dry basis. Superphosphate shall contain 20% of phosphoric acid.

2.08 GUYS, STAKES AND WRAPS

A. Stakes for guying shall be wood 2" x 4" x 30" long minimum size.

B. Stakes for staking shall be sound, cedar posts, 3-inch in diameter, 9 ft long, with bark skinned off.

C. Guying cable shall be three No. 12 gauge galvanized wires, twisted.

D. Turnbuckles shall be galvanized or dip-painted, with a 3-inch minimum lengthwise opening, fitted with screw eyes. Three turnbuckles per tree.

E. Staking wire shall be 12 gauge galvanized steel.

F. Hose for covering wire shall be new or used, black or red, two-ply fiber reinforced garden hose, not less than 1/2-inch inside diameter. Seconds rejected by factory are acceptable.

G. Tree wrap shall be treated wrapping, Kraft wrap or approved equal.

2.09 RIPRAP

A. Riprap shall be "heavy riprap" as defined in the Michigan Standard Specifications for Highway Construction. Riprap shall be placed where shown on the Plans and in conformance with the Michigan Standard Specifications.

3.00 EXECUTION

3.01 TEMPORARY SEEDING AND MULCHING

A. The seedbed immediately before seeding shall be firm but not so compact as to prohibit covering seed, securing adequate germination, or root penetration. Tillage implements shall be used as necessary to provide at least a 3-inch depth of firm but friable soil, free of large clods and stones.

B. Seed may be broadcast by hand, by cyclone-type mechanical seeders or applied with a drill, cultipacker-seeder, or other suitable equipment. Seed should be covered approximately 1/2" deep either during seeding operation or by following broadcast application with cultipacker or similar tool.

C. Mulching shall be used with all seedings on disturbed soil areas and for temporary use without seeding during months unfavorable to seeding.

D. Immediately after seeding, mulch all critical areas (slopes steeper than 4:1, unstable soils, or heavy clay soil) with unweathered small grain straw (preferably wheat) or hay spread uniformly at the rate of 11/2 ton per acre or 100 lbs (2-3 bales) per 1000 square feet.

E. For acceptable anchoring and application techniques, see Subsection 3.04 of this Specification.

3.02 PERMANENT SEEDING

A. Seeding and mulching required for temporary soil erosion control shall be removed prior to preparation of permanent seeding and mulching.

B. Topsoil, 4 inches in depth, shall be worked to a smooth uniform surface and compacted firmly. Any lumps or depressions which occur shall be regraded and re-rolled until a satisfactory grade is obtained.

C. Provided that all machinery and operations are approved, and provided that a smooth finely pulverized seedbed is produced, areas may be machine-finished except for a 3-foot strip adjacent to walks, roads, parking areas or structures. This 3-foot strip shall be hand-raked and seeded. All areas to be seeded shall be thoroughly loosened and graded to true lines free from all unsightly variations, lumps, ridges and depressions. All sticks and stones, roots and other objectionable material over 1-inch in any dimension which might interfere with the formation of a finely pulverized seedbed shall be removed from the soil. The prepared area shall be thoroughly rolled with an approved lawn roller and all low spots leveled up.

D. Immediately before seeding, the topsoil surface shall be reworked until the seedbed is a fine pulverized, smooth seedbed, varying not more than 1/2-inch in 10 ft.

E. Seed as specified shall be evenly sown at the rate of 5 lbs per thousand square feet, and lightly worked into the surface, using a mechanical seeder. The CONTRACTOR may increase the quantity of seed at his option at no increase in cost to the OWNER.

3.03 FERTILIZING

A. Commercial fertilizer shall be spread over all areas to be seeded or sodded at a rate of 20 lbs per 1000 sq ft and incorporated by discing, rototilling or other acceptable mechanical means to a depth of 3 to 4 inches. In areas inaccessible to power equipment, it shall be incorporated with the soil by hand tools.

3.04 MULCHING

A. Mulch shall be spread evenly with extreme care so as to leave the seeded surface with a minimum amount of damage.

B. Mulch shall be anchored by one of the following acceptable methods:

1. Mulch anchoring tool with a series of flat, notched discs that punch and anchor the mulch material into the soil. A regular farm disc weighted and set nearly straight may substitute but will not do a job comparable to the special mulch anchoring tool. For either, the soil must be moist, free of stones and loose enough to permit disc penetration to a depth of 3 inches.

2. Asphalt mulch tie-down: Either of the following asphalt products may be blown on with the straw mulch or be sprayed or sprinkled on immediately after mulch is spread. (In areas of playing children or pedestrian traffic, asphalt methods could cause problems of "tracking in" on rugs, damaging shoes, clothing, etc.).

    a. Liquid asphalt: Rapid curing (R.C. - 1, 2 or 3) or medium curing (M.C. - 2 or 3). Apply 0.10 gallons per square yard. Since liquid asphalt is cut back with a kerosene-like product it can be applied during freezing weather.

b. Emulsified asphalt: Rapid curing (R.C. - 1 or 2), medium curing (M.C. - 2), or slow setting (S.S. 1). Apply 0.04 gallons per square yard. Emulsified asphalt contains approximately 50% water; therefore, it cannot be applied during freezing weather.

c. Rapid Curing (R.C.) is formulated for curing in approximately 24 hrs even during periods of high humidity.

d. Medium Curing (M.C.) is formulated for use in spring and fall, with approximately 24 hrs curing time.

e. Slow Setting (S.S.) is formulated for use during hot, dry weather, with approximately 24 hrs curing time. The higher the number appearing in the "formula", the heavier the resultant residue.

3. Mulch netting: Lightweight fibrous materials which, when properly placed over the mulch and stapled to the ground, will check erosion and reduce displacement of the mulch.

C. Machines which cut mulch into short pieces will not be permitted. The mulch shall be loose enough to allow sunlight to penetrate and air to slowly circulate, but thick enough to shade the ground, reduce rate of water evaporation and prevent or reduce water or wind erosion. All mulch shall be placed on seeded areas within 48 hrs after seeding or planting. The CONTRACTOR shall protect as necessary all traffic, vehicles, structures, etc., from being marked or disfigured by adhesive materials.

3.05 SODDING

A. For sodding areas, the cut sod shall be laid on prepared soil, tightly together and with staggered joints. All cracks shall be filled with screened soil. Wood stakes (1" x 1") shall be driven through the sod in place. The stakes shall be pulled after the sod has rooted firmly to the embankment. The areas shall be soaked thoroughly. As soon as sod is dry enough to walk on, it shall be rolled or tamped to a smooth surface to eliminate small bumps and given good contact with soil beneath. The areas shall be watered every 2 or 3 days as necessary for two weeks.

3.06 PLANT STAKING

A. The CONTRACTOR shall field stake all trees for the ENGINEER's review prior to planting. The CONTRACTOR shall schedule his work and arrange to stake enough planting work for two weeks and arrange for a periodic site meeting with the ENGINEER for the purpose of reviewing the work that has taken place in the prior two weeks and review of the staking for the next two weeks.

B. It shall be understood and agreed that where minor changes and deviations from the Plans or staking may be required by the ENGINEER, such revisions shall be done by the CONTRACTOR at no additional cost, providing such instructions are given to the CONTRACTOR before such affected work other than staking is started.

3.07 ROOT PROTECTION

A. Plants designated "BB" in the Plant List shall be "balled and burlapped." They shall be dug with firm, natural balls of earth of sufficient diameter root systems necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord. No balled and burlapped plant shall be planted if the ball is cracked or broken. Bare root plants shall be handled in such a manner that the roots are protected at all times.

B. All plant material shall be delivered in either closed or open vehicles with the entire load properly covered in transit for protection from drying winds. They shall be planted immediately upon delivery. No plant shall be bound with rope or wire in a manner that will damage the bark or break the branches.

3.08 PLANTING

A. Prior to planting, tree pits shall be excavated as shown on the Plans. Subsoil dug from pits, trenches and beds shall be disposed of by the CONTRACTOR.

B. When the plants have been properly set, the pit shall be backfilled with planting mixture, gradually filling, tamping and settling with water. No soil in a frozen or muddy condition shall be used for backfilling. A ring of soil shall be formed around the edge of each plant to hold water.

C. The CONTRACTOR shall make adjustments in the locations of plants where necessary as directed by the ENGINEER.

3.09 PLANT MULCHING AND WATERING

A. All planting shall be mulched with a cover of peat. Plant pits shall be completely covered with a two-inch layer of mulch.

B. All plants shall be thoroughly soaked after planting. After each watering, all beds shall be raked and left in a complete and finished manner.

3.10 ROOT PROTECTION

A. Upon completion of planting, all trees and shrubs shall have been pruned and injuries repaired. Remove dead or injured twigs and branches as necessary to compensate for the loss of roots from transplanting. Pruning shall be done in such a manner as not to change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs. Paint all cuts over 3/4-inch in diameter with tree paint.

3.11 GUYING, STAKING AND WRAPPING

A. Guying and staking shall be completed immediately after planting. Guy trees over five inches in caliper, and stake trees under five inches in caliper. Maintain guys and stakes until the end of the guarantee period. The trunks of all deciduous trees larger than 6-8 feet above grade shall be wrapped with standard tree wrap from the first branch down to the ground and secured at every second wrap.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall supply all labor, materials, tools and equipment necessary to lower and control the groundwater levels and hydrostatic pressures to permit all excavation and construction specified under this contract to be performed in the dry. The control of all ice, snow and surface water shall be considered as part of the work under this Section.

B. The work under this Section shall include all costs of mobilization, supply, installation, operation, maintenance, supervision, and final dismantling and removal from the site of any and all dewatering equipment.

C. The CONTRACTOR or his dewatering subcontractor shall be currently and appropriately licensed by the State of Michigan to undertake the work covered under this Section and shall submit such information to the ENGINEER.

1.02 EXAMINATION OF THE SITE

A. The CONTRACTOR shall take all the steps that he considers necessary to familiarize himself with the site conditions, the ground conditions and the groundwater conditions. A copy of the log of the soil boring and a soils report are among the data available and a part of these Contract Documents. The data described above is furnished for information only, and it shall be expressly understood that the OWNER and/or the ENGINEER will not be held responsible for any interpretation or conclusions drawn there from by the CONTRACTOR.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit complete plans and description of the overall dewatering system he proposed to use for the work under this Section for review by the ENGINEER, showing the details of the dewatering system prior to initiation of any excavation within 3 ft of the prevailing groundwater levels.

B. Review by the ENGINEER of the dewatering system proposed by the CONTRACTOR will be only with respect to the basic principles of the methods the CONTRACTOR intends to employ. Review by the ENGINEER of the dewatering system will be based on the demonstrated performance of the system to satisfy the requirements for dewatering as specified herein.

2.00 PRODUCTS

Not Applicable

3.00 EXECUTION

3.01 GENERAL

A. It is the intent of this Section that an adequate dewatering system shall be installed to lower and control the groundwater in order to permit excavation, construction of the structures and the placement of the fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the structure foundations, the drains, the sewers and all other excavations. In addition, the system to be used shall reduce the hydrostatic head in the water-bearing strata below the

structure foundations, the drains, sewers, and all other excavations to the extent that the water level and piezometric water levels in the construction area are substantially a minimum of 3 ft below the prevailing excavation surface at all times. Appropriate screens and filters shall be used to prevent loss of soil through the dewatering equipment.

B. Prior to any excavation below the groundwater level, the dewatering system shall be placed into operation to lower the water levels as required and shall be operated continuously 24 hrs per day, 7 days per week until all drains, sewers and structures have been satisfactorily constructed including placement of fill materials and no longer requiring dewatering. An adequate weight of fill material or of structure shall be in place to prevent buoyancy or flotation prior to discontinuing operation of the dewatering system.

C. The CONTRACTOR shall obtain written approval from the ENGINEER before discontinuing the operation of the dewatering system.

D. The CONTRACTOR shall be solely responsible for the arrangement, location and depths of the dewatering system necessary to accomplish the work described under this Section. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level and piezometric water levels in the construction area are substantially a minimum of 3 ft below the prevailing excavation surface, will prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata, will maintain stability of the sides and bottom of the excavation and will result in all construction operations being performed in the dry.

E. The control of all surface and subsurface water, ice and snow is considered as part of the dewatering requirements. The control shall be adequate such that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled, and that flooding of excavations or damage to the existing and/or new structures or portions thereof does not occur. Surface water shall not be directed toward the excavations.

F. The CONTRACTOR shall dispose of all water removed from the excavations in such a manner as will not endanger public health, property, any portion of the work under construction or completed either by him or any other CONTRACTOR, shall not recharge the water bearing strata and shall be performed in such a manner as will cause no inconvenience whatsoever to the OWNER, ENGINEER, or to others engaged on work about the site. Water shall be conveyed in conduits or open water channels to avoid erosion in foundation areas. However, open channels adjacent to existing footings shall not be permitted.

G. The CONTRACTOR shall provide complete standby equipment, installed and available, for immediate operation as may be required, to adequately maintain dewatering on a continuous basis in the event that all or any part of the dewatering system may become inadequate or fail.

H. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, loosening of the foundation strata or instability of the slopes or damage to the foundations or structures may occur. The supply of all labor, materials and plant, and the performance of all work necessary to carry out any necessary additional work for the reinstatement of the structures or the foundations soils resulting from such inadequacy or failure shall be undertaken by the CONTRACTOR subject to the approval of the ENGINEER and at no additional expense to the OWNER.

3.02 OBSERVATION WELLS

A. The CONTRACTOR shall supply, install, take measurements and maintain the observation wells (piezometers) at various locations near existing structures to insure complete drawdown.

B. The observation wells shall be of a suitable design proposed by the CONTRACTOR and as reviewed by the ENGINEER.

C. The CONTRACTOR shall be responsible for installing and maintaining all observation wells and observing and recording the elevation of the groundwater and piezometric water levels in all the observation wells daily. A record of the information obtained shall be given to the ENGINEER each day. The CONTRACTOR shall also permit the ENGINEER to make his own observations. Any observation well that becomes inactive, damaged or destroyed shall be replaced within 24 hrs by the CONTRACTOR at no additional expense to the OWNER. If an observation well becomes inactive, damaged, or destroyed and if in the opinion of the ENGINEER the observations from that observation well are critical, further excavation shall be suspended at the discretion of the ENGINEER and at no additional expense to the OWNER. Excavation shall not recommence until that observation well is repaired or replaced to the satisfaction of the ENGINEER and reliable observations can be obtained from that well or its replacement well.

D. The CONTRACTOR shall demonstrate by adding or removing water from all observation well risers that the observation wells are functioning properly.

E. All observation wells shall be satisfactorily installed and proven to be functioning properly prior to commencement of dewatering in any section of the site.

3.03 CONTROL OF GROUNDWATER LEVELS

A. The observation wells and test pits or holes shall be used as a primary basis of determining compliance with the requirements of this Section.

3.04 REMOVAL OF SYSTEM(S)

A. After all requirements of this Section are met; the CONTRACTOR shall remove all materials and equipment used during this operation. All holes, wells, and pits shall be filled immediately with suitable material.

END OF SECTION

1.00 GENERAL

1.01 SECTION INCLUDES

A. Requirements for the rehabilitation of the existing wetwells by cleaning, surface preparation, repair and the application of a protective coating system to concrete wetwell surfaces. The protective coating shall protect concrete wetwells from hydrogen sulfide and acid as well as eliminate infiltration, fill voids, and enhance the structural integrity of the manhole.

1.02 REFERENCES

A. ASTM C109 - Compressive Strength Hydraulic Cement Mortars

B. ASTM C579 - Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C. ACI 506.2-77 - Specifications for Materials, Proportioning, and Application of Shotcrete

D. SSPC SP-13/NACE No. 6 – Surface Preparation of Concrete

E. NACE - The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX

F. SSPC - The published standards of the Society of Protective Coatings, Pittsburgh, PA

G. SPWC 210-2.3.3 - Chemical resistance testing published in the Standard Specifications for Public Works Construction (otherwise known as “The Greenbook”)

1.03 SUBMITTALS

A. CONTRACTOR shall submit the completed bid proposal form, CONTRACTOR qualifications and proposed product information with their bid submittal. All items not listed on the bid proposal form shall be considered incidental to the project. Bids will be evaluated on price, qualifications and performance of the coating system.

B. The following information shall be submitted to the OWNER 14 Days prior to commencing Work:

1. A work plan outlining the schedule, procedures, and work site.

2. Material Safety Data Sheets (MSDS) for each product used.

3. A list of personnel, including backup personnel, with their qualifications and experience.

C. A final installation report on completed wetwells shall be submitted within 14 days of the completion of all rehabilitation work.

1.04 QUALITY ASSURANCE

A. CONTRACTOR shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.

B. A field representative authorized by the coating manufacturer shall be on site prior to the application of the coating system to verify that the substrate has been properly prepared, and during the application of the coating system to certify that the coating system has been properly applied. The authorized field representative shall provide the OWNER with a written report stating inspection observations during preparation, application and final inspection. The representative shall also verify adherence to coating manufacturer recommendations, industry standards and written specifications and provide written documentation to this effect with the final installation report.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials are to be kept dry, protected from weather and stored under cover.

B. All materials are to be stored according to manufacturer's recommendations. Do not store near flame, heat or strong oxidants.

C. Repair materials and protective coating materials are to be handled according to their material safety data sheets (MSDS).

2.00 PRODUCTS

2.01 APPLICATION EQUIPMENT

A. Equipment shall be specifically designed for the work intended. Equipment shall be capable of continuous mixing and spraying of the rehabilitation material and cleaning the wetwell prior to the application process.

2.02 COATING MATERIAL

A. Coating materials shall be as specified in Table 1.

TABLE 1

Surface Preparation:	**Per manufacturer. Surface must be dry, clean, and free from contaminants. On concrete, remove non-degraded release agents, oil, wax, and grease by washing with a hot trisodium phosphate solution. Water blast 5000 psi to 3 mil profile. Brush-off blast cleaning (concrete) SSPC SP13. Remove all loose and deteriorated concrete.**					
Paint Manufacturer	**Application**	**Product Name**	**Generic Type**	**No. Of Coats**	**Thickness**	**Comments**
<u>METHOD A:</u>						
Durakote, LLC	First Coat/Primer	Duraline	100% Solids Epoxy	one	20 mil	
"	Finish Coat	Duraline	100% Solids Epoxy	one	20 mil	

METHOD B:						
Tnemec	First Coat	Mortarclad	Epoxy Modified Cementitious Mortar	one	1/16”	
“	Intermediate Coat	Perma Glaze Series 435 Beige	Modified Polyamine Epoxy 100% Solids	one	20 mil	
“	Finish Coat	Perma Glaze Series 435 Gray	Modified Polyamine Epoxy 100% Solids	one	20 mil	

3.00 EXECUTION

3.01 INSTALLERS

A. Protective coating must be applied by a Certified CONTRACTOR of the protective coating manufacturer and according to manufacturer specifications.

3.02 EXAMINATION

A. CONTRACTOR shall follow all local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.

B. Any active flows shall be dammed, plugged or diverted as required to ensure that the liquid flow is maintained below the surfaces to be repaired or coated. Flows should be totally plugged and diverted when applying polymer coatings to the wetwells. All extraneous flows into the structures at or above the area coated shall be plugged and/or diverted until the coating has set hard to the touch.

C. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with the manufacturer’s recommendations.

D. Temperature of the surface to be coated should be maintained between 60°F and 100°F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is falling versus rising (i.e. late afternoon into evening vs. morning into afternoon).

3.03 SURFACE PREPARATION

A. CONTRACTOR shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Applicator shall notify OWNER of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and protective coating.

B. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

C. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

D. Surface preparation method(s) should be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.

E. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the substrate and the repair materials and/or protective coating. At a minimum, this shall be achieved with pressure water cleaning using equipment capable of 3,500 psi at 4 gpm. Other methods such as high pressure water jetting (refer to NACE Standard No. 5/SSPC-SP12), abrasive blasting, shotblasting, grinding, scarifying, or acid etching may also be used. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound, clean, neutralized surface that is not excessively damaged.

F. Removal and proper hauling and disposal of all sludge and debris within the wetwells shall be the CONTRACTOR's responsibility and shall be performed before the protective coating is applied.

3.04 APPLICATION OF REPAIR MATERIALS

A. Following cleaning and preparation, all active leaks shall be sealed by applying a quick-setting cementitious mortar or a chemical-based (acrylate/urethane) quick-setting resin grout designed to instantly stop running water or seepage in all types of concrete and masonry structures. The applicator shall apply materials in accordance with manufacturer's recommendations and specifications. Voids shall be repaired by chipping out loose material to a depth specified by the manufacturer and/or ENGINEER. Cementitious material shall be applied per manufacturer's recommendations until leak is stopped. Holes shall be drilled and chemical-based resin grout shall be injected per manufacturer's recommendations until leak is stopped. Proper application should not require any special mixing of product or curing requirements after application.

B. Apply a rapid setting, high early strength, non-shrink patching material to fill all large voids and repair benches and inverts prior to protective coating of the structures. For invert repairs, flow must be temporarily stopped by inflatable or mechanical plugs prior to cleaning. In invert applications, care should be taken to not apply excessive material in the channel, which could restrict flow.

C. Repair materials shall be trowelled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bugholes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.

D. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.

E. Application of the repair materials, if not performed by the coating certified CONTRACTOR, should be inspected by the protective coating certified CONTRACTOR to ensure proper finishing for suitability to receive the specified coating.

F. After abrasive blast and structure repair/restoration is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shotblast, or other approved method.

3.05 APPLICATION OF PROTECTION COATING SYSTEM

A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

B. The spray equipment shall be specifically designed to properly ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

C. The protective coating material must be spray applied by a Certified CONTRACTOR of the protective coating manufacturer.

D. Where required for the complete coating system, a restoration material underlayment shall be applied. Restoration underlayment shall be spray or trowel applied to a minimum thickness of ½ inch or per the manufacturer's recommended thickness for the material being coated, whichever is greater.

E. Polymer protective coatings shall be applied to a minimum thickness of 500 mils or per the manufacturer's recommended thickness for the material being coated, whichever is greater.

F. A permanent identification tag with the manufacturer, products and date of work performed shall be affixed to the structure in a readily visible location. Tag shall be a stamped stainless steel nameplate permanently affixed to the structure.

G. If necessary, subsequent topcoating or additional coats of the protective coating material should occur as soon as the basecoat becomes tack free, ideally within 12 hours, but no later than the recoat window for the specified product. Additional surface preparation procedures will be required if this recoat window is exceeded.

3.06 TESTING AND INSPECTION

A. During application, a wet film thickness gage meeting ASTM D4414 shall be used to ensure a uniform thickness. Documentation of thickness readings shall be included with the final installation report.

B. After the system has cured, approximately 1 hour in most conditions, all surfaces shall be inspected for holidays with high voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection, all detected holidays shall be marked and repaired by the manufacturer's recommended method.

C. A final visual inspection shall be made by the manufacturer's approved representative and OWNER/ENGINEER. Any deficiencies in the finished coating shall be marked and repaired according to the manufacturer's recommendations. Provide final written report to OWNER detailing the location, date of report, and description of repair.

END OF SECTION

1.00 GENERAL

1.01 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with the provisions of ACI 301 "Specifications for Structural Concrete for Buildings"; ACI 311 "Guide for Concrete Inspection"; ACI 302 "Guide for Concrete Floor and Slab Construction"; ACI 318 "Building Code Requirements for Structural Concrete"; ACI 347 "Guide to Formwork for Concrete"; ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete"; and Concrete Reinforcing Steel Institute, "Manual of Standard Practice", except where more stringent requirements are shown or specified.

B. Concrete Testing Service:

1. The OWNER will select a testing laboratory to perform materials evaluation and to design and test concrete mixes in accord with requirements of ACI 301, and to evaluate concrete delivered to, and placed at, the site. The testing laboratory will be entirely responsible for taking, storing, curing, etc., of all concrete samples.

1.02 SUBMITTALS

A. Laboratory Test Reports

1. Submit 3 copies of laboratory test reports for concrete materials, for mix design tests and for results of field quality control testing to the Architect, the OWNER, CONTRACTOR and concrete producer on same day tests are made.

2. Provide a 6’ x 6’ site mock up wall sample to demonstrate concrete finish, color, architectural jointing and recessed finished form tie holes for approval by the OWNER and Architect.

2.00 PRODUCTS

2.01 FORM MATERIALS

A. General:

1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

B. Exposed Concrete Surfaces:

1. Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces. Follow jointing pattern shown on the Drawings. Where no jointing is shown or required, use largest practical sizes to minimize jointing

C. Unexposed Concrete Surfaces:

1. Suitable material to suit project conditions.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars:

1. ASTM A 615, Grade 60.

B. Concrete Slab Reinforcing:

1. Integral Fiber Reinforcing:

a. As manufactured by "Fiber Mesh". Install according to manufacturer's recommendations.

2. Welded Wire Fabric:

a. ASTM A 185, 6x6-W2.9x 2.9, unless otherwise noted.

3. Reinforcing Steel:

a. ASTM A 615, Grade 60.
b. Deformed billet steel bars, uncoated finish.

2.03 CONCRETE MATERIALS

A. Portland Cement:

1. ASTM C 150, type as required.

B. Aggregates:

1. ASTM C 33, except local aggregates of proven durability may be used when acceptable to Structural ENGINEER.

C. Water:

1. Clean, drinkable.

D. Air-Entraining Admixture:

1. ASTM C 260

E. Water Reducing Admixture:

1. ASTM C 494. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable.

F. Calcium Chloride:

1. Calcium chloride will not be permitted in concrete unless authorized by Architect in writing.

2.04 RELATED MATERIALS

A. Moisture Barrier:

1. Reinforced 6 mil polyethylene.

2. Mfr.: Reef Industries or equal.

B. Membrane Forming Curing Compound:

1. ASTM C 309, Type I.

C. Joint Fillers:

1. See Section 07900 for requirements.

D. Epoxy Setting Grout:

1. Thorogrip cement base expanding compound for setting reinforcing in concrete. Manufacturer: Thoro System Products.

E. Concrete Bonding Agent:

1. Sonobond two component epoxy resin adhesive system for bonding new and existing concrete. Manufacturer: Sonneborn Building Products.

F. Floor Grating/Mats:

1. See drawing for locations.

G. Recessed Form Plugs:

1. Dayton Superior B-40 plastic setback plug for 1” setback, dark gray

H. Concrete Sealer (Floor application):

1. Scofield Products “Selectseal-W” water based, acrylic polyurethane sealer, VOC compliant for sprayer application, (2) coat application, applied only to cured, dried concrete floors.

2.05 CONCRETE MIX DESIGN

A. Proportion mixes by either laboratory trial batch or field experience method, complying with ACI 211.1.

1. Submit written reports of each proposed mix for each class of concrete to Architect at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Architect.

2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and reviewed by the Architect.

B. Use air-entraining admixture in all concrete which will be exposed to freezing and thawing, providing not less than 5% nor more than 7% entrained air.

C. Design the mix to produce standard weight concrete consisting of Portland cement, aggregate, water, and specified admixtures to produce the following properties:

1. Compressive Strength:

a. Piers, walls and footings: 3,000 psi minimum at 28 days.
b. Exposed concrete and slabs on grade: 4,000 psi minimum at 28 days

2. Slump Range:

a. 1" to 4" for all concrete.

3. Water Cement Ratio:

a. The maximum water-cement ratio shall be in accordance with ACI 301 except as follows:

(1) For thin sections (railings, curbs, sills, ledges, ornamental work) and sections with less than 1" cover over steel, maximum water-cement ratio for severe weathering area shall be 0.43.

(2) For all other structures in severe weathering area, maximum water-cement ratio shall be 0.45.

3.00 EXECUTION

3.01 FORMING AND PLACING CONCRETE

A. Ready-Mixed Concrete:

1. ASTM C 94.

B. Preparation:

1. Place moisture barrier within sub-grade prior to placement of reinforcement. Keep foot traffic over moisture barrier to a minimum. Lap all joints a minimum of 6".

C. Formwork:

1. Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position, complying with ACI 347.

2. Provide openings in framework to accommodate work of other trades, accurately place, and securely support items built into forms.

3. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement, if required, to eliminate mortar leaks.

D. Reinforcement:

1. Position, support and secure reinforcement against displacement in accordance with ACI SP-66(ACI 315). Locate and support with metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

2. Provide reinforcing steel splices in accordance with ACI 318. Provide class B splices for vertical and horizontal wall steel and longitudinal and transverse footing steel. Provide corner bars to match al horizontal reinforcing.

3. Install welded wire fabric in as long lengths as practicable, lapping a minimum of 8 inches. Offset end laps in adjacent widths.

4. Clean loose rust and mill scale, earth, ice, and other materials that may reduce the concrete bond to the reinforcement

5. Provide minimum concrete cover for reinforcing as specified in ACI 318

6. Provide Shop Drawings illustrating location of reinforcing along with type of reinforcing and amount of reinforcing bars.

E. Joints:

1. Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.

2. Control joints in exterior walks require special attention, see construction Drawings for pattern. Also refer to paragraph 3.02 regarding finish of concrete surfaces at all exterior walks.

F. Installation of Embedded Items:

1. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting diagrams, templates and instructions provided by others for locating and setting.

G. Concrete Placement:

1. Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

2. Free fall shall not exceed 10 feet for all concrete containing high range, water-reducer (superplasticizer) and 5 feet for all other concrete. Provide elephant trunk, tremies, or other placing equipment to limit free fall.

3. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all part of forms.

4. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.

    a. In cold weather, comply with ACI 306.

        (1) Do not use calcium chloride, salt or other materials containing anti-freeze agents or chemical accelerators, unless otherwise accepted in mix designs.

    b. In hot weather, comply with ACI 305.

5. Reference Appendix A, this Section, for cold weather concreting guidelines, Portland Cement Association.

H. Equipment Pad:

1. Provide concrete housekeeping pads for all floor mounted electrical and mechanical equipment.

3.02 CONCRETE FINISHES

A. Exposed-to-view Surfaces:

1. Provide a smooth finish for exposed concrete surfaces and surfaces that are to be covered with a coating or covering material applied directly to concrete. Remove fins and projections, patch defective areas with cement grout, and rub smooth.

B. Slab Trowel Finish:

1. Apply trowel finish to monolithic slab surfaces that are exposed-to-view or are to be covered with resilient flooring, paint or other thin-film coating. Consolidate concrete surface by finish troweling, free of trowel marks, uniform in texture and appearance.

2. All interior floor slabs shall receive a finish with Class A tolerance; true planes within 1/8" in 10'-0" as determined by 10'-0" straightedge placed anywhere on the slab in any direction.

3.03 CURING

A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protection as required to prevent damage to exposed concrete surfaces.

3.04 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. OWNER's testing laboratory will perform sampling and testing during concrete placement in accord with requirements of ACI 301, which may include the following:

1. Sampling:

    a. ASTM C 172

2. Slump:

    a. ASTM C 143, one test for each load at point of discharge.

3. Air Content:

    a. ASTM C 173, one for each set of compressive strength specimens.

4. Compression Test Specimen:

    a. ASTM C 31, one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

5. Compressive Strength:

    a. ASTM C 39, one set for each 50 cubic yards or fraction thereof of each class of concrete; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one retained for later testing if required.

    b. When the total quantity of a given class of concrete is less than 50 cubic yards, the strength tests may be waived by the Architect or testing agency if field experience indicates evidence of satisfactory strength.

B. The OWNER's testing laboratory shall report test results, in writing, to the Architect, the OWNER, CONTRACTOR and concrete producer on same day tests are made.

C. The CONTRACTOR shall give 48 hours prior notice to the OWNER's testing laboratory of his intention to place concrete.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Furnish and install all mortar and grouting specified herein. The work of this Section includes:

1. Mortar for unit masonry construction.

2. Structural grout for filling selected concrete block cores identified on the Drawings, for filling bond beams, for grouting beam pockets in walls, and for forming structural bearing pads and leveling beds.

3. Mortar for repointing.

B. Related work that is not a part of this Section and is specified elsewhere includes:

1. Division 03, Section 3.08
2. Division 04, Section 4.02
3. Division 04, Section 4.03
4. Division 04, Section 4.22

1.02 QUALITY ASSURANCE

A. Use skilled workmen who are familiar with the type of construction, materials, and techniques required.

B. When required by local ordinance or by the ENGINEER, prepare grout cylinders for strength testing, and test them to verify compliance with these Specifications.

1.03 SUBMITTALS

A. Prior to beginning masonry work, submit product literature on Portland cement, lime and masonry cement to indicate compliance with the Specifications.

B. Prior to beginning grouting, submit a schedule of proposed structural grout products and their specific application.

2.00 PRODUCTS

2.01 MORTAR

A. For use in constructing all other masonry work without steel bar masonry reinforcing, provide mortar conforming to ASTM C270, Type S.

B. For use in constructing masonry work with steel bar masonry reinforcing, provide mortar conforming to ASTM C476.

C. For all mortar in exposed-to-view brick surfaces, provide mortar tinting additive as manufactured by Solomon Grind-Chem Service, Medusa Cement Co., or equally established manufacturer to achieve the color designated by the ENGINEER (mortar colors will be selected to be compatible with adjacent existing brickwork where applicable).

D. Where Portland cement is called for as a mortar constituent, use Portland cement conforming to ASTM C150 or air entraining Portland cement conforming to ASTM C175.

E. Where masonry cement is called for as a mortar constituent, use prepared masonry cement conforming to ASTM C91, Type II.

F. Where lime is called for as a mortar constituent, use lime conforming to ASTM C207 Type S.

G. Where sand is called for as a "mortar constituent", use clean, natural bank sand conforming to ASTM C144. For joints less than 1/4 inch, use aggregate in which 100% passes the No. 16 sieve.

H. Where water is called for as a "mortar constituent", use potable water.

I. The use of calcium chloride or admixtures containing calcium chloride will not be permitted in mortar.

2.02 GROUT

A. For grout used to form base plates and leveling beds, provide products of Chem-Master Corp., U.S. Grout Corp., or of an equally established manufacturer with at least five different grout products. Select grout based upon manufacturer's recommendations and submit schedule of proposed grouts as indicated in paragraph 1.03.

B. Except as allowed in the following paragraph, for all remaining grout provide grout meeting the requirements of ASTM C476 for fine grout and with the minimum strength requirements listed below.

C. For grout to be placed in block cores, bond beams and beam pockets, coarse grout as defined in ASTM C476 may be used if the minimum dimension of the void to be filled exceeds 6 inches. Comply with the minimum strength requirements listed below.

D. Provide grout that obtains a minimum 28-day compressive strength of 3750 psi with a maximum 7 inch slump unless a higher required strength is indicated on the Drawings.

E. Provide grout of a fluid consistency that will pour without segregation of constituent parts.

F. No admixtures will be permitted without prior review of the ENGINEER.

2.03 STORAGE AND PROTECTION

A. Store and protect all materials against weather and moisture damage prior to use.

3.00 EXECUTION

3.01 GENERAL

A. Installation of mortar in conjunction with unit masonry is described in Section 4.03. Additional special requirement are specified herein.

3.02 SURFACE CONDITIONS

A. Prior to work of this Section, inspect the work of all other trades to insure that all such work is complete to the point that this installation may properly commence. Installation of mortar and/or grout shall indicate acceptance of surfaces conditions.

3.03 INSTALLATION OF GROUT FOR FILLING BLOCK CORES AND BOND BEAMS

A. Prior to beginning grout work, inspect area to be grouted and install all necessary temporary and permanent formwork. Cover the tops of unfilled block cores under a horizontal bond beam with metal lath or provide special masonry units to confine the grout fill to the beam section.

B. Clean voids to be grouted of protruding mortar fins and droppings. Remove all additional foreign materials and debris.

C. Securely anchor all structural steel, reinforcing bars and affected work of other trades prior to initiating grouting.

D. Mix grout mechanically for a minimum of five minutes on-site before placing. Mix only as much grout as can be used in one hour after water has been first mixed into the batch. Hand mixing and retempering of grout shall not be permitted without review by the ENGINEER.

E. Quickly move grout from mixer to point of deposit. Handle and mix so as to avoid segregation of grout components. Puddle or vibrate grout during placement to insure complete filling of the space to receive grout. If masonry is highly absorptive, revibrate grout as it begins to stiffen to avoid eventual settlement and shrinkage.

F. Grouting of bond beams and other horizontal elements shall be performed in one continuous operation.

G. During grouting, place and secure all indicated anchor bolts, dowels for lintels, and embedded items for other trades.

H. At the completion of grouting the vertical block core reinforcing, terminate each pour 1-1/2 inches below the upper horizontal joint line of the top masonry units.

I. Comply with applicable requirements for cold weather masonry construction specified in Section 4.03.

3.04 INSTALLATION OF GROUT FOR BEARING AND LEVELING BEDS

A. Prior to placing grout, inspect the surfaces on which grout will be placed. Clean surfaces of debris and materials that would restrict proper bonding between grout and the substrate.

B. Hand place all grout for bearing and leveling beds. Work freshly placed material to ensure complete consolidation. Finish using a metal trowel to produce smooth, tight surfaces free of voids, depression, mounds or fins.

3.05 CLEANING UP

A. Upon completion of the work of this Section, remove mortar stains, splatter and drippings, and wire brush masonry to remove loose mortar and stains.

3.06 COORDINATION

A. Coordinate the work of this Section with the work of all other trades.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. As the work of this Section, furnish and install vertical and horizontal masonry reinforcing, masonry anchors and ties as necessary for a complete masonry installation and precast concrete sills and wall cap.

B. Related work that is not a part of this Section and is specified elsewhere includes:

1. Division 04, Section “Mortar and Grouting”
2. Division 04, Section “Unit Masonry”

1.02 SUBMITTALS

A. Prior to delivery of wire gauge masonry reinforcing to the project site, submit manufacturer's literature indicating compliance of products to be supplied with these Specifications.

B. Prior to delivery of precast concrete sills and wall cap to the project site, submit Shop Drawings showing the exact dimensions of each unit to be supplied.

1.03 STORAGE AND HANDLING

A. Protect all masonry reinforcing against weather and rust so that it is clean and free of scale, dirt, rust, and other materials which would prevent the reinforcing from bonding with mortar or grout.

B. Handle precast concrete units so as to prevent breakage, cracking, spalling, chipping, or other damage. Replace all units damaged during construction.

2.00 PRODUCTS

2.01 STEEL BAR MASONRY REINFORCING

A. Provide horizontal and vertical steel bar reinforcing conforming to the requirements of ASTM A615, Grade 40.

B. Provide straight reinforcing bars except at bends around corners and where bends or hooks are detailed on the Drawings.

2.02 WIRE GAUGE MASONRY REINFORCING

A. Provide wire gauge masonry reinforcing manufactured by AA Wire Products Co., Dur-O-Wal Inc., Heckman Building Products, Inc., or an equivalent established manufacturer. For the purpose of designating the required standard of quality and general design of accessories, the products of AA Wire Products Co., have been indicated.

B. Provide wire used for individual ties and joint reinforcing that is made from high tensile steel conforming to ASTM A82 (fy = 60,000 psi min.).

C. Treat all reinforcing to achieve a Class 3 galvanized finish as defined in ASTM A116.

D. Provide necessary corner and intersection assemblies to ensure complete reinforcement.

E. Properly size all reinforcing to wall thicknesses.

F. For horizontal reinforcement of concrete block masonry, provide ladder type galvanized wire reinforcing with No. 9 gauge cross rods at 15 inches on center and No. 8 gauge side rods. Furnish AA Wire Products Co. "Blok-Lok," "Partition-Lok" and "Corner-Lok".

G. For anchoring masonry to concrete, provide dovetail anchors installed in dovetail anchor slots cast into concrete face. Furnish AA Wire Products Co., "AA 100" dovetail anchor slots and "AA 200" dovetail anchors.

2.03 PRECAST CONCRETE SILLS AND WALL CAPS

A. Form precast concrete sills and wall caps using concrete with a 28-day compressive strength of 3000 psi that complies with the requirements of Section 3.08 of this Specification. In addition to those requirements, where cement is called for use only white Portland cement. Where aggregate is called for use aggregate that is maximum 3/8" in diameter.

B. Cast precast concrete units in rigid forms with smooth liners. Use non-staining form-release agents. Cast units to within 1/8" of detailed dimensions. After removal from forms, inspect all units. Patch and grind units to produce finished sections with smooth dense surfaces free of voids or honey combing. Reject units in which repaired areas are clearly visible.

2.04 WEEP-HOLE

A. Furnish plastic tubes inserts.

3.00 EXECUTION

3.01 INSTALLATION OF REINFORCING

A. Install all vertical and horizontal reinforcing in conjunction with the work of Division 4, Unit Masonry. Follow specification requirements indicated in that Section. Additional special requirements are specified herein.

B. Lap reinforcing bars a minimum of 24 bar diameters or 24 inches where spliced. Separate lapping bars by at least one bar diameter or wire together.

C. Place vertical bars so that they are held in position at top and bottom and at intervals not exceeding 192 bar diameters.

D. Place reinforcing bars so that they have a minimum clearance of 1/4-inch from adjacent masonry and not less than one bar diameter between bars in the same block core.

E. If not otherwise indicated on the Drawings, install wire gauge masonry reinforcing in horizontal joints of concrete block walls at a spacing of not more than 16 inches apart vertically.

F. Unless otherwise indicated on the Drawings, install wire gauge masonry reinforcing for brick veneer in the following manner. Provide at least one tie for each 2-2/3 sq ft of wall area. Install ties in rows with a maximum spacing between ties of 24 inch both horizontally and vertically. Embed ties at least 2 inches into the bed joints of the veneer. Attach reinforcing anchors through the sheathing to structural framing members.

G. Install wire gauge reinforcing so that it is completely embedded in mortar or grout. Joints with wire gauge reinforcing shall be at least twice the thickness of the reinforcing. Where continuous wire gauge reinforcing is called for, lap reinforcing and install corner and intersection assemblies to provide complete reinforcement of the entire horizontal masonry joint at that elevation. Tie corner reinforcing units to straight wall units.

3.02 INSTALLATION OF PRECAST CONCRETE SILLS AND WALL CAPS

A. Install sills and wall caps level and aligned with adjacent masonry joints. Grout in anchors if anchors are indicated on the Drawings. Place units on full mortar bed joints, following the requirements of Section 4.03.

3.03 INSTALLATION OF WEEP-HOLE

A. Install weep-hole as directed in Division 04 of these Specifications.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Furnish and install all unit masonry indicated on the Drawings. The work of this Section includes:

1. Supplying and laying up all stone veneer and limestone trim.
2. Supplying and laying up all concrete block and precast concrete lintels.
3. Placing all vertical and horizontal reinforcing specified in Section 4.02.
4. Building in all flashings, metal bearing plates, lintels, anchors, inserts, outlets, conduit, piping, and similar items required by other trades.

B. Related work that is not a part of this Section and is specified elsewhere includes:

1. Division 04, Section “Mortar and Grouting”
2. Division 04, Section “Masonry Accessories”
3. Division 04, Section “Cast Stone”

The furnishing of metal bearing plates, steel lintels, structural anchors, and structural members which must be built into the masonry work specified in this Section.

1.02 GOVERNING STANDARDS

A. Conduct the installation of stonework so as to conform to ANSI A41.1 "Building Code Requirements for Masonry". This ANSI specification shall be considered as part of this Specification except as specifically modified herein.

B. Conduct the installation of concrete block so as to conform to the "Specification for the Design and Construction of Load-Bearing Concrete Masonry," latest revisions of hereinafter referred to as NEMA.

C. 1974, as published by the National Concrete Masonry Association (NCMA). The NCMA specification and all standards referenced there shall be considered as part of this specification except as specifically modified herein.

1.03 QUALITY ASSURANCE

A. Using specified materials and construction techniques, provide concrete block masonry assemblies that achieve a 28-day ultimate compressive prism strength (f'm) of 1200 psi. If in the judgment of the ENGINEER, any portion of the completed work does not meet this minimum standard, conduct prism tests as directed. Prism testing shall conform to Section 3.2 of NCMA.

B. 1974 and Method B described in ASTM E447.

1.04 SUBMITTALS

A. Prior to delivery of masonry units to the project site, submit a letter from the manufacturer of the masonry units certifying that masonry units to be delivered are in strict conformance with these Specifications.

B. Prior to delivery of face stone to the project site, submit samples for review by the ENGINEER.

1.05 PRODUCT HANDLING

A. Use all means necessary to protect the materials of this Section from damage prior to installation.

B. Store masonry materials on platforms above ground and cover with weatherproof tarps to keep dirt and water away from the masonry materials.

C. Organize masonry unit stockpiles so that units with differing compressive strength are stored separately. Mark each stack of masonry units with a tag indicating the compressive strength of the units in the stack.

2.00 PRODUCTS

2.01 CONCRETE BLOCK

A. Furnish concrete block that has cured at least 28 days prior to use in the building. Provide concrete block of great enough individual unit strength to achieve the specified prism strength with the mortar specified in Section 4.01. Except where specifically called for otherwise, provide Grade N, Type I hollow load-bearing concrete block conforming to ASTM C90. Where solid concrete block is called for on the Drawings or is necessary to meet the prism strength requirements, provide Grade N, Type I solid load-bearing concrete block conforming to ASTM C145.

B. Unless otherwise dimensioned on the Drawings, provide concrete block stringer units that are nominally 16 inches long and 8 inches high (15-5/8" long and 7-5/8" high actual). All Drawing dimensions of concrete block are nominal. Provide corner, end, and cap units that have finished faces. Furnish special bond beam units where indicated on the Drawings or provide an alternate means of forming bond beams as reviewed by the ENGINEER.

C. Where single scored block are indicated on the Drawings, provide block with a single vertical score on the exterior block face. The score shall be located midway along the block face, and shall be 3/8" wide to produce on 8"x8" grid pattern on the exterior wall face when laid in normal running bond.

D. Where three score block are indicated on the Drawings, furnish block with three equally spaced vertical scores on the exterior block face. Scores shall be 3/8" wide and shall be located to produce a 4" wide by 8" wide grid pattern on the exterior wall face when laid in normal running bond.

E. Where 8 fluted block are indicated on the Drawings, provide split face fluted block with 8 equally spaced flutes per block. Flutes shall be so spaced on the blocks as to create a uniform pattern on the exterior wall face when laid up in stack bond.

F. Where block cores are indicated to be filled, provide 2 core block or break webs of units to provide on equal cross-sectional area. For all other locations, provide 2 or 3 core concrete block meeting all other Specification requirements.

3.00 EXECUTION

3.01 GENERAL

A. Provide one skilled journeyman mason who shall be present at all times during execution of the work of this Section and who shall personally direct the execution of this portion of the work.

B. Prior to beginning the erection of unit masonry, carefully inspect the installed work of all other trades to verify that all such work is complete to the point that masonry work may properly commence. During erection of masonry work, build into completed work all those items of other trades that are indicated or specified elsewhere as being installed with the masonry.

3.02 MASONRY ERECTION

A. Lay-up fluted block walls in stack bond. Lay-up all other walls in running bond. Lay-up all walls with horizontal joints level and the walls plumb and true to the lines and dimensions indicated on the Drawings. Align vertical joints of alternate courses, align scored joints with natural head joints above and below where a stacked bond appearance is indicated, and align all cores to be filled. Cross bond corner joints. Do not use chipped or broken masonry units. Remove any damaged units discovered in the finished work and replace with new units. Place all units with completely filled bed and cross joints using mortar specified in Section 4.01.

B. Install vertical and horizontal reinforcing as the masonry work progresses. Follow Section 4.02 requirements. Tie lapping steel bars or provide adequate spacing between bars. Support all bars to provide minimum clearances specified in Section 4.01. Where vertical reinforcing is indicated and grouting in greater than 4 ft high lifts will be used, install lowest course masonry units to maintain vertical joints but to provide clean-out openings for cores to be filled. Before grouting, clean debris out of cores through the clean-out openings and place temporary formwork over them. Proceed with grouting.

C. Tool all joints to a smooth, dense finish. On interior exposed-to-view masonry wall faces and on exterior brick and flush face block wall faces, use concave joints with excess mortar struck off the masonry face. On exterior block wall faces where scored units are used, use compacted and raked joints to match the block scores. On exterior wall faces where fluted block are used, use compacted and raked joints to produce a recess that matches adjacent recesses. On masonry wall faces that will not be exposed to view, compact joint and strike off excess mortar to present a flat masonry surface.

D. Prior to placement in the work, wet brick and structural clay tile units that have a water absorption rate in excess of 20 grams /sq in./minute as determined by ASTM C67. Wet brick and clay tile as necessary to that absorption is reduced to this specified rate.

E. Provide weep holes in cross joints of the first course of exterior brickwork immediately above all flashing. Accomplish this by placing weep-hole wick for full thickness of masonry facing units. Space weep holes approximately 24 inches apart.

F. Where air space is indicated in composite wall construction, keep the cavity between materials clean of mortar and debris. Where solid composite wall construction is indicated, completely fill all voids by parging or pouring the vertical joint full of grout.

G. Where new "masonry abuts existing masonry, do not key new masonry into existing. At these locations (except where new work bears on top of existing), provide properly flashed and sealed expansion joints.

3.03 COLD WEATHER MASONRY CONSTRUCTION

A. General

1. When the mean daily temperature falls below 40°F, follow the cold weather requirements specified below. Prior to implementation of these procedures, conduct a meeting of all involved parties to detail the practical institution of these requirements.

B. Preparation

1. On bearing surfaces covered with ice or snow, apply heat to surfaces until surfaces are dry. Remove previously installed masonry damaged due to cold weather.

C. Special Construction Requirements

1. Install dry masonry units that are at least 20°F. If reviewed by the ENGINEER, use Type III Portland cement and/or mortar admixtures to attain early mortar setting. Use mortar at a temperature of between 40°F and 120°F. If possible, use 70°F mortar. Mix mortar so that successive batches vary in temperature by no more than 30°F.

2. Air temperature 40°F to 32°F: heat sand or mixing water to achieve specified mortar temperature at point of use.

3. Air temperature 32°F to 25°F: heat sand and mixing water to at least 70°F prior to mixing. Provide auxiliary heat to mortar boards as necessary to ensure specified mortar temperature at point of use.

4. Air temperature 25°F and below: heat sand and mixing water to at least 70°F prior to mixing. Provide continuous auxiliary heat to mortar boards to ensure specified mortar temperature at point of use.

D. Special Protection Requirements

1. Mean daily temperature 40°F to 32°F: protect masonry from rain, snow, and freezing by covering. Use plastic or canvas tarps.

2. Mean daily temperature 32°F to 20°F: protect masonry from rain, snow and freezing by covering within 2 hours of mortar application. Maintain masonry above freezing for 24 hours by using auxiliary heat or insulated blankets. With wind velocities over 15 mph provide windbreaks.

3. Mean daily temperature 20°F and below: construct enclosures and supply sufficient heat to maintain masonry enclosure above 32°F for 24 hours.

3.04 PROTECTION OF CONSTRUCTION

A. Cover the tops of all walls not enclosed or sheltered using a strong weather-resistive material at the end of each day.

B. Cover partially completed walls at all times when work is not in progress. Drape cover over the wall and extend a minimum of 2 ft. down both sides. Hold securely in place.

C. Provide temporary bracing of all walls until they are securely braced by permanent construction.

3.05 CLEANING

A. Upon completion of work, remove mortar stains, splatter and drippings, and wire brush all masonry to remove loose mortar and stains.

B. After cleaning, inspect all masonry work for incomplete workmanship. Point-up joints as required to achieve complete bonding and continuously smooth mortar joints.

C. As directed by the ENGINEER, patch and repoint work damaged by other trades.

END OF SECTION

1.00 GENERAL

1.01 RELATED DOCUMENTS

A. General Contract Provisions and Section of Division apply to Work of this Section.

1.02 DESCRIPTION OF WORK

A. The extent of cast stone work is shown on the Drawings. It generally includes the following:

1. Furnishing and setting new cast stone sills, trim and base courses.

2. Anchors and Dowels

3. Cleaning

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 4.21: Concrete and Brick Masonry Units: Building-in anchors and dowels for anchoring cast stone work.

B. Section 7.90: Sealants

1.04 SYSTEM DESCRIPTION

A. Design Requirements for Cast Stone:

1. The CONTRACTOR is responsible for designing cast stone and its supports and anchorage to meet performance requirements and the following.

2. Cast stone shall be secured by metal supports and anchors; not less than two (2) anchors per piece. Reliance on mass or mortar bond to prevent displacement is not acceptable.

B. Performance Requirements for Cast Stone:

1. Accommodate the following conditions without overstressing cast stone or its anchorage or allowing water to penetrate joint seals.

2. Thermal Load: Movement caused by -20ºF to +180ºF material temperature range.

3. Wind Load: 30 psf positive and negative pressure.

1.05 QUALITY ASSURANCE

A. Cast stone shall meet requirements of the Cast Stone Institute.

B. Tolerances: Comply with Cast Stone Institute Technical Manual #04435-90.

C. Coordination of Fabrication: Wherever possible, check dimensions shown on Drawings or at supporting structure at the site by accurate field measurements before final submission of Shop Drawings, and before final fabrication of sill and coping work. However, coordinate fabrication schedule with construction progress as directed by the CONTRACTOR to avoid delay of work.

D. Cast Stone Manufacturer's Qualifications:

1. The cast stone manufacturer shall be regularly engaged in the manufacture of cast stone products of the kind, quality and finish required for the Project.

2. He shall have manufactured cast stone products, comparable to those required for the Project that show no deterioration or surface defects after 10 years exposure to environmental conditions at least as severe as those of the project.

3. He shall employ established quality control procedures and have personnel, equipment and plant capacity to assure uniform product quality and meet Project delivery schedule.

E. Cast Stone Installer Qualifications: Experienced stone setters working under competent supervision, who have completed comparable cast stone installations with 10 year (minimum) in place performance histories.

1.06 SUBMITTALS

A. Samples:

1. Submit two (2) samples not less than 12" x 12", conforming to profiles shown on Drawings.

2. Samples shall have same color and finish as required for the complete work.

3. Any material falling below the general character, as shown by the approved samples will be ejected and must be replaced with approved material.

4. Incorporate sill sample into required exterior wall mock up called for in Section 4.21.

5. Provide sample of inscribing of stone.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Cast stone shall be carefully packed for transportation and all precautions shall be taken against damage to the stone in transit. Where necessary to insure against damage, the stone shall be crated.

B. All cast stone shall be prepared in shops that are well protected from the weather and it shall be delivered to the job in a dry condition and without moisture or other stains. All cast stone that is wet or discolored by moisture or other stains when delivered at the building, will be rejected and must be removed from the premises at once. After delivery at the project site, the cast stone shall be placed on plan platforms raised far enough above the ground or floor to prevent wet contacts or earth contacts and shall be kept properly covered with suitable material that will protect it from rain, snow and discoloration.

C. Lift and support cast stone only at points shown on Shop Drawings.

2.00 PRODUCTS

2.01 MATERIALS

A. Cast Stone:

1. Concrete for cast stone shall be 3,200-5,000 psi minimum compressive strength at 28 days and 5% (max.) absorption, made with Portland cement and dense-graded durable aggregates, free from impurities that cause staining, efflorescence and deterioration: color shall be selected and as approved by the Architect.

2. Finish shall be as called for in specific locations as noted on the Drawings.

   a. Exposed surface shall exhibit a fine grained texture similar to natural stone. No bug holes or air voids shall be permitted.

3. Type: Architectural Dimensional Series

B. Manufacturer and Material Selection

1. Cast stone shall be Southern Ledgestone Echo Ridge by BORAL.

2. Or equal

C. Anchors and Dowels

1. 302/304 stainless steel dowels, anchors, cramps and/or other devices that prevent transfer of thermal movement/stress from piece to piece.

2. This CONTRACTOR shall be responsible for properly anchoring his material. He shall be responsible for making corrections in anchorage as required by design.

D. Mortar: Mortar for setting bed shall consist of one (1) part non staining white Portland Cement, one (1) part lime, six (6) parts sharp clean white sand.

E. Fabrication Method allowed: Vibrant-Temp method or machine manufacture using zero slump mixture to achieve desire appearance and physical properties.

F. Color:

1. Refer to Drawings for Dimensional Series sizes, types, finishes and colors.

2. Color variations allowed – 2% hue, 6% lightness, chroma and hue combined.

3. Matched to color and finish of approved sample when viewed in direct sunlight at a 10 foot distance.

2.02 FABRICATION OF SILLS, TRIM BAND, BASE COURSING AND WATER TABLE

A. Style: Similar to RockCast Architectural Cast Stone Series

1. Accent Band Trim: 3-5/8”(d) x 3-5/8”(h) x 23-3/8”(l) ST004

2. Sill Band: 3-5/8”(d) x 3-5/8”(h) x 23-3/8”(l) ST004

3. Base Coursing Field: 3-5/8”(d) x 7-5/8”(h) x 23-3/8”(l) ST205

4. Water Table: 7-5/8”(d) x 7-5/8”(h) x 47-3/8”(l) w/ sloping face WT700

B. Section of uniform lengths

C. Projection beyond face of wall shall have drip groove cut along the underside.

D. Drip groove shall not contact face of building.

E. Full return heads.

F. Top beds cut with minimum 1-inch wash, washing in direction away from building glass.

G. Provide minimum two (2) reinforcing rods.

H. Finish – Refer to Drawings.

I. Color – Refer to Drawings.

J. Provide finished exterior corners.

K. Provide smooth finished exposed face at door jambs and other openings.

3.00 EXECUTION

3.01 SETTING

A. Thoroughly clean each piece immediately before setting. Remove dust and other matter that inhibits or prevents bond or causes staining. Each stone shall be set in a full bed of soft mortar and taped home to a full solid bearing. Special care must be used on setting cast stone to prevent undue stresses or pressure on the edges. Vertical joints shall be filled solid with mortar. The face of the cast stone work shall be kept free from mortar. All holes for anchors and dowels shall be filled with mortar. Leave head joints in copings open for sealant.

1. Set stones 1/16” or less within plane of adjacent unit.

2. Joints, + 1/16”, - 1/8”.

3. Joint size at stone/brick joints: 3/8”. At stone/stone joints in vertical position: 1/4”.

B. After setting, all joints shall be raked out to a depth of 3/4” from the face of the cast stone for pointing, and the face of the stone shall be sponged clean along all joints except for caulked joints which shall be free of mortar.

C. The CONTRACTOR will not be permitted to patch any cast stone, or set any cast stone having edges or faces chipped or otherwise damaged.

3.02 JOINTING

A. Joint Size

1. At Stone/brick joints – 3/8”.

2. At Stone/Stone Joints in vertical position – 3/8”.

3. Stone/Stone joints exposed on topside – 3/8”.

B. Joint Material

1. Use a full bed of mortar at all bed joints.

2. Flush vertical joints full with mortar.

3. Leave all joints with exposed tops open for sealant.

C. Location of Joints

1. As shown on approved Shop Drawings.

3.03 CLEANING

A. All cast stone work shall be thoroughly cleaned after completion of the setting and after the completion of the other work liable to damage or soil cast stone. This cleaning shall be done in conjunction with the cleaning of masonry work and shall not be done in temperature below 50ºF. This cleaning shall be done as specified in Section 4.20 – Unit Masonry. After cleaning, drench all surfaces of the cast stone thoroughly with clean water. The use of sand blast, wire brushes or acids of any kind will not be permitted under any circumstances for the cleaning of cast stone work.

END OF SECTION

1.00 GENERAL

1.01 REFERENCE TO GENERAL CONDITIONS

A. The requirements of the General Conditions shall be reviewed for their application to the work within the Electrical Division.

1.02 WORK INCLUDED

A. The work included in this Division consists of providing all labor and material required for the installation of the complete electrical system, ready for operation.

1. Arrange with the local electric and gas utility company for the required services and pay all associated fees, including connection fees.

B. The work shall include the following:

1. Coordination with utilities for work involving the Moon Road Pump Station.

2. Complete electrical service with either service entrance conductors or laterals, grounding, metering including a current transformer cabinet where required, and a service disconnecting means suitable for use as service equipment;

3. Generators and automatic transfer switches including a battery charger all power conductors, control conductors, and miscellaneous branch circuits for generator lights, battery charger, all heaters, and other miscellaneous equipment;

4. Panel boards

5. Control Panels

6. Transformers

7. Soft Starters

8. All branch circuits with overcurrent protection, local disconnect switches, raceways and conductors to the site motors, including any control wiring.

9. Wiring devices including switches, receptacles, plates, etc.

10. All wiring and equipment for instrumentation and controls;

11. Site exterior lighting including poles, foundations, and all other items for a complete exterior lighting system if required.

12. All items incidental to and/or required to complete the installation;

13. Local disconnect switches for all HVAC equipment where the local disconnect switch is not furnished with the equipment;

14. 120 volt power to control equipment if required;

15. Building, controls housing and equipment grounding;

16. Electrical system and instrumentation and control start-up and testing.

17. Associated incidental wiring with raceways and conductors which is not shown on the Plans will be required with, but not limited to, the following equipment specified under separate sections:

    a. Pump Station Control SCADA Improvements.

    b. Generator Power (heaters included) and controls.

    c. Electrical Utility Improvements.

18. Raceway system with cable for the following systems:

    a. Control Systems.

    b. Computer network backbone system, wireless and fiber optic in conjunction with the MultiSmart Controller.

    c. Updates to KISM to including I/O points.

1.03 CHARACTER OF WORK

A. The work shall be done in a first-class and workmanlike manner by skilled tradesmen and shall be complete in all details. It shall be executed so that the installation conforms and accommodates itself to the building structure, facilities, equipment and usage.

1.04 MATERIALS

A. All materials and equipment shall be new and, to the extent possible, standard products of the same manufacturer for similar equipment. Equipment or material not specifically identified shall conform to the general standard of quality established herein.

B. Factory assemble control panels and component assemblies.

C. All materials and equipment shall be listed and labeled by a nationally recognized testing laboratory.

D. All mounting hardware installed outdoors, in wet locations, or in contact with concrete shall be stainless steel.

E. Equipment and materials must be UL certified. Where there is no alternative to supplying equipment that is UL certified, obtain special approval from the Electrical Inspection Department. CONTRACTOR to pay all associated fees.

1.05 PERMITS

A. The CONTRACTOR shall obtain and pay for all permits and certificates of inspection for work herein specified. The cost of such permits and certificates shall be included in the CONTRACTOR’s bid price.

B. CONTRACTOR to submit necessary interim and final certificates of inspection and approval required by Inspection Authorities as evidence that the work installed complies with laws and regulations of governing authorities.

C. Provide Inspection Authorities any additional necessary number of Drawings and specifications for examination and approval prior to commencement of work.

D. Notify Project Manager / Administrator of changes required by Inspection Authorities prior to making changes.

E. Notify the Inspection Authorities in sufficient time for them to arrange to inspect work.

F. Furnish the final unconditional Certificates of Acceptance from Inspection Authorities having jurisdiction on completion of work to the client and the Project Manager / Administrator.

1.06 LAWS, ORDINANCES, REGULATIONS

A. The CONTRACTOR shall comply with, and all work and materials shall conform to, the requirements of all applicable federal, state and local laws, ordinances, regulations, as well as the rules and standards of the National Board of Fire Underwriters.

1.07 TEMPORARY CONSTRUCTION POWER

A. The CONTRACTOR shall provide facilities for temporary light, power, and heat as hereinafter specified and as indicated under the General Conditions.

B. The CONTRACTOR shall connect the temporary power feed to the site as required and coordinate the connection point with the OWNER/CLIENT. All cost involved with connecting to the site shall be the responsibility of the CONTRACTOR.

C. Temporary wiring shall be removed as soon as permanent wiring is completed and the service connected. Discard temporary wiring at the direction of the OWNER/CLIENT.

D. If additional power or current characteristics are required, the CONTRACTORs requiring the service shall pay for providing this service.

1.08 RECEIPT OF PORTABLE AND DETACHABLE PARTS

A. All portable and detachable portions of the installation, such as keys, etc., shall be retained. At the completion of the work, they shall be turned over to the OWNER and itemized receipts obtained.

1.09 COORDINATION WITH OTHER DIVISIONS

A. Follow the Contract Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.

B. Examine the drawings and specifications of all divisions and become fully familiar with the work. Before commencing work, obtain a ruling from the ENGINEER on any conflicting issues between divisions. No compensation will be made for any costs arising from conflict not identified before work has commenced.

C. Coordinate the work to be performed under this Section of the specification with all divisions installing equipment to ensure that there are no conflicts.

D. Install anchors, bolts, pipe sleeves, hanger inserts, etc. required in ample time to prevent delays to other division's installation work.

E. Lay out the work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural Drawings take precedence over electrical Drawings regarding locations of walls, doors and equipment.

F. Structural members shall not be cut without prior approval of the ENGINEER.

G. Examine previously constructed work and notify the ENGINEER of any conditions that prejudice the proper completion of this work.

1.10 CONTRACT DRAWINGS

A. Follow the Contract Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.

B. Confirm underground conditions prior to project startup.

C. The Drawings for electrical work are performance Drawings, diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate location of apparatus, fixtures and approximate sizes and location of equipment and outlets. The Drawings do not show architectural, process and structural details.

D. Do not scale the Drawings to determine dimensions, but obtain information for accurate dimensions by referring to architectural and structural Drawings, or by site measurements.

E. Review existing Drawings as available at the site during the tender period. Become familiar with the condition of the existing Drawings and related equipment. Allow for errors and omissions in the existing Drawings and ensure that the tender price includes the provisions to make the necessary field reviews, field verifications, field changes, and Drawing changes to suit the intent of the modification required.

F. Work which is indicated, but not completely detailed shall be installed by common practice or as directed by the Project Manager / Administrator.

G. Make, at no additional cost, any changes or additions to materials, and/or equipment necessary to accommodate structural conditions (runs around beams, columns, etc.).

H. Alter, at no additional cost, the location of materials and/ or equipment as directed, provided that the changes are made before installation and do not necessitate additional material.

I. Ceiling mounted components (lighting fixtures, detectors) shall be installed in accordance with reflected ceiling Drawings, reviewed by the Project Manager / Administrator and Manufacturer’s recommendation.

J. Leave space clear and install work to accommodate future materials and/or equipment as indicated and to accommodate equipment and/or material supplied by other trades. Verify spaces in which work is to be installed. Install conduit and cable runs to maintain headroom and clearances to conserve space.

K. Confirm on the site the exact location of outlets and fixtures. Confirm location of outlets for equipment supplied by other trades.

L. The drawings, specifications, and standards are complimentary to one another, meaning that, that which is called for on one is meant to be called for on all. Where conflict exists between the Sections, Standards and/or Drawings, it shall be referred to the Project Manager / Administrator for clarification and rectification before any material is purchased or electrical work commences. Code requirements shall be considered a minimum standard. When materials shown on Drawings as indicated in the specifications exceed code requirements, the plans and specifications shall govern. If, having examined all documents pertaining to Division 16, concerning the nature and extent of the work being performed under other sections, clarification of the item and/or items in question will come from the Project Manager / Administrator.

1.11 CONSTRUCTION / SHOP DRAWINGS

A. Shop Drawings shall be prepared as defined in the General Conditions for all equipment supplied under Division 16.00, Electrical.

B. Submit data (Drawings) for review prior to commencement of manufacturing or installing with the exception of conduit, standard conduit fittings and low voltage wiring.

C. Assume responsibility for accuracy of equipment dimensions related to available space and accessibility for maintenance and service, and compliance with codes and inspection authorities.

D. Show all details of construction, dimensions, capacities, weights, and electrical performance characteristics of equipment or material.

E. Obtain manufacturer's installation directions to aid in properly executing the work. Submit two (2) copies of such directions to the Contract Administrator prior to installation, for use in inspecting the work.

F. Prepare composite construction Drawings, fully dimensioned of cables, conduit, cable tray, bus duct, sleeves, clearances, pipes, ducts, etc., and equipment in mechanical and electrical equipment rooms, ceiling spaces and all other critical locations to avoid a conflict of trades. Base Drawings on manufacturer’s Shop Drawings. Drawings should be developed from consultation with and agreement of all trades involved. Prepare Drawings of equipment bases, anchors, slabs, floor and roof curbs, if needed, for the electrical work.

G. CONTRACTOR is responsible for providing Shop Drawings showing the integration between supplied control panels and control panels supplied with equipment. These Drawings are to be a single Drawing for each specific device, showing interconnection between the device and all associated panels and terminal blocks. Contract Administrator reserves the right to request more detailed Drawings if those provided are deemed insufficient.

H. Submit samples of material and equipment where specified or as requested by the Contract Administrator for review before ordering same in accordance with Division 1. The Contract Administrator may retain the samples until the completion of the contract.

I. Complete all work in accordance with reviewed Shop Drawings.

J. Where conduits, cable trays and lay-in ducts are not detailed, submit conduit, cable tray and wiring layout Drawings. Show conduit/tray and cable sizes including number of cables/conductors in each conduit/tray. Drawings shall be on the same size sheets as the Contract Drawings.

K. Update single line electrical diagrams to include any modifications to the electrical distribution system.

L. Indicate the number or letter used on the Drawings/Specifications as an identification symbol on product data for panelboards, light fixtures, and other equipment submitted.

M. Bind one complete set of construction/Shop Drawings showing “as built” conditions in each operating and maintenance instruction manual.

N. In addition to the requirements of the General Provisions, provide working drawings with, but not necessarily limit to, the following additional information:

1. Manufacturer's and Supplier's name.

2. Manufacturer’s bulletins, leaflets and specifications of major electrical equipment.

3. Catalogue model number.

4. Number identifying item on the Drawings and/or in the specifications such as equipment, item number, panel identification letters, etc.

5. Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

6. Where applicable, include wiring, single line and schematic diagrams.

7. Include wiring diagrams or diagrams showing interconnections with work of other sections.

8. Lighting fixtures, including photometric data.

1.12 RECORD DRAWINGS

A. Shop drawings shall be prepared as defined in the General Conditions for all equipment supplied under Division 16.00, Electrical.

B. Before commencing work, obtain two sets of electrical drawings for showing “As Built” conditions. As job progresses, mark on field set of prints to indicate accurately all installed work. At completion stage, transfer all information onto master set of Drawings and indicate “CONTRACTORS Certified Approval of Accuracy” before submitting to Contract Administrator for review and record use.

C. Indicate on record Drawings “As Built” stamp.

D. Show on the record Drawings as-built, all outlets and equipment such as runs of conduit, locations of pull boxes, outlets, motors, panels, etc., as well as all services entering the building and on the property.

E. Dimension underground services and concealed main and sub-feeder conduits at key points of every run in relation to structure and building. Record all elevations for underground services in relation to the ground floor level of the building. Indicate on record Drawings, location of all buried services. This information is to be certified correct by Contract Administrator before backfilling commences.

F. Indicate exact location of all services left for future work.

1.13 OPERATIONS AND MAINTENANCE MANUALS

A. The CONTRACTOR shall supply five (5) copies of Installation, Operation and Maintenance Manuals for all equipment supplied under Division 16.00, Electrical.

B. In addition to the requirements of General Provisions – Submittals, include in the Operations and Maintenance Manuals:

1. Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

2. Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.

3. Wiring and schematic diagrams and performance curves.

4. Names and addresses of local suppliers for items included in Maintenance Manuals.

5. Copy of test data.

6. Recommended spare parts list.

1.14 OPERATION INSTRUCTIONS

A. Comply with the requirements of the General Provisions of the Contract – Clean-up, Start-up and Commissioning.

B. Upon completion of testing, provide on-site operating instructions by certified and experienced personnel to the operating/maintenance personnel at their convenience. As a minimum, this shall include:

1. Main Electrical Distribution System

2. Motor Control Equipment

3. Local Control Panels

C. Provide these services as necessary to put equipment in operation. Ensure that plant staff, operating/maintenance are conversant with its care and operation.

2.00 INSTALLATION

2.01 PLANS

A. The Electrical Plans show the arrangements, and general design and intent of the wiring system only. The circuit runs are diagrammatic; however, the Drawings may include details giving specific data. Pull boxes or junction boxes, though not shown on the Plans, shall be provided and installed by the CONTRACTOR. Electrical work indicated on the Plans but not covered by these Specifications or vice versa shall be provided and installed by the CONTRACTOR.

2.02 FIELD MEASUREMENTS

A. The CONTRACTOR shall make all necessary field measurements where electrical installations are involved to insure the ability to execute the work in accordance with the working Drawings.

B. Should interferences occur which will necessitate deviation from the layout or dimensions shown on the Plans, the ENGINEER shall be notified for his review of the changes before proceeding with the work.

2.03 COORDINATION OF WORK

A. The CONTRACTOR shall coordinate his work with that of subcontractors on the job.

B. The CONTRACTOR shall check with the ENGINEER before placing any panels, flush devices or other equipment installed in masonry walls and partitions.

C. The CONTRACTOR shall install all motor starters, disconnect switches and other items or material used in connection with equipment in accordance with supplier's requirements and diagrams.

2.04 DEMOLITION

A. The CONTRACTOR shall remove and/or relocate all electrical equipment, devices, conduit and wiring work as called for on the Drawings and as necessary whether such items are actually indicated on the Drawings or not in order to accomplish the installation of the specified new work.

B. Equipment, materials and devices removed shall remain the property of the OWNER and shall be stored at locations as directed by the ENGINEER. Such items shall only be reused if specifically designated on the Drawings.

C. Demolition may require staging for main power supplies. CONTRACTOR to coordinate with all scheduling and maintain power at site for all equipment deemed necessary.

2.05 POWER INTERRUPTIONS

A. The CONTRACTOR shall coordinate with the ENGINEER any interruptions to power in the existing building. Every effort shall be made to give enough advance notice to allow proper scheduling of the affected work activities.

B. The CONTRACTOR shall provide temporary wiring or power generation to minimize the duration of electrical interruptions and to keep critical load energized.

2.06 CONCRETE WORK

A. Concrete work for foundations, manholes, concrete encased conduit, etc., shall be provided by the CONTRACTOR and performed as shown on the Plans and shall conform to the Concrete Work Section of these Specifications.

2.07 LEGEND PLATES

A. Electrical equipment shall be equipped with laminated plastic legend plates with black lettering engraved on white background. The legend plates shall be 1-1/4 inches high and 3-1/2 inches wide and shall be attached to the equipment by means of stainless steel machine screws. The plates shall be approximately 3/32-inch thick and shall have letter sizes and legends as reviewed by the ENGINEER.

B. Legend plates shall be installed on the doors or covers of all enclosed electrical equipment.

C. Non-corroding, visible and legible after equipment is installed.

D. Provide “Asbestos Free” labels on switchgear.

E. Wording on nameplates to be approved by Client and/or Project Manager / Administrator prior to manufacture.

F. Identification to be in English.

2.08 MOUNTING HEIGHTS

A. Devices shall be installed at heights as listed below unless otherwise shown on the Drawings or directed in the field. Dimensions given are from the finished floor to the centerline of the device unless otherwise noted:

Push button stations	4'-0"
Hand-off-auto selector switches	4'-0"
Receptacles	1'-6"
Lighting switches	4'-0"
Telephone outlets (for desk phones)	1 -6"
Telephone outlets (for wall phones)	4'-10"
Outdoor receptacles	3 0" above ground
Lighting panelboards	6'-6" to top of panel
Power panelboards, starters, disconnect switches, actuating handle	6'-6" to highest

2.09 ENCLOSURES and AMBIENT ENVIRONMENTS

A. Unless noted otherwise, enclosures shall be NEMA 12 for interior locations; NEMA 4X for outdoor locations and for units indicated weatherproof on the Plans. Supply classified rated equipment where areas are deemed hazardous areas. Where CONTRACTOR is unsure what to provide, obtain ENGINEER confirmation. Installation of improperly rated equipment shall result in complete replacement at the CONTRACTOR’s expense.

B. Unless otherwise indicated, supply equipment enclosures, boxes, electrical materials and products suitable for ambient environments of the following areas:

AREA	GEN CLASSIFICATION	EQUIPMENT ENCLOSURE TYPE
Electrical Rooms	Dry, clean	NEMA 12
Control Rooms	Dry, clean	NEMA 12
Other rooms / areas	Dry, clean	NEMA 12
Outdoor areas	Wet	4X(stainless steel) / Alum 3R
Wet Well	Class 1 Division 1	NEMA 7 to suit classification

2.10 CUTTING AND PATCHING

A. The CONTRACTOR shall be responsible for the proper location of all chases, recesses and openings required for the electrical work and shall advise other trades of the sizes and locations of those required for his work.

B. The CONTRACTOR shall provide all sleeves, etc., required for the introduction and placement of his work and shall be responsible for their correct location.

C. Cutting, coring, and patching required as a result of the omission or opening of sleeve shall be done by the CONTRACTOR at his own expense.

D. All cutting, coring, and patching shall be done by workers skilled in that trade.

2.11 ACCESS DOORS

A. The CONTRACTOR shall provide access doors for concealed pull boxes and other work items that require accessibility for operation and maintenance.

2.12 EQUIPMENT SUPPORTS, FOUNDATIONS AND STANDS

A. The CONTRACTOR shall provide supports, foundations, stands, and platforms for electrical equipment when specified or required for proper installation.

B. Supporting structures shall be designed and constructed of a strength to withstand stresses and to distribute the load over building areas.

2.13 PROTECTION

A. Protect the work of others from damage resulting from the work of this project.

B. Protect the work of the project from that others, mage good any damage, remove all debris and rubbish and leave the project site in a clean and tidy condition to the approval of the Project Manager / Administrator.

C. Protect exposed line equipment during construction for personnel safety. Shield and make live parts “Live 120 Volts”, or with appropriate voltage.

2.14 CLEANING

A. Clean during construction and make final cleaning in accordance with Division 1

B. Before energizing and systems, inspect and clean all the inside of power panel boards and cabinets to ensure that they are completely free from dust and debris.

C. Clean all polished, painted and plated work brightly. Clean all lighting fixtures and replace all burned out lamps.

D. Remove all debris, surplus materials and tools.

E. At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

2.15 EXCAVATION, TRENCHING AND BACKFILLING

A. The CONTRACTOR shall perform all excavation and backfilling required for the complete installation of the electrical systems.

B. Excavations and backfilling shall be made at such time as will permit the uninterrupted progress of the work.

C. Trenches for conduit may be excavated manually or with mechanical trenching equipment. Where underground utilities are encountered, the trenching shall be done by hand. Trenches shall be opened the complete length and depth before conduit is placed so that if any obstructions are encountered proper provisions can be made to avoid them. The CONTRACTOR shall sheet and brace the trenches, where necessary, and shall furnish and keep in place such bridges and crossing as may be required.

D. All conduits shall be securely fastened in place during construction and shall be plugged or capped to prevent entrance of grout, water or dirt. Any conduit having a defective joint shall not be installed.

E. No conduit shall come into contact with tunnels, or gas, water or sewer pipes. The conduit where crossing gas, water or sewage pipes shall be separated therefrom by at least 6 inches of soil. Conduits laid parallel to tunnels or gas or water mains or sewers must be separated therefrom by at least 12 inches of soil.

F. Where it is necessary to cut existing paving, the CONTRACTOR shall restore the paving to its original condition.

G. Restore any disturbed grading or seeded areas to their original conditions.

H. The appropriate sections of Division 2.00, Sitework, shall be referred to for additional requirements of the listed work.

2.16 ELECTRIC SERVICE

A. The electric service from the power company shall be coordinated by the CONTRACTOR and all cost for obtaining the service shall be paid by the CONTRACTOR. The CONTRACTOR shall make connection to the power company equipment and conform to the power company requirements. Coordinate with local utility standards as deemed necessary.

B. Scheduling with the local utility company shall also be the responsibility of the CONTRACTOR. No downtime shall be regarded as an extra in the event of delaying the contract.

2.17 LOAD BALANCE

A. Measure phase current to panel boards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes. Maintain accurate record of changes made and provide circuit directory that lists final circuit arrangement.

B. Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment. Balance electrical load between phases as nearly as possible on switchboards, panel boards, motor control centres and other equipment where balancing is required.

C. Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers, oil-filled transformers, and switchgear operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

2.18 CONDUIT AND CABLE INSTALLATION

A. Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 rigid PVC, sized for free passage of conduit, and protruding 50 mm.

B. Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

C. Arrange for holes through exterior walls and roof to be flashed and made weatherproof. Coordinate with appropriate division.

2.19 INSERT, SLEEVES, FASTENINGS AND SUPPORTS

A. Provide all necessary inserts, hangers, fastenings, sleeves and curbs for electrical equipment, suspended from or passing through structural walls or floors, to suit the specific location, and as approved by the Contract Administrator. Sleeves: allow 12 mm clearance over the O.D. of all cables and conduits, 25 mm horizontally and vertically for rectangular openings.

B. Finish sleeves flush with wall finish (each side) or the ceiling to curb top.

C. Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields, properly sized for the load to be carried.

D. Secure equipment to poured concrete with expandable inserts, properly sized for the load to be carried.

E. Secure equipment to hollow masonry walls or suspended ceilings with factory made threaded or toggle type inserts, properly sized for the load to be carried.

2.20 FIREPROOFING

A. Where sleeves or openings are installed in walls, floors or partitions to accommodate raceways, cables or bus duct, provide all necessary seals, fittings, barriers and fire-resistant materials to restore the installation to its original fire rating to the satisfaction of the governing authorities and the OWNER’s insurance underwriters. Minimum of 2 hour fire rating.

3.00 TESTS

3.01 GENERAL

A. Following installation but not more than 120 hrs before energization, the CONTRACTOR shall test the electrical system and components in the manner described below. All test results shall be recorded in writing. If requested, the CONTRACTOR shall use test documents supplied by the ENGINEER to record data. A certified copy of all test results shall be submitted to the ENGINEER immediately after completion.

B. All necessary test instruments and equipment shall be furnished by the CONTRACTOR.

C. Tests shall be performed and the system reviewed by the ENGINEER for acceptability before any work is covered up or concealed. If such work is concealed, it shall be re-opened so that the test may be performed.

D. The ENGINEER shall be given ample notification of tests to permit him or the OWNER to be present. If tests are conducted without notification, they shall be required to be redone.

E. A representative of the CONTRACTOR shall accompany the ENGINEER during the final inspection and checking out of the electrical system.

3.02 TESTS REQUIRED

A. All work shall be given a visual inspection for good workmanship and conformance with standard practice.

B. The CONTRACTOR shall make any tests or adjustments required or recommended in the manufacturer's installation instructions.

C. The direction of rotation of all motors shall be checked. The motor shall be mechanically uncoupled from the driven load where reverse rotation could damage equipment.

D. All motor control circuits shall be checked for correct operation, as well as all control functions, all actuating mechanisms and sensors. All adjustable circuit breakers and overload protection devices for motor circuits shall be adjusted to allow the motors to start and run. Furnish and install the proper size heaters if required.

E. All lighting circuits and associated control shall be checked and any burned out lamps shall be replaced.

F. All 480V distribution systems, including cabling for correct phasing, voltage, grounding and load balancing.

G. Communication, control and instrumentation, fire alarm and emergency power systems.

H. Test and check electrical instrumentation systems for correct operation and compliance with regulatory authorities.

I. After the ground system is completed, the CONTRACTOR shall test the resistance of the mat to earth. The test shall be conducted in the presence of the ENGINEER or OWNER. Testing shall be performed during normal dry weather conditions with at least five (5) consecutive non-rain days prior to the test. The resistance to ground shall not exceed 5 ohms. All ground paths shall be tested for continuity and all connection points inspected. The ENGINEER shall be notified after installation of the grounding system but before backfilling in order to have an opportunity to inspect all connection points.

J. All 480 volt motors shall be tested with a 500 volt insulation megohm tester. The test shall be held for a period of one (1) minute or until a constant reading of 15 seconds after one minute. Megger test the following per industry standards, with a 1,000V tester:

   1. 208V and 480V feeders >#6AWG.

   2. Panelboards.

K. Supply instruments, meters, consumable parts (such as fuses) and equipment. Arrange for qualified personnel to conduct tests.

L. Check electrical voltage after facility has been in operation for 60 days. Adjust transformer tap settings as required. Tabulate, make adjustments and record data in Maintenance and Operating manuals.

M. Obtain the services from an approved testing agency for major electrical equipment such as switchgear, switchboards, motor control centers, and 480V panel boards. The approved testing agency will conduct power system study and acceptance tests on the installed equipment complete with a report certified by a licensed engineer. The rest report shall include a summary of the project, description of the equipment tested, methodology of the test, test results and analysis of results.

N. The tests will be in accordance with the relevant latest NETA – Acceptance Testing Standards for the following equipment: switchgear, metal enclosed busway, secondary grounding, ground fault protection systems, motor control centers, and capacitors.

3.03 CHECKOUT AND STARTUP

A. Voltage Field Test:

1. Check voltage at point of termination of power company supply system to project when installation is essentially complete and is in operation.

2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

3. Record supply voltage (all three phases simultaneously on same graph) for 24 hours during normal working day. Submit Voltage Field Test Report within 5 days of test.

B. Equipment Line Current Tests:

1. Check line current in each phase for each piece of equipment.

2. Make line current check after supply utility has made final adjustments to supply voltage magnitude or balance.

3. If any phase current for any piece of equipment is above rated nameplate current, prepare Equipment Line Phase Current Report that identifies cause of problem and corrective action taken.

C. Conduits and Ducts

1. Conduits or ducts which are required to be installed but left empty shall be tested for clear bore using a ball mandrel of approximately 85% of the conduit or duct inside diameter. Any conduit or duct which rejects the ball mandrel shall be cleared at no additional cost to the OWNER. These tests shall be witnessed by the Contract Administrator. Three days' notice shall be given prior to testing.

D. Grounding System

1. Test the ground system efficacy for compliance with Supply Authority requirements. Verify that the ohmic resistance values specified therein are not exceeded.

2. If ohmic value of the grounding system is not satisfactory to the Contract Administrator or Supply Authority, install additional ground rods and ground conductor to rectify.

3. Notify inspection Authorities that they may be present to witness CONTRACTOR testing and provide any assistance required by these Authorities for their own testing procedures.

3.04 COORDINATION OF PROTECTIVE DEVICES

A. Ensure circuit protective devices such as over-current trips, relays and fuses, are installed to correct values and settings.

B. Ensure all protective devices ratings and settings are set to the coordination study settings.

C. Record and submit to Contract Administrator all protective devices settings as left.

D. Provide tests for all relays and provide full and complete data sheets on as found settings, as tested settings, and as left settings.

E. Provide full data sheets for all settings of multifunction relays within the scope of this contract: Full data sheets to include:

1. All protective settings.

2. All relay input settings.

3. All relay output settings.

4. All communications settings.

3.05 FINAL INSPECTION

A. Make request, in writing, to the Contract Administrator to arrange for a final inspection of all electrical systems with a schedule of inspections.

B. Do not issue this written request until:

C. All deficiencies noted during the job inspection have been completed.

D. All systems have been balanced and tested and are ready for operation.

E. Operating and maintenance instructions have been submitted and approved.

F. Identification of equipment and raceways is complete.

G. Certificates have been submitted.

H. Spare parts and replacement parts specified have been provided and receipt of same acknowledged, in accordance with Section 01700 – Project Closeout.

I. Record Drawings are completed and approved.

J. OWNER's operating personnel have been instructed.

END OF SECTION

1.00 GENERAL

1.01 CONDUIT MATERIALS

A. All conduit, unless otherwise indicated, shall be rigid galvanized steel.

B. Buried conduit shall be Schedule 80 PVC.

C. Conduit passing through concrete pads and walls shall be RGS.

1.02 INSTALLATION

A. All conduit shall be surface-mounted unless otherwise noted or shown on the plans.

B. Conduit and raceway systems in offices or administration areas shall be concealed in floors, walls, or ceilings.

1.03 CONDUIT SIZES

A. Minimum size of conduit shall be 3/4-inch unless otherwise indicated.

2.00 PRODUCTS

2.01 RIGID GALVANIZED STEEL CONDUIT

A. Rigid galvanized steel conduit shall be mild steel pipe with threaded connections, hot-dipped galvanized on both interior and exterior surfaces, conforming to ANSI Standard C80.1, "Specifications for Rigid Steel Conduit (zinc-coated)." Manufacturers shall be Allied, Triangle, Youngstown, Steelduct, or equal.

2.02 METAL CONDUIT FITTINGS

A. Metal conduit fittings shall conform to ANSI C80.4, "Fittings for Rigid Metal Conduit and Electrical Metal Tubing." Manufacturers shall be Appleton, Crouse-Hinds, O.Z. Gedney, Pyle-National, Russel & Stoll, Thomas & Betts, or equal. Conduit fittings for EMT shall be compression type.

2.03 ELECTRICAL METALLIC TUBING

A. Electrical metallic tubing shall be mild steel tube, zinc-coated, threadless type conforming to ANSI C80.3, "Specifications for Electrical Metallic Tubing (zinc-coated)." Manufacturers shall be Jones & Laughlin, Allied, Triangle, Steelduct, or equal.

2.04 LIQUIDTIGHT FLEXIBLE STEEL CONDUIT

A. Liquidtight flexible steel conduit shall be constructed of a flexible galvanized steel core made from a continuous metal strip and an extruded PVC cover. Manufacturers shall be Anaconda, ElectriFlex, or equal.

2.05 PLASTIC CONDUIT AND FITTINGS

A. Plastic conduit and fittings shall be rigid polyvinyl chloride (PVC), UL 651 labeled for 90°C and NEMA-40-PVC and meeting ASTM D 1784-81 standards for PVC compounds. Material shall

permit chemical solvent sealing of joints in the field, providing continuity of mechanical strength and water tightness. Manufacturers shall be Amoco, Carlon, Olin, or equal.

2.06 PVC-COATED RIGID METAL CONDUIT AND FITTINGS

A. Rigid metal conduit and fittings shall be identical to Paragraph 2.01 and 2.02 but with a minimum of 40mil bonded coating of PVC on the exterior and a minimum of 2 mil interior coating.

2.07 INTERMEDIATE METAL CONDUIT

A. Intermediate metal conduit shall be steel pipe with threaded connections, hot-dip or electro galvanized and conform to ANSI Standards. Manufacture shall be in accordance with the requirements of UL 1242IMC.

3.00 EXECUTION

3.01 GENERAL

A. All electrical wiring shall be installed in conduit.

3.02 RACEWAYS

A. All exposed conduit shall be run in neat symmetrical lines parallel and perpendicular to building walls, beams, columns, and other building elements.

B. All conduit shall be dry, clean, and free of obstructions before conductors are pulled. If there is evidence of moisture, obstructions, or foreign matter in the conduit when the conductors are installed, the wiring shall be removed and the conduit cleaned to the satisfaction of the ENGINEER. All wiring showing evidence of damaged insulation shall be replaced.

C. Assemble metallic conduit in such a manner that it will be electrically continuous.

D. Conduits shall be separated by at least one conduit diameter.

E. Maximum distance between pullboxes and/or outlets in any conduit run shall not exceed 80 ft.

F. Keep conduit at least 12 inches clear of all hot water pipes, steam lines, and flues.

G. Concealed conduit shall be placed in the floors before concrete is poured and in concrete or masonry walls as the walls are laid up. The conduit shall be blocked and fastened in place to prevent any displacement during construction.

H. One nylon fish cord shall be furnished and left remaining inside each run of conduit in which no conductors are installed. Splicing of fish cord will not be permitted.

I. Use flexible steel conduit for short connections to motors on adjustable rails, to vibrating equipment, between outlet boxes in hung or furred ceilings and flush-type lighting fixtures, between outlet boxes and chain mounted fixtures, and in metal partitions.

J. Where plastic conduit is used, a ground conductor shall be installed.

K. Expansion joints for conduit shall be furnished to compensate for thermal expansion and contraction.

3.03 CONDUIT SUPPORTS

A. Groups of conduits shall be supported on trapeze hangers, "Unistrut," "Powerstrut," or equal. Hanger supports shall be rod or pipe with threaded connections.

B. Conduit pipe straps shall be one-hole malleable iron. Individual conduits not supported on pipe straps shall be provided with clevis hangers.

C. Conduit shall be supported at intervals not exceeding the maximum distances as specified by the N.E.C. for a given type/size conduit. Multiple runs of conduit shall be mounted with steel supports so arranged that each individual conduit is clamped in place.

D. Conduit installed on walls shall be mounted on spacers to provide not less than 1/4-inch space between the conduit and the wall.

E. Conduit and other equipment may be attached to structural steel only after review by the ENGINEER.

F. All conduit shall be secured to the supports by means of approved galvanized clamps which are designed for use with the support system.

3.04 PENETRATIONS/TERMINATIONS

A. Provide conduit running through expansion joints of the building with approved expansion fittings.

B. Conduit passing through walls and ceilings shall be installed in conduit entrance seals by Nelson Electric Co., Type MCT, O.Z. Gedney, Electrical Mfg. Co., Type WSK, or equal.

C. Wherever a conduit enters an electrical equipment enclosure from an underground location, the opening shall be sealed with duct seal after the wires and/or cables are pulled.

D. The threads of all steel conduit connections concealed in concrete shall be coated at the time of installation with zinc-clad primary coating as manufactured by the Sherwin Williams Corp., General Electric Co., or equal.

E. All conduits, fittings, and enclosures shall be terminated with bonding and bushing fittings as required by NEC.

END OF SECTION

1.00 GENERAL

1.01 CONCEALED BOXES

A. Outlet boxes for concealed indoor work and for ceiling lighting fixture outlets shall be galvanized pressed steel of the knockout type, having galvanized steel cover or extension ring, as required.

1.02 EXPOSED BOXES

A. Outlet boxes for exposed work shall be cast aluminum or cadmium plated cast iron with threaded hubs, Type FS or FD.

B. Outlet boxes on structural columns in industrial areas shall be mounted on the web of the column and shall not project beyond the column flanges.

C. Outlet boxes on concrete walls shall be attached to lead anchors with machine screws, or to permanent inserts similar to Unistrut channels.

1.03 FLUSH FLOOR BOXES

A. Flush floor boxes shall be Lew Electric, National, or equal, with receptacles where indicated.

1.04 TELEPHONE BOXES

A. Telephone boxes shall be 4-11/16 inch square, galvanized steel.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers of outlet boxes shall be Appleton, Steel City, Crouse-Hinds, Killark, Pyle-National, Russell & Stol, or equal.

END OF SECTION

1.00 GENERAL

1.01 CONDUCTOR TYPES AND SIZES

A. Unless otherwise noted, all general use cable shall be 600 volt, NEC Type THWN, or XHHW, annealed copper.

B. All shielded instrumentation cable shall be 300 volt, UL type PLTC, twisted pair/triad, with overall aluminum polyester cable shield, suitable for conduit and cable tray applications.

C. All conductors shall be stranded.

D. Unless otherwise noted all conductors shall be minimum No. 12 AWG, except No. 14 AWG may be used for control circuits. No. 18 AWG shall be used for all shielded instrumentation circuits.

E. Multi-conductor cable shall consist of 2 or more insulated color coded conductors with an overall PVC jacket. All multi-conductor cable shall be specifically approved for cable tray use, NEC Type TC, including conduit and other approved raceways in accordance with NEC Article 340.

F. Supply and install the new fiber optic back bone cables as indicted on Drawings.

G. Fiber optic indoor/outdoor GRADE 4 back bone cables to meet the following minimum requirements.

1. Fibre: 50/125µm MULTIMODE, coating 250µm
2. 12 fibre strands per cable
3. Armor: Corrugated steel type
4. 2 Colour coded tubes, each contains 6 of the above 12 described fibres.
5. Buffer: loose buffer tube, gel filled, diameter 1.9mm, PBT
6. Cable Assembly: 2 tubes and 4 fillers cabled around a central GRP strength element
7. Barrier: overall water blocking tape, 25% LAP
8. Inner Jacket: PVC, black, nominal diameter 8.13mm
9. Outer Jacket: Black PVC, nominal diameter 13.72mm
10. Wavelength: 850 – 1300nm
11. Attenuation: 3.25 – 1.00 max
12. Crush Resistance: 2000N/cm
13. Tensile Load: 2700N (600lbs)
14. Operating Temperature: -40°C to 70°C
15. Minimum Bending Radius: 15X cable Diameter
16. Manufacturer: Belden, or approved equal
17. Standard of Compliance: UL Type OFCR, cUL OFC FT4

2.00 PRODUCTS

2.01 600 VOLT CABLE

A. Conductors shall be annealed, uncoated, softdrawn copper wire, UL listed, AWG gauge, insulated for 600 volts with code grade insulation conforming to I.P.C.E.A. specifications. Manufacturers shall be Okonite, Rome Cable, American (AIW), Essex, Triangle, or equal.

2.02 INTERLOCKED ARMOR CABLE

A. Interlocked Armor Cable with a PVC jacket may be direct buried, as required.

B. Cable shall be 600 volts Type MC cable, rated 90ºC in wet or dry locations.

C. Cable may be used for power, control, or instrumentation.

D. Conductors shall be annealed, uncoated, softdrawn copper wire, UL listed, AWG gauge, insulated for 600 volts with code grade insulation conforming to I.P.C.E.A. specifications.

E. Cable shall be listed and labeled for direct burial and the overall jacket shall be listed as Sunlight Resistant.

F. The cable shall have galvanized steel interlocked armor.

G. Each pair of instrumentation conductors shall have an individual shield.

3.00 EXECUTION

3.01 GENERAL

A. The inside of conduit and raceways shall be dry and clean before cables are pulled. Care shall be exercised in pulling to avoid damage to the cable. A UL approved wire lubricant shall be used where required to facilitate wire pulling.

B. All wire and cable shall be equipped with lugs and connectors, except where cable terminations are included with the equipment being connected.

C. Splices and taps shall be made only in junction boxes or cabinets.

D. Cable connections for No. 8 AWG and smaller shall be with a copper indent type pressure connector.

E. Cable connections for No. 6 AWG and larger shall be made with a compression or bolted type pressure connector.

F. Conductors terminating at outlets shall be left with not less than 8 inches free length within the outlet.

G. Conductors for control circuitry may be No. 14 AWG unless otherwise noted.

H. 480 volt circuits shall be run in individual conduits, one circuit per conduit.

I. Control and power circuits shall not be run in the same conduit or raceway unless otherwise noted.

J. Low voltage (24VDC) and 120 volt control conductors shall not be run in the same conduit or raceway unless otherwise noted.

K. DC and AC control conductors shall not be run in the same conduit or raceway unless otherwise noted.

L. All shielded instrumentation cables shall be run in individual conduits or raceways separate from power and control and shall not be spliced.

M. Each wire and cable shall be tagged at least once as it passes through each junction box, manhole, or handhole, and at each termination. Tags shall be vinyl cloth, plastic coated, self-adhesive tape markers.

N. Orientation of three phase circuits at terminations shall take the order: Phase X - Phase Y - Phase Z, left to right, top to bottom, or front to back.

O. Exposed Interlocked Armor Cable must be protected against mechanical damage. Sleeves shall be installed for each cable penetration through all concrete walls and foundations. Each penetration through an exterior building wall shall be sealed with a link seal.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Unless otherwise indicated, switches, receptacles and plates shall be specification grade listed and labeled per the NEC, and comply with NEMA Standard WD1 “General Purpose Wiring Devices.”

2.00 PRODUCTS

2.01 SWITCHES

A. Switches shall be rated for 20 amperes at 120/277 volts AC, toggle type, quiet operation, single-pole, 3-way or 4-way as indicated.

B. Limit switches for lighting activation at access hatch shall be rated for 20A at 120/277V AC, rolling type with activation level, single pole, NEMA 3R or 4X rated.

2.02 GENERAL USE RECEPTACLES

A. General use receptacles shall be duplex, 3-wire grounding type, rated 20 amps at 125 volts AC.

2.03 GROUND FAULT RECEPTACLES

A. Ground fault receptacles shall be with integral ground fault protection and test and reset pushbutton on the face of the receptacles.

B. All outdoor receptacles shall be of the ground fault type (or supplied from GFI breakers) with a cast aluminum rainproof cover.

2.04 COVER AND SWITCH PLATES

A. Plates for flush installations in finished areas shall be 0.035 inch thick minimum Type 304 stainless steel with satin finish.

B. Plates for exposed devices in industrial areas shall be zinc or cadmium coated steel with rounded corners and/or beveled edges.

2.05 MANUFACTURERS

A. Manufacturers of wiring devices shall be Hubbell, Pass & Seymour, Bryant, General Electric, Cooper, or equal.

3.00 EXECUTION

3.01 TOGGLE SWITCHES

A. Single pole toggle switches shall be mounted so that the switch is on in the up position.

3.02 RECEPTACLES

A. Duplex receptacles shall be installed with the ground pin slot down or to the right.

B. The grounding yoke of all receptacles shall be firmly connected to the outlet box.

3.03 RECEPTACLE TESTING

A. All receptacles shall be tested for correct polarity and phase sequence.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Electrical system neutrals and non-current carrying parts of electrical equipment shall be grounded in accordance with the National Electrical Code, latest edition, except where additional requirements are shown on the plans or called for herein.

2.00 PRODUCTS

2.01 GROUND RODS

A. Ground rods shall be 3/4-inch diameter x 10 ft long copper-clad steel rods.

B. Copper coating of ground rod molecularly bonded to steel core, chamfered top, machined conical point.

2.02 GROUND BUS

A. Ground bus shall be minimum No. 4/0 stranded, soft drawn bare copper, continuous length from ground rods to ground terminal of service entrance equipment.

2.03 GROUND CONDUCTORS

A. Ground conductors shall be stranded, soft drawn, bare or insulated copper, sized per NEC, but not smaller than No.12 AWG.

2.04 GROUND ELECTRODE INSPECTION BOXES

A. Galvanized steel construction, open bottom, removable top cover, 9” diameter X 12” deep X 0.8” minimum wall thickness.

2.05 GROUND CLAMPS

A. To accommodate system ground conductor and metallic pipe not suitable for thermit weld connections, provide a product by Thomas and Betts Ltd or Burndy.

2.06 COMPRESSION CONNECTORS

A. Pure wrought copper material, prefilled with oxide inhibiting compound. Materials and tools by one manufacturer.

2.07 GROUNDING CONDUCTORS IN CORROSIVE ENVIRONMENTS

A. Insulated or bare tinned copper where in contact with aluminum or corrosive material, soil or atmosphere.

1. Thermit welded type conductor connectors
2. Bonding jumpers, straps
3. Pressure wire connectors

2.08 MANUFACTURERS

A. Clamp or bolt connectors shall be Thomas & Betts, Everdur, or equal.

B. Exothermic weld connectors shall be Cadweld, Erico Products, or equal.

3.00 EXECUTION

3.01 STRUCTURAL FRAME AND EQUIPMENT CONNECTIONS

A. Ground connections to structural steel shall be made with exothermic welds.

3.02 UNDERGROUND AND CONCEALED CONNECTIONS

A. All underground and concealed ground connections shall be made with exothermic weld connections compatible with the materials being interconnected, designed for the specific application and grounding conductor size.

3.03 GROUND RODS AND BUS

A. Ground rods and underground ground bus shall be at least 18 inches below grade.

B. Make connections to ground bus using compression type connectors.

3.04 DISTRIBUTION AND LIGHTING PANELS

A. The neutral of all distribution and lighting panels shall be bonded to comply with NEC, latest edition.

3.05 MOTOR CONTROL CENTERS

A. The ground bus of all motor control centers shall be bonded to the common ground bus system.

3.06 480 VOLT POWER SYSTEM

A. The grounded conductor of 480 volt power circuits shall be bonded in accordance with NEC.

3.07 GROUND CONDUCTORS IN CONDUIT

A. Ground conductors run in conduit with circuit conductors shall be securely connected inside junction boxes or enclosures.

3.08 SYSTEM AND EQUIPMENT GROUNDING

A. The system and equipment grounding systems shall be bonded at the service entrance equipment in accordance with NEC. Connect to ground bus and to cold water service pipe, if available.

3.09 GROUNDING CONDUCTORS IN CONDUIT

A. Any ground conductor smaller than No. 6 AWG subject to mechanical injury shall be installed in steel conduit, grounded to the conduit at both ends.

3.10 FLEXIBLE AND PLASTIC CONDUIT

A. All plastic conduit shall contain a separate ground conductor.

B. All flexible steel conduit exceeding 6 ft in length shall contain a separate ground conductor.

3.11 SUPPORT OF BARE GROUND CONDUCTORS

A. Bare ground conductors shall be supported at intervals not exceeding two (2) ft.

3.12 BONDING SURFACE PREPARATION

A. All bonding surfaces shall be thoroughly cleaned prior to making ground connection.

3.13 INSULATED GROUND CONDUCTORS

A. Where insulated ground conductors are used, all splices and connections shall be taped.

3.14 GROUNDING PENETRATION THROUGH BUILDING STRUCTURE

A. Where a grounding conductor passes through floors or walls, it shall be installed in rigid metal conduit, bonded to the conduit at both ends.

3.15 GROUNDING CONNECTIONS

A. Connections to grounding electrodes shall be made with ground conductors as shown on the Plans.

B. Soldered joints are not permitted.

C. Use mechanical connectors for grounding connections to equipment provided with lugs.

D. Protect exposed grounding conductors from mechanical injury.

E. Install connectors in accordance with manufacturer’s instructions.

F. For areas requiring multiple connections, attach copper ground loops to building steel or ground bus to which the multiple ground connection shall be made.

G. Ground cable armouring, unless otherwise noted for single conductor cables, at both ends through a ground strip and suitable fittings.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Provide, install and connect a complete system of feeders, panels, safety switches, starters, contactors, push buttons, conduits, wire fittings, boxes, supports and all necessary materials for equipment requiring electrical power as indicated on the Plans or hereinafter specified, ready for satisfactory and complete operation.

2.00 PRODUCTS

2.01 SOLID STATE MOTOR STARTERS 3-PHASE UP TO 600 VOLTS

A. All starter units shall be combination starters with molded case circuit breaker disconnects. The circuit breaker disconnect shall be mechanically linked to a handle mounted on the outside of the enclosure so that the circuit beaker can be operated without opening the cover of the enclosure. Allow padlocking of handle in ON or OFF position with three padlocks minimum.

B. All 3-phase starters shall be full voltage, reversing or non-reversing as noted on the Drawings or in these Specifications. Overload relays shall be of the thermal, manual reset type with ambient temperature compensation. Motors shall be protected by three (3) overloads, one in each phase. All overloads shall have reset capability from the front of the unit without opening the door.

C. Circuit Breakers of starter units shall be moulded case, 3 pole, 600V, magnetic only with adjustable instantaneous trips, MCP (motor circuit protector). CONTRACTOR to provide and coordinate properly rated devices regardless of settings implied on the drawings.

D. All starters shall include an individually fused, grounded control transformer, 480/120 volts, 1-phase, 60 Hz. This transformer shall be on the load side of the motor circuit protector specified above and shall provide power to operate the contactor coil, indicating lights, and other control equipment associated with the individual motor. This transformer shall be fused on one side of its secondary or 120 volt coil. The opposite side shall be grounded. Both sides of the primary of this transformer shall be fused. Provide 50% spare fuses of each type and rating.

E. Unless noted otherwise, all starters shall have green light - motor stopped; red light - motor contactor energized. These lights shall be visible from the front of the enclosure.

F. Circuit breaker auxiliary contact: Provide a minimum of two spare, normally-open and normally-closed contacts. These contacts shall be rated for at least 10 amperes and 1/3 horsepower at 120 V AC.

G. The enclosure, when not mounted in panels, switchboard or motor control centers, shall be NEMA 12 for interior locations; NEMA 4X for outdoor locations, and for units indicated weatherproof on Plans; and bolted explosion proof in Class 1 Group D areas (division to be specified).

H. All solid state starters shall have a short circuit withstand rating as indicated on the Drawings as a minimum unless otherwise noted. This value is to be coordinated and verified by the CONTRACTOR prior to order purchase.

I. Each starter shall have a Hand-Off-Auto selector switch, a start button that will operate only in the Hand mode, and a stop button with a mushroom head that will operate in all modes. These buttons shall be visible and not behind any covers.

J. Manufacturers shall be Square D, Allen-Bradley (Rockwell) or General Electric.

2.02 CIRCUIT BREAKERS (Thermal-Magnetic Breakers – feeder and branch breakers)

A. Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

B. Breaker trip unit: fixed trip unit, size as indicated.

C. The breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents.

D. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual ON and OFF positions.

E. All poles shall be so constructed that they open, close and trip simultaneously. Breakers must be complete, enclosed in a molded case. Ampere ratings shall be clearly visible.

F. The minimum interrupting ratings of the circuit breakers shall be as indicated on the Drawings, unless noted otherwise.

G. Circuit breakers shall be listed with Underwriter's Laboratories, Inc. Manufacturer shall be Eaton Electric, Square D, General Electric, Appleton or Crouse-Hinds.

H. The enclosures, when not mounted in panel, switchboards or motor control centers, shall be NEMA 12 for interior locations; NEMA 4X stainless steel for outdoor locations and for units indicated weatherproof on Plans, and bolted explosion proof in Class 1, Group D areas.

2.03 MAGNETIC BREAKERS (MCP)

A. Moulded case motor circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

B. Breaker fame: 600V, 3-pole, 60Hz, minimum interrupting capacity as per the Contract Drawings, unless otherwise noted.

C. Breaker Trip unit: adjustable magnetic trip unit, properly rated for the motor that it is to protect.

D. Circuit breakers shall be listed with Underwriter's Laboratories, Inc. Manufacturer shall be Eaton Electric, Square D, General Electric, Appleton or Crouse-Hinds.

E. The enclosures, when not mounted in panel, switchboards or motor control centers, shall be NEMA 12 for interior locations; NEMA 4X stainless steel for outdoor locations and for units indicated weatherproof on Plans, and bolted explosion proof in Class 1, Group D areas.

2.04 DRY TYPE TRANSFORMERS

A. Transformers shall be indoor, dry-type, self air-cooled, metal enclosed with provisions for conduit connections and shall have windings with Class H, 150°C rise insulation.

B. Transformers with KVA ratings less than 30 KVA shall be provided with two 5% full capacity below normal voltage taps on the primary winding.

C. Transformers rated 30 KVA and greater shall be provided with two 2-1/2% full capacity above and below normal voltage taps on the primary windings.

D. Transformers shall be quiet type and shall be designed, manufactured, and tested in accordance with applicable IEEE, ANSI and NEMA standards.

E. Manufacturers shall be Eaton Electric, Square D, or approved equal.

2.05 PANELBOARDS AND CIRCUIT BREAKERS

A. Panelboards shall be dead front and have ratings and features as shown on the Plans and coordinated with any upstream devices.

B. Enclosures for panelboards shall be minimum 20 inches wide by 5-3/4 inches deep with an overall door. Boxes shall be made of code gauge galvanized steel and shall be designed for surface or flush mounting as shown on the Plans.

C. Glazed directory frames and cards designating the branch circuits shall be mounted on the inside of the cabinet door. All directories shall be typed or printed.

D. Circuit breakers shall have molded plastic cases, AC rated, quick-make, quick-break, with trip-free operating handle, position indicator, and thermal magnetic trip device.

E. Two- and three-pole breakers shall have a common operating handle and a common trip mechanism. All interrupt ratings of breakers within the panel boards is to be the same, and as a minimum the same rating as the panel board, but never less. Provide quantity of branch circuit breakers as indicated on the drawings and panel board schedule. Provide GFCI circuit breakers on required loads.

F. Panelboards shall be service entrance rated as required for the application and furnished with neutral and ground bus bars.

G. Provide a surge protective device in each panel board, whether it has been shown on the drawings or not.

H. Ground fault circuit interrupters shall be installed in panels where noted on the Plans.

I. NEMA 12 for indoor environments, NEMA 4X for outdoor, damp environments. See section 16.01 for additional rating approval.

J. Panelboards shall be manufactured by Square D, Siemens, Eaton Cutler Hammer or approved equal.

K. Circuit breakers shall be listed with Underwriter's Laboratories. Approved manufacturer's include Square D, Siemens, Eaton Cutler Hammer.

2.06 SAFETY SWITCHES

A. Safety switches shall be industrial grade heavy-duty type, dead front construction, quick-make, quick-break switch mechanism, with cover interlocked with handle with provision for padlocking handle with three positions, horsepower rated, fused or non-fused as shown on the Plans.

B. The enclosures, when not mounted in panel, switchboards or motor control centers, shall be NEMA 12 for interior locations; NEMA 4 for outdoor locations and for units indicated weatherproof on Plans. Switches mounted in hazardous locations shall be rated as such. Coordinate with Contract Drawings.

C. Manufacturer shall be Eaton Electric, Square D, or equal.

2.07 MOTOR STARTERS – SINGLE PHASE

A. Single phase manual motor starters shall have a quick make, quick break toggle mechanism with overload.

B. Single phase magnetic breakers shall be similar to that of three phase breakers except that it is modified for single phase operation.

C. The enclosures, when not mounted within a panel, switchboards or motor control centers, shall be NEMA 12 for interior locations, NEMA 4X stainless steel for outdoor locations and for units indicated as weatherproof on the drawings; and explosion proof in Class 1 Group D areas.

2.08 FUSES

A. Where fuses are installed, they shall be dual-element type unless otherwise indicated, and manufactured by Bussmann.

3.00 EXECUTION

3.01 PANELBOARD MOUNTING

A. Panel boards shall be mounted at uniform heights throughout the building, as indicated in Section 16.01.

B. Flush-mounted panel boards shall be provided with two spare 1-inch conduits extending to the ceiling cavity or nearest area of exposed conduit.

3.02 EQUIPMENT IDENTIFICATION

A. Identification shall be provided on all electrical equipment, as called for in Section 16.01.

3.03 PANELBOARD DIRECTORIES

A. Panel board directories shall be filled out identifying the equipment served and the location.

3.04 SECURING AND ANCHORING

A. All electrical equipment not self-supporting, including panel boards, circuit breakers, starters, safety switches, and similar equipment shall be mounted securely to walls, columns and machine frames with 1/4-inch minimum separation from same, and provided with all

necessary spacers, brackets, structural pieces, inserts, anchors, and bolts for this purpose. All self-supporting equipment shall be anchored securely to floors and to supporting steel where such supports are indicated or required. All equipment mounting shall conform to the manufacturer's recommendations.

3.05 TRANSFORMERS

A. Transformers shall be mounted so as to minimize transmission of vibrations to the building. Isolation pads and flexible 18-inch long conduit connections for transformers over 15 KVA shall be provided.

B. All transformers shall be checked in the field for proper tap position. A tabulation shall be made showing the tap position for each transformer and six (6) copies submitted for the ENGINEER's review.

C. The CONTRACTOR shall adjust taps to give a line to neutral voltage under load of 115V to 119V for nominal 120/240V systems and 265V and 275V for 277/480V systems.

3.06 ADJUSTABLE CIRCUIT BREAKERS, FUSES, AND MOTOR OVERLOAD DEVICES

A. The CONTRACTOR shall set all adjustments on circuit breakers and solid state motor overloads. A copy of the settings shall be given to the ENGINEER for approval.

B. The CONTRACTOR shall furnish and installed all required fuses and shall replace any fuses that blow during start-up.

C. The CONTRACTOR shall furnish and install proper size heaters for motor overload protection. The heaters shall be size to the full load current as stated on the nameplate of the actual motor that is being protected.

D. The CONTRACTOR shall be responsible to make adjustments and take corrective action to all overcurrent devices in order to start and run all motors and other loads. All adjustments and other action must meet the requirements of the National Electrical Code.

END OF SECTION

1.00 GENERAL

1.01 FURNISHING OF CONTROL DEVICES

A. When not supplied with other apparatus, control devices shall be furnished and installed as required to achieve the control functions indicated on the Plans.

1.02 IDENTIFICATION OF CONTROL

A. All control devices shall be provided with legend plates identifying the equipment being controlled, as specified in Section 16.01 of this Division.

2.00 PRODUCTS

2.01 TIME SWITCHES

A. Time switches shall be heavy duty, voltage rated for application, momentary or maintained contacts as called for on Plans, 24-hour, astronomical dial, omitting device, spring wound carryover. Manufacturer shall be Tork, Paragon, Intermatic, or ENGINEER approved equal.

2.02 ELAPSED TIME METERS

A. Operating voltage of 120V AC, solid state construction, mechanical type display showing total run time in hours. Veeder Root or Fritz Kubler GmbH model or approved equal.

2.03 PUSHBUTTONS, SELECTOR SWITCHES, AND PILOT LIGHTS

A. Pushbuttons, selector switches, and pilot lights shall be heavy duty, oil tight, with die-cast bushings, and interchangeable lenses, buttons, and knobs. Contact blocks shall be tandem mounted and terminals shall be screw type, easily accessible, and well identified. Enclosures shall be NEMA 13 (oil-tight and dust tight), flush or surface mounted as shown on the Plans. Manufacturer shall be MicroSwitch, Square D, or ENGINEER approved equal.

2.04 RELAYS

A. Relays shall be electromechanical, heavy duty, industrial grade, enclosed, with ratings and contacts as shown on the Plans. Manufacturer shall be General Electric, Allen Bradley, Square D, or ENGINEER approved equal.

2.05 RELAY ACCESSORIES

A. Overlap contact cartridges: supplied in pairs having NO contact that closes before NC contact opens (early make-late break).

B. Mounting strips: indexed strips easily cut to required length and bolted in place. Relays are installed in rows on strip with captive mounting screws. Rows of relays on mounting strip form their own wiring trough.

2.06 TERMINAL BLOCKS

A. UL486F/GEN and UL 1059, sized to allow insertion of necessary wire sizes, capable of termination of control circuits entering or leaving equipment, panels or boxes. Screw clamp type compression, dead front barrier type with current bar providing direct contact with wire between compression screw and yoke. Yoke, current bar, and clamping screw of high

strength and high conductivity metal. Yoke shall guide all strands of wire into terminal current bar shall ensure vibration proof connection.

B. The terminals shall be capable of wire connections without preparation other than stripping, individual, rail mounted.

C. Separate connection point for each conductor entering or leaving a box.

D. Spare terminal points – 25%.

E. Marking system allowing use of pre-printed or field marked tags.

F. Manfacturers: Hoffman, Weidmuller, Electrovert USA corp.

3.00 EXECUTION

3.01 INSTALLATION

A. All control wiring shall be run in separate raceways from feeder and branch circuit wiring unless otherwise noted.

3.02 IDENTIFICATION

A. All control wiring shall be tagged and identified in accordance with the requirements under Section 1.00 of this Division.

3.03 MINIMUM CONTROL WIRE SIZES

A. Minimum size of control wiring shall be No. 14 AWG.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Under this Section, the CONTRACTOR shall furnish and install all equipment and materials to provide a complete and fully operating process control and instrumentation system as shown on the Plans and as described below. The work shall include all wiring, piping, raceways, and mounting and accessory equipment required to make the system fully operational.

B. The work shall include all electrical, pneumatic, and hydraulic interconnections between equipment which is functionally a part of the instrumentation and control system, whether the equipment is furnished under this Section, under other sections of the Contract, is existing equipment, or is furnished by others.

C. The work shall include all mechanical installation associated with mounting, assembling, wiring and plumbing of equipment furnished under this Section.

D. The detailed specifications given herein are intended to establish the minimum requirements of the system but will in no way relieve the CONTRACTOR of the responsibility to provide all necessary hardware to meet the functional requirements established by the performance specifications.

E. Scope of Work

1. The CONTRACTOR is responsible for system integration of controls for the following locations that will include control, monitoring and trending: **MOON ROAD PUMP STATION.**

2. The SCADA system will be an expansion/reuse of the existing KISM system by Kennedy Industries, no “or” equals shall be allowed.

1.02 STANDARDIZATION

A. For purposes of standardization and to insure a complete and totally integrated instrumentation and control system, all of the equipment shall be furnished by a single supplier and shall have overall accuracy as guaranteed by the selected supplier.

1. The supplier shall be the manufacturer of basic elements of the system and shall be responsible for the correct operation of all equipment after installation.

B. System Integration Qualifications:

1. The CONTRACTOR performing the work of this section shall meet or exceed the following qualifications. Upon request by the ENGINEER and prior to award of the Contract, the CONTRACTOR shall be required to demonstrate compliance with the stated qualification requirements.

a. Organization that has been established for a minimum of 10 years and actively involved in the business of process control and instrumentation systems integration and has adequate plant facilities, organization structure, manpower, and technical and managerial expertise to properly perform the work under and in conformance with these specifications.

b. Involvement in 5 (minimum) projects of similar scope and size involving the design, integration, installation, testing, and commissioning of a sanitary water and wastewater treatment facility process instrumentation and control systems over five (5) years.

c. Shall have at the time of project advertisement an experienced engineering and technical staff capable of process control system design, integration, testing, and commissioning, as well as a thorough understanding of water and wastewater treatment processes.

d. Shall have the in-house resource of permanent personnel for the preparation of system documentation and system operation and maintenance training. All instrumentation and industrial electronic systems shall be provided under the supervision of a single systems integrator, chosen by the CONTRACTOR, which is regularly engaged in the design and installation of such systems of similar scope and complexity.

e. CONTRACTOR shall have personnel located within a 4 hour response time of the project. CONTRACTOR shall also provide contract information directly to involved personnel once the process systems are functional.

f. The organization must have a direct formal relationship with the specified hardware manufacturers. This relationship at a minimum shall include certification as a Motorola Partner.

2. The following CONTRACTORS have been pre-qualified for this project: Commerce Controls, Kennedy Industries, Windemuller Automation.

1.03 EQUIPMENT QUALITY

A. The instrumentation and control system elements shall be fabricated of new materials selected and designed to provide long service with minimal maintenance. Housings shall be of sturdy design, rigid and close fitting at closures and shall be resistant to corrosion. Electrical equipment such as limit switches, manual switches, solenoid elements and the like shall be suited to application in a humid atmosphere. Electrical coils shall be rated for continuous duty.

B. All components of the instrumentation system shall be, "state of the art", design.

1.04 RESPONSIBILITY AND COORDINATION

A. It shall be the responsibility of the CONTRACTOR to furnish a complete and fully operating system. The Plans and Specifications are intended to include all details of a complete equipment installation for the purposes specified. The CONTRACTOR shall be responsible for all details which may be necessary to properly install, adjust and place in operation the complete installation.

1.05 DOCUMENTATION

A. The CONTRACTOR shall submit to the ENGINEER, six (6) complete sets of Drawings and other documents for the ENGINEER's approval prior to the manufacture and/or assembly of the system. The submittal package shall consist of the following:

1. Dimensional Drawings of console and panels.

2. Internal panel wiring and piping schematic Drawings.

3. Outline dimension Drawings of all field mounted instrumentation.

4. Manufacturer's data sheet for each individual piece of equipment listing complete model number, mounting information, power requirements and other installation details.

5. System schematic Drawings illustrating all components being supplied complete with pneumatic and electric interconnections. Schematics to clearly show all wiring and tubing identification numbers.

6. Design specifications including process control loop functions, applicable software, and overall operational system descriptions.

B. At the time of shipment, the manufacturer shall provide five (5) complete system manuals necessary for the installation, maintenance and operation of the system. These manuals shall include the following sections or topics as a minimum:

- General Description
- Operation and Programming
- Installation and Checkout
- Theory of Operation
- Schematic and Wiring
- Diagrams
- Maintenance
- Maintenance Aids
- Parts Data
- Recommended Spare Parts Inventory
- Wire List
- Software Documentation

1.06 AS-BUILT DRAWINGS

A. Prior to final payment, the CONTRACTOR shall submit as-built Drawings of the system he has installed. The as-built Drawings shall include connection and schematic diagrams of all panel and field wiring. The Drawings shall include schedules showing the terminal and wire number at each termination point, both internal and external to panels.

B. The as-built Drawing shall fully and accurately reflect any and all modifications made to the system during the course of installation or start-up.

C. The as-built Drawings shall be prepared by the equipment supplier on standard size “D” bond, using the ENGINEER's standard symbols and notations. The tracings shall become the property of the OWNER.

1.07 MANUFACTURER'S START-UP SERVICES

A. The services of a factory-trained, qualified, service representative of the equipment manufacturer shall be provided to inspect the complete installation, to insure that it is installed in accordance with manufacturer's recommendations, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment furnished. A minimum of two (2) days start-up assistance shall be provided. One (1) of these days shall be designated for "call-back"

service, to be used at the discretion of the ENGINEER at anytime during the initial six months of plant operation.

1.08 ACCEPTANCE TESTING

A. General

1. During the course of the project, the CONTRACTOR shall prepare system test procedures for each phase of the work, approved by the ENGINEER, which will demonstrate conformance of the system to the Specifications and project requirements. The manufacturer shall include in his shop drawings a general outline of the tests he intends to perform.

B. Shop Testing

1. The test procedure shall be performed at the manufacturer's factory prior to shipment of the equipment. The manufacturer shall notify the ENGINEER at least four (4) weeks before the factory testing in order that the test may be witnessed. The test results shall be fully documented and a copy of the test results shall be furnished to the ENGINEER for his records.

C. Preliminary Acceptance Testing

1. The same test procedure with supporting documentation shall be performed after installation to determine if damage has occurred during transit or installation. Successful completion of this field test will constitute the preliminary acceptance testing of the equipment for a given site.

D. Final Acceptance Testing

1. Final system acceptance shall be defined as that point in time when the system has passed the field acceptance tests and, further, has performed as a functioning unit for 30 continuous days without loss of supervisory control functions.

1.09 TRAINING

A. Operator Training

1. During the initial five (5) days of operation, the equipment manufacturer shall conduct an on-the-job training course for the plant personnel. This course shall be designed to train the operating personnel to operate the system including the following tasks:

   a. Power up all equipment at the control center.

   b. Make all necessary routine checks when equipment is started.

   c. Interpret all display and panel light communications from the processor.

   d. Take appropriate action for all alarm conditions.

   e. Operation training services shall be completely independent of the start-up services covered above.

B. Maintenance Training

1. During the first five (5) days of operation the control system manufacturer shall provide operating personnel with the training necessary to perform routine periodic maintenance and light emergency maintenance on the equipment.

1.10 SPARE PARTS

A. At the very minimum, the following spare parts shall be provided by the CONTRACTOR:

1. Five (5) electro-mechanical or solid state relays of each type used in the system.

2. Spare fuses, one of each type supplied under this Contract.

1.11 SCREEN / SEQUENCE OF OPERATION WORKSHOPS

A. CONTRACTOR shall hold a minimum of one (1) workshops to develop HMI screen and updates to the sequence of operation.

B. All workshops will be held at the OWNER's office.

C. Additions/deletions to the programming only as a result of the workshops will be at no cost to the OWNER.

1.12 ELECTRICAL WORK

A. All instrumentation and control system wiring shall be run in separate conduits from power system wiring.

B. All analog signal circuits shall be run in separate conduits from discrete signal circuits.

C. All wiring for analog signal circuits shall be individually shielded, twisted pair instrumentation cable, with drain conductor.

2.00 PRODUCTS

2.01 CONTROL AND INSTRUMENT PANELS

A. All control panels and consoles shall be fabricated and assembled by the manufacturer of the major components of the supervisory control system.

1. All control and instrumentation equipment shall be of electronic design except as may be required to interface with pneumatic final control devices.

2. All control and instrumentation equipment shall be designed for 24V dc operation as standard. Power supplies shall be provided as required.

3. All process variable indicators shall have scales calibrated in engineering units suitable to the application.

4. Front panel-mounted instruments shall use standard 3" x 6" or 6" x 6" (DIN) instruments as specified or indicated on the drawings bezel size.

5. Inscribed legend plates shall be provided as called for in the Plans or Specifications or as required for proper identification of control components. Wording on inscribed plates shall be coordinated with the ENGINEER at the time of shop drawing review.

6. The CONTRACTOR shall provide, current alarms, isolation transformers, signal converters, transducers, pneumatic and electric supplies and relays as may be necessary for proper system operations as described herein and/or shown on the Plans.

7. Terminal blocks in all panels shall be oversized to permit the future connection of at least one no. 12 AWG conductor at each termination point.

8. Standard analog signal range shall be 4 to 20 milliamps dc.

2.02 CONTROL AND INSTRUMENT PANEL FABRICATION (LOCATED WITHIN PUMP STATION ENCLOSURE)

A. Panels shall be totally enclosed one piece design, NEMA 12 construction. Specific panel designs may require to be constructed in multiple sections for access through building entry way doors. It is the CONTRACTOR's responsibility to build the panel(s) in such a way that installation will not require building structure demolition. They shall be floor-mounted and free-standing unless indicated otherwise. Materials shall be not less than 12 gauge sheet steel reinforced and plug molded to angle iron frames. Construction incorporating a frame with light gauge skin will not be acceptable. Panels shall have removable front flush doors when mounted against walls. Where back access is possible, panels shall be provided with fully hinged double back doors. All access doors, whether of front or rear design, shall be in a suitable size to permit free access to all internally mounted equipment. All panels shall be constructed in strict compliance with JIC standards. All panels shall be dust-tight, NEMA 12 industrial grade construction.

B. The panels shall be factory assembled, wired, tubed and tested. All wiring and tubing shall be neatly and firmly installed in the horizontal and vertical runs and shall not block access through the door panels. Terminals shall be provided near the bottom for connection of incoming wires and tubing. The equipment within the console shall be so arranged that there is complete accessibility to all items through the access doors.

C. Each and every wire both internal and external to the panel shall be tagged at both ends with its respective wire number. All pneumatic tubing shall be similarly identified. All wires shall be terminated with compression type spade lug connectors.

D. Finish: All welds scratches and other rough marks shall be ground smooth and the entire cubicle shall be bonderized and painted internally and externally with a minimum of two (2) primer coats and one (1) finish coat in a color to be selected by the ENGINEER.

E. Equipment Layout: Surface-mounted pieces of equipment shall be arranged as shown on the Plans or as otherwise approved by the ENGINEER.

F. Inscribed Plates: Instruments, meters, gauges indicators, selector switches, pushbuttons and indicating lights mounted on the console shall be identified with engraved laminated plastic plates finished to match console color. Alternate types of plates will be acceptable if approved equal by the ENGINEER. Wording on the engraved plates shall be coordinated with the ENGINEER.

G. Each panel shall be provided with a 115 volt duplex convenience outlet, main power circuit breaker, and an interior switch controlled light.

2.03 GENERAL PURPOSE RELAYS

A. General purpose relays shall be rugged, industrial grade, electro-mechanical, tube type, 8-pin octal plug-in with clear plastic dust cover. Contacts shall be 2 or 3 PDT (2 or 3 Form C), silver cadmium oxide or silver overlay, rated minimum 5 amperes at 120 volts ac. Coil shall be rated for continuous duty and shall be Class A construction with 105EC wire with operating voltage to suit the application.

B. General purpose relays shall be Potter and Brumfield KA series, Square D, or equal.

2.04 GENERAL PURPOSE TIMING RELAYS

A. General purpose timing relays shall be rugged, industrial grade, solid state, designed to be compatible with the general purpose relays specified above. They shall have timing range as shown on the Plans, repeat accurate within 1%, field adjustable by means of an external knob. Timing relays shall be on-delay or off-delay as required and voltage rating to suit the application.

B. General purpose timing relays shall be Potter and Brumfield DC series, Square D, or equal.

2.05 RELAY MOUNTING SOCKETS

A. Mounting sockets for general purpose relays shall be 8-pin octal with screw-type terminations.

2.06 PUSHBUTTONS, SELECTOR SWITCHES, AND PILOT LIGHTS

A. Pushbuttons, selector switches, and pilot lights shall be of heavy-duty design with oil tight shafts and panel seals. They shall have square legend plates, universal mounting die-case bushings, and inter-changeable lenses, buttons, and knobs. Contact blocks shall be tandem mounted and terminals shall be screw-type easily accessible and well identified. Devices shall be as manufactured by Westinghouse, Allen Bradley, Square D, General Electric, or approved equivalent.

2.07 PRIMARY SENSING ELEMENTS

A. The work shall include all necessary installation, calibration, check-out, and start-up of all primary sensing elements as listed in the Instrument List, shown on the Plans, or specified under this Section. Mounting accessories shall be provided as required to securely position the sensors and/or transmitters in their proper relationship to the medium being monitored.

B. All necessary electrical, pneumatic, or plumbing connections between sensors and transmitters shall be provided by the CONTRACTOR.

C. Operating ranges shown on the accompanying instrument list shall be verified by the CONTRACTOR from actual mechanical equipment plans. Operating points for on/off type sensors shall be based upon functional descriptions given elsewhere or will be field determined by the ENGINEER.

D. The CONTRACTOR shall furnish and install all power supplies needed for transducers.

E. Tubing between the pressure taps on flow tubes and d/p transmitters shall be furnished and installed by the CONTRACTOR.

F. All primary sensing element installations shall conform to the manufacturer's recommendations.

2.08 PUMP STATION CONTROLLER

A. The CONTRACTOR shall install, program, and make operational a pump station controller.

B. Standard Functions: The field hardware shall provide control of a typical pump station, with an intuitive, interactive user-interface. The product shall come from pre-built configuration parameters which are selectable via the user interface and a PC configuration, including:

1. Setpoint adjustment for pump activation/deactivation and level alarms.

2. Level device from 4-20mA or conductive probe.

    a. Redundant level device handling.

3. Selectable between fill/empty.

4. Functionality for advanced pump control of 3 pumps including a grouping and alternation.

5. Station optimization, including:

    a. Max off time (odor reduction).

    b. Maximum pumps to run (overload protection).

    c. Maximum starts per hour (pump protection).

    d. Inter-pump start and stop delays.

    e. Maximum run time (turn off inefficient or partially blocked pumps).

    f. Blocked pump detection.

    g. Well washer controls.

    h. Well clean out (periodic pump down to snore point).

6. Multiple profiles of setpoints for spill management, off peak pumping, tariffing, etc.

7. Datalogger.

8. 3-phase power supply monitoring and supply protection. All connections that are required for 3-phase supply monitoring will be completed by CONTRACTOR including conduit and conductors as necessary.

    a. Under-voltage.

    b. Over-voltage.

    c. Phase fail.

    d. Phase rotation.

9. Monitoring of dc supply, battery voltage, and internal temperature.

C. Operational Functions:

1. Motor protection and power module including:

a. Over-and under-current.

b. Ground/earth fault detection and alarm.

c. Insulation resistance testing for motor windings.

d. KVA, kW and power factor measurement.

2. Calculated flow via draw down test.

3. VFD control algorithm.

D. Programmability: The product shall have the option of IEC61131-3 PLC programming language to interact with (or replace) pump control module.

E. The I/O shall be expandable to many hundreds of I/O points per unit. Available I/O types shall include:

1. Digital inputs (voltage free input), also configurable as counters.

2. Digital outputs (240V, 5A resistive).

3. Analog inputs (10 bit).

4. Analog outputs (10 bit).

F. Digital Inputs configurable for seal, thermistor, and other pump station requirements: Additionally, the Digital Inputs shall be selectable as pump station specific I/O to reduce components in the panel and therefore save cost, e.g. remove pump relays such as mini-CAS relays, MAS relay.

1. Seal sensor.

2. PTC Thermistor.

3. Flygt FLS & CLS.

4. Conductive probe (for liquid level sensing).

G. Specific I/O for motor protection and monitoring: The product shall have I/O cars to minimize additional components which include:

1. Insulation resistance test (IRT) to 1000V.

2. 3-phase current monitoring, derived from CT's, 0.5% resolution. CONTRACTOR to supply and install CT's as required including conductors, conduit, etc.

3. 3-phase supply monitoring, 0.5% resolution. Up to 630V phase to phase.

H. User Interface: The field hardware shall include a user interface for operations and configuration. The display shall provide status of most aspects of the pump station, control of pumps, resetting of faults, and configuration of parameters.

1. Status: The following parameters shall be displayed on the main screen:

   a. Level.

   b. Setpoints for alarms and pump start/stop.

   c. Pump running/stopped.

   d. Pump available.

   e. 3-phase current for each motor (when motor protection card installed).

   f. Pump fault.

   g. 3-phase supply.

   The screen will also have buttons to allow the user to access Faults, History, Information and Settings.

2. Information Screens: The following parameter shall be available via a user key press from the main screen:

   a. Hours run accumulators for each pump and the station with the following comparisons:

      1) last minutes run.

      2) this hour, last hour.

      3) today, yesterday.

      4) this week, last week.

      5) total hours run.

   b. Starts accumulators for each pump and the station with the following comparisons:

      1) this hour, last hour.

      2) today, yesterday.

      3) this week, last week.

      4) total starts.

   c. Flow values, either derived from calculations or via a flowmeter, including inflow, pump flow rate, total volume.

   d. Any overflow information, including start time, duration, and estimated volume.

e. Insulation resistance value for each motor.

f. Status of all I/O.

3. Control: The following aspects of the system, as a minimum, shall be controlled intuitively through the user-interface:

   a. Pump mode, for each pump, between Auto/Manual (Hand)/Off.

   b. Pump fault reset.

   c. Level alarm reset.

4. Fault Screen:

   a. The main screen shall include a fault button which takes the user to a fault screen and allows them to check all current and unacknowledged alarms.

   b. The fault screen will detail the fault (e.g. contactor fail, seal fault, motor overtemp, over-current, etc.) along with date/time each fault occurred and cleared.

   c. A reset option for a fault will be presented to the user when faults can be acknowledged / reset.

5. History Screen: The main screen shall include a history button which takes the user to a history screen and allows them to check all faults and events along with date / time. The history screen shall include the ability to filter to view only faults, only events, or narrow down to events relating to specific types of data.

6. Configuration: The user interface should allow intuitive configuration of the system, including as a minimum:

   a. Set-points, including alarm and pump setpoints.

   b. Enable/disable level alarms (so that for example, the low level alarm can be easily activated or deactivated).

   c. Start, stop and alarm displays.

   d. Alternation/fixed sequence and grouping of pumps where necessary.

   e. Configure I/O:

      1) Assign primary / backup level to any input, e.g. 4-20mA or conductive probe.

      2) Assign pre-defined (or user-defined) faults, e.g. thermal overload, contactor fail, to any digital input.

      3) Zero and span analog inputs.

      4) Set Digital outputs to change state with any digital tag in the system.

      5) Set Analog outputs to follow any analog value, including primary level.

f. Fault configuration:

1) Set each fault as either: display only; manual/SCADA restart; auto restart with configurable restart time.

g. Pump station optimization parameters such as:

1) Max off time (odor reduction).

2) Maximum pumps to run (overload protection).

3) Maximum starts per hour (pump protection).

4) Inter-pump start and stop delays.

5) Maximum run time (turn off inefficient or partially blocked pumps).

6) Well washer controls.

7) Well clean out (periodic pump down to snore point).

h. Supply protection:

1) Under and over voltage alarm points.

2) DC supply alarm point.

i. Motor protection parameters, including under and over current, ground/earth fault, phase fail.

j. Communications ports, speeds and addresses.

k. The configuration of the unit will also allow the user to save a known good configuration on the unit itself that they can revert back to at any time.

7. Maintainability: The supplier shall also demonstrate that their system is maintainable in the future, especially that future applications do not incur any user-interface development cost on the customer, i.e., the user-interface shall be an integral part of the system.

I. Communications:

1. Physical: The product shall include:

a. Ethernet 10Mbit/s.

b. Multiple RS232 ports to 115kBits/s.

2. Media: The system shall support a variety of communications networks including:

a. Private radio over RS232.

b. PSTN.

c. Wireless LAN.

d. Serial and Ethernet Modbus.

3. Protocols: The communications protocol will be an open protocol such as DNP3 which includes:

a. Change of state reporting.

b. Native date/time and quality stamps for each data point.

c. Event buffering for different classes of data.

d. Modbus master/slave protocol will also be provided.

J. All digital input points (General I/O) including faults and sensor alarm points will have selectable instant call out on contact closure. All call outs based on polling cycle will not be accepted.

K. Unit shall be a MultiTrode, MultiSmart pump controller (2nd Generation) with Ethernet and Serial Modbus Support, UPS System and +24Vdc power supply for instrument power.

2.09 MEDIA CONVERTERS (FIBER TO ETHERNET)

A. Supply and install fiber to copper media converter switches in the control panel at the pumping station site, as indicated on the Drawings.

B. The media converter shall come equipped with the following features:

1. UL approved.

2. Operation – full duplex.

3. Status LED indicating lights.

4. 120V ac power supply, 60Hz.

5. Link copper and fiber networks.

6. MDI / MDI-X crossover for configuring RJ-45 port.

7. For use on desktop or wall mount.

8. Must sustain operating temperature parameters within housing.

9. Shall come equipped with proper number of ports required.

C. Manufacturers

1. Black Box LPD100A

2. STRIDE SE Series

3. Approved equal

2.10 NETWORK SWITCHES

A. Provide an Ethernet switch for each control panel (as required) for communication networking in the main control plant.

B. General requirements are as follows.

1. 16-port managed Ethernet switch.

2. Designed to operate reliably in electrically and environmentally harsh environments.

3. Provides a high level of immunity to electromagnetic interference (EMI) and heavy electrical surges.

4. Capable of configuration for a minimum of 1000 VLANs with a bandwidth of 3.2Gbps.

5. Capable of configuration for a minimum of 80 switches and fault recovery times in the order of less than 5ms per switch.

6. Operating temperature, no fans, of -40°C to 85°C.

7. 120VAC operable.

8. Form-C failsafe contact relay: 1A @ $30V_{DC}$.

9. Switching Method: store and forward with IEEE 802.3x full duplex flow control, non-blocking.

10. MAC Addresses: 4000 nodes, self-learning with address aging.

11. Suitable for mounting on a 19” rack, DIN rail or panel.

C. Provide the following front panel indicators:

1. Power on.

2. System is receiving power, but not functioning properly.

3. Individual LED’s for each RJ45 port indicating connection, port is transmitting/receiving data, and faults.

D. Provide the following minimum requirements:

1. Two (2) fiber-optic ports with high speed, single mode 100BaseFX ports.

2. Provide fiber-optic connectors.

E. Provide a minimum of 14 RJ45/CAT 6 ports, meeting the following requirements

1. 10/100 auto-negotiating Ethernet ports.

2. Automatic negotiation of the speed and duplex settings.

F. Software Features

1. Automatic learning, negotiation and crossover detection.
2. RSTP (802.1w) and Enhanced Rapid Spanning Tree (eRSTP) network full recovery (<5ms).
3. Quality of Service (802.1p) for real-time traffic.
4. VLAN (802.1q) and GVRP support.
5. IGMP Snooping for multicast filtering.
6. Port rate limiting and broadcast storm limiting.
7. Port configuration, status, statistics, mirroring and security.
8. Loss of link management on fiber ports.
9. Security features to include SSH/SSL, Enable/Disable ports, 802.1q VLANS, MAC based port, 802.1x Port based Network Access Control, Access Control Lists (ACL's), RADIUS, SNMPv3.

G. Standards of Compliance

1. IEC 61800-3 Industrial (Variable Speed Drive Systems)
2. IEEE 802.3u 100BaseFX
3. IEEE 802.3x Flow Control
4. IEEE 802.1d STP Packet Priority
5. IEEE 802.1p Class of service
6. IEEE 802.1q VLAN Tagging
7. IEEE 802.3ad static configuration
8. RFC 894 IP over Ethernet
9. RFC 1155 Structure of Mgmt. Information (SMIv1)
10. RFC 1157 SNMPv1
11. Emissions meet FCC Part 15, Class A, NEBS Level 3 Certified

H. Refer to the tender documents for the number and location of the switches. Beyond those indicated on the drawings, provide three (3) spare units, of the same manufacturer and model number.

I. Network switch manufacturer and model to be RuggedSwitch RS1600 Series or approved equal.

2.11 FIBER OPTIC CONNECTORS

A. All fiber-optic connectors shall be of the Duplex SC Connector type, where possible.

2.12 SCADA SYSTEM SOFTWARE SUMMARY

A. General Software/Hardware Requirements

1. PLCs shall have permanently installed system software for process input/output servicing, PLC intercommunications, communication, diagnostics and process control. The basic model for PLC operations shall be the "ladder diagram".

2. The CONTRACTOR will reserve two (2) seats/licenses for the remote interface/motoring/controls of the systems.

3. Two (2) copies of the screens and related programming routines will be provided at the end of project close-out.

B. Hosted Software/Hardware Requirements

1. The SCADA monitoring systems shall be hosted for the OWNER. The system shall be developed on Trihedral Software with VTSCADA software version 10.2 or higher. All systems shall have a high level redundancy including the data center. The data shall have multiple power sources including one power source being an automatic generator system. A minimum of four (4) internet connection is required with a minimum of 2 different carriers that are not “resellers” of each other. The hosted solution shall be KIStationMaster by Kennedy Industries or ENGINEER approved equal. Any alternatives to KIStationMaster must be preapproved.

2.13 NON-MERCURY TYPE LEVEL SWITCHES

A. Where float-type level switches are required they shall be plastic or stainless steel buoyant housings enclosing a mechanical, non-mercury switch. They shall be mounted at a fixed elevation and shall give a closed and open contact in response to liquid level changes past the point of mounting.

B. They shall be mounted completely within the tank or chamber containing the liquid to be monitored. No through-the-wall shafts will be allowed. The float switch shall be field adjustable and shall have N.O. and N.C. set of contacts. It shall be furnished complete with all necessary mounting clamps, junction boxes, and waterproof 4-conductor cable of a length suitable for each specific application.

C. The float-type level switches shall be Flygt Corp., Consolidated Electric Co., or ENGINEER approved equivalent.

2.14 CONDUCTIVE LEVEL SENSING PROBE

A. The CONTRACTOR shall install a conductive level sensing probe with indicator controller.

B. The conductive level sensing probe shall meet the following requirements:

1. High Grade Stainless steel Alloy Sensors.

2. 10 Sensor Rings (200mm Spacing).

3. 2.5 Meter Length.

4. PVC Extruded Tube Casting.

5. PVC Multicore Cable.

6. 32” to 149°F operating range.

7. Stainless Steel Mounting Kit with extra wall clearance.

8. 30 Meter Cable Length.

9. Provide a separate pressure transducer.

C. The conductive level sensing probe shell be by Multitrode, or ENGINEER approved equivalent.

2.15 MEASUREMENT AND CONTROL INSTRUMENTATION

A. General

1. Section includes:

A. Non-contact radar sensor for continuous level measurement.

2. Measurement Procedures

A. The transducer shall be pulse radar type, emitting short bursts of 26 GHz energy, measuring the empty space above the liquid level and convert these variations into a linear 4-20mAdc signal. Signal processing shall filter out false reflections and other background noises.

3. Range

A. Up to 15 meters (49.21 feet)

4. System Description

A. Performance Requirements

1. Accuracy: ± 2mm
2. Process pressure: -14.5 to 29.0 psig
3. Process temperature: -40 to +176 deg F
4. Ambient temperature: -40 to +176 deg F
5. Vibration resistance
   a. With mounting strap 1g at 5 to 200 Hz
   b. With adapter flange 2g at 5 to 200 Hz
6. Shock resistance: 100g, 6ms

B. Characteristics

1. Protection rating NEMA 6P submersible
2. Measuring cycle time 450ms
3. Step response time ≤ 3s
4. Beam angle 10 deg

5. Output signal 4-20mA/HART
6. Integrated real time clock

5. Certifications

   A. CE approved.

   B. FCC 15.256 approved.

   C. CSA certified to General purpose for use in Canada and USA.

   D. CSA certified Intrinsically Safe to Class I, Division 1, Groups A,B,C, and D; Class II, Division 1 groups E,F, and G; Class III for use in Canada and USA.

   E. CSA certified Non-Incendive to Class I, Division 2, Groups A,B,C, and D; Class II, Division 2, Groups F,G for use in Canada and USA.

6. Memory

   A. Measured Value Memory

      1. Up to 100,000 measured values can be stored in the sensor. Each entry should be date/time stamped as well as the respective measured value.

   B. Event Memory

      1. Up to 500 events should be automatically stored with a time stamp in the sensor (non-deletable).
      2. Each entry should contain date/time, event type, event description and value.

   C. Echo Curve Memory

      1. The echo curves should be stored with date and time and the corresponding echo data.
      2. The memory should be divided into two sections:

         a. Echo curve of the setup
         b. Up to 10 further echo curves

7. Diagnosis

   A. The radar sensor shall include self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650.

   B. Status messages categories shall be failure, function check, out of specification and maintenance requirement.

8. Mounting

   A. The radar sensor shall have mounting options of a straining clamp, wall mounting bracket, mounting strap for ceiling or wall and an adapter flange.

9. Warranty

    A. The product includes a two-year warranty from the date of shipment.

10. Technical Support

    A. 24 hours/day, 7 days/week manufacturer technical support.

11. Maintenance

    A. No maintenance required in normal operation

12. Manufacturer

    A. VEGA Americas

        1. VEGAPULS WL 61 radar sensor or ENGINEER approved equivalent.

3.00 EXECUTION

3.01 INSTALLATION

A. The complete instrumentation and control system shall be provided ready for operation. The installation shall conform to the manufacturer's installation recommendations and to the Plans.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Under this Section, the CONTRACTOR shall provide all materials, labor, and services necessary for furnishing and installing one (1) permanent standby generator set as shown on the Plans for the purpose of delivering emergency power to the facility in case of utility power failure.

2.00 PRODUCTS

2.01 ELECTRICAL CHARACTERISTICS

A. The generator set shall consist of a natural gas engine directly coupled to an electric generator, together with the necessary controls and accessories for automatic start/stop control and automatic transfer switch. The generator shall have the following electrical characteristics:

100 kW continuous standby rating
125 kVA continuous standby rating
120/208 volts
60 cycles
3-phase
4-wire
0.8 power factor

2.02 REQUIREMENTS

A. All materials and parts of the generator set shall be new. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment. The complete unit shall be supplied by a single manufacturer. The unit shall be a standard series of the manufacturer and not a one-of-a-kind fabrication.

B. The CONTRACTOR shall specify the nearest location of permanent parts outlets from which parts may be obtained.

C. The CONTRACTOR shall furnish three (3) sets of operation, maintenance and parts manuals covering all components of the generator set and equipment. The CONTRACTOR shall also instruct the OWNER in the operation and maintenance of the unit.

D. Complete operating instructions shall be installed in a suitable form and mounted on the unit.

E. The performance tests of the generating set series shall be in accordance with procedures certified by an independent testing laboratory. The manufacturer shall have successfully tested a prototype of the generating set series offered which shall include:

1. Maximum power level.

2. Maximum motor starting capacity.

3. Transient response and steady state governing.

4. Generator temperature rise per NEMA MG122.40.

5. Single step load pickup per NFPA 76A-822.

6. Harmonic analysis and voltage waveform deviation per MIL-STD-7O5B.

7. Three phase short circuit test for mechanical and electrical strength.

8. Fuel consumption.

9. Structural soundness.

10. Engine-generator cooling air flow.

F. The complete standby electric power system shall be warranted for a period of two (2) years minimum or fifteen hundred operating hours, whichever occurs first, from the date of initial start-up. The warranty must be provided by the system manufacturer. Multiple warranties for individual components will not be acceptable. Satisfactory warranty documents must be provided.

2.03 MANUFACTURER

A. The standby generator shall be as manufactured by Cummins or Kohler Power systems.

2.04 ENGINE

A. The engine shall be natural gas fueled, 4-cycle, water-cooled type. The engine shall be equipped with oil filter and an air cleaner with replaceable elements, fuel filter, and engine mounted radiator, fan and coolant pump.

B. The engine isochronous governor shall maintain the generator frequency within 0.025% from no load to full load generator output.

C. The rated net horsepower of the engine at the generator synchronous speed with all accessories attached shall not be less than that required to produce the kW specified. The horsepower rating shall take into account generator efficiency losses. The engine shall be capable of producing this rated power and the generator set shall be capable of producing the specified kW for a continuous standby rating.

D. The engine shall be liquid cooled with an engine-mounted radiator with fan and shall be sized to maintain safe operation at 100°F maximum ambient temperature.

E. The engine cooling system shall be filled with anti-freeze protection to -40°F.

F. The exhaust line shall be of such size that back pressure on the system shall not exceed the back pressure that permits the engine to produce the maximum power required for this application. A flexible connection shall be mounted between the engine exhaust manifold and the exhaust line and an approved rain cap shall be installed at the discharge end of the exhaust line. Piping within reach of personnel shall be protected by screening or covered with lagging.

G. The muffler shall be a critical-type silencer. Exhaust silencer shall provide a maximum dBA level of 70 at a distance of 23 feet when installed in sound reducing enclosure. Silencer shall be supplied by generator manufacturer, or approved equivalent. The muffler shall be housed within the generator enclosure.

H. A thermostatically controlled engine coolant heater (block heater) shall be furnished.

2.05 GENERATOR

A. The generator shall be a synchronous type and be built to NEMA standards.

B. The frequency regulation shall not exceed 0.15 Hz from no load to rated load. Voltage regulation shall be within 2% of rated voltage from no load to full rated load. A rheostat shall provide a minimum of +5% voltage adjustment from rated value. Temperature rise shall be within NEMA MGI 22.40 standards

C. The generator shall be equipped with 120 volt electric strip heaters to help prevent condensation in the generator windings. The heaters shall be de-energized while the generator is running.

2.06 STARTING SYSTEM

A. A 12-volt or 24-volt DC electric starting system with positive engagement drive shall be furnished.

B. Fully automatic generator set with local start-stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, over speed, over-crank, and one auxiliary contact for activating remote alarm. Controls shall include 30 second single-cranking cycle limit with lockout.

C. A 12-volt or 24-volt lead-acid storage battery set of the heavy-duty starting type shall be provided. The battery set shall be of sufficient capacity to permit starting of the generator engine a minimum of three (3) times without recharging. A battery rack and necessary cables and clamps shall be provided. A thermostatically controlled battery box heater(s) shall be furnished.

D. A current-limiting battery charger shall be furnished to automatically recharge batteries. Charge shall float at 2.17 volts per cell. It shall include over voltage protection, silicon diode full wave rectifiers, voltage surge suppressors, DC ammeter, and fused AC input. The AC input voltages shall be 120 VAC, single phase. Charger rating shall not be less than 10 amps. The battery charger shall be factory mounted within the generator enclosure. Wiring between charger and batterie(s) shall be factory installed.

E. The unit shall be provided with an engine driven 12 volt or 24 volt DC alternator with voltage regulatory designed to keep the 12 volt or 24 volt battery set properly charged.

2.07 GENERATOR CONTROL PANEL

A. A generator-mounted, vibration isolated dead front 14 gauge steel control panel shall be provided. Top of the generator control panel shall not exceed six (6) feet above ground level.

B. The panel shall contain, but not be limited to the following equipment:

1. Engine Pre-Heat Switch

2. Voltmeter, 2% accuracy

3. Voltmeter Phase Selector Switch

4. Ammeter, 2% accuracy
5. Ammeter Phase Selector Switch
6. Frequency Meter
7. Manual/Auto Starting Controls
8. Running Time Meter
9. Panel Illumination Lights and On/Off Switch
10. Voltage Level Adjustment Potentiometer
11. Engine Oil Pressure Gauge
12. Engine Water Temperature Gauge
13. Automatic engine shutdown for the following conditions: Low Oil Pressure, High Water Temperature, Over speed, and Overcrank
14. Fault Indicators for Low Oil Pressure, High Water Temperature, Low Coolant Level, Low Fuel Supply, Overspeed, and Overcrank, High Battery Voltage and Low Battery Volts w/Individual Fault Lamps and Test and Reset Switches
15. Contacts for Remote Alarms Wired to Terminal Strips (one for each fault). The following alarms are required outputs from the Generator main control panel:
    1. Generator Running
    2. Generator General Fault Alarm
    3. Load on Utility
    4. Load on Generator
    5. Utility Failure
    6. 2 SPARE Output Contacts
16. Manual Reset Field Breaker (not used with permanent magnet field exciters)

2.08 MAIN LINE CIRCUIT BREAKER

A. A generator-mounted totally enclosed main line molded case adjustable circuit breaker(s) shall be installed as a load circuit interrupting and protection device. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions. Breakers shall be 100% rated.

B. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection. The circuit breaker shall meet standards established by the Underwriters' Laboratories, National Electric Manufacturer's Association, and National Electrical Code.

C. Ratings and trip settings as indicated on the drawing.

D. Two (2) breakers shall be provided.

2.09 STATIONARY BASE AND ENCLOSURE

A. The unit shall be equipped with a structural steel sub-base. The base shall be a box-type frame construction consisting of a channel-iron perimeter and wide flange beam cross members for engine support. The base shall contain vibration isolators.

B. The unit shall be equipped with a weather protective, sound attenuated enclosure for an outdoor application. The enclosure shall be factory installed, made of heavy gauge pre-painted aluminum and attached to the generators stationary base. Access shall be provided to the engine, generator, and instrument panel with hinged, lockable/stainless steel latches for all access doors.

C. The housing shall be a standard level 2 enclosure with a dB level of 74 or less at 9 meters.

D. Lighting fixtures with lamps shall be factory mounted on the inside of the generator enclosure and powered from the generator battery or be furnished with dedicated batteries. There shall be at least one lamp at each opening in the enclosure. Each lamp shall be equipped with an on/off switch. The fixture shall have a base and a globe over the lamp and be suitable for outdoor use.

2.10 AUTOMATIC TRANSFER SWITCH

A. The CONTRACTOR shall furnish and install where indicated on the contract drawings an automatic transfer switches (total of two (2) having a ratings, accessories, etc., as indicated or noted herein. The automatic transfer switch shall be fully rated, to protect all types of loads, inductive and resistive, from loss of continuity of power. The switch shall be rated as suitable for all classes of loads without derating, either open or closed.

B. The transfer switch shall automatically transfer its load circuit to an emergency power source from failure of its normal supply. Upon restoration of the normal supply, the transfer switch shall automatically retransfer its load circuits to the normal supply.

C. The transfer switch shall be interlocked so that it shall not be possible for load circuits to be connected to normal and emergency sources simultaneously.

D. Voltage sensing relays shall be provided to monitor each phase of the normal supply. A drop in voltage in any phase below the predetermined drop-out value of the relay shall initiate load transfer, with a timed delay coordinated. The relay(s) shall initiate retransfer of the load to the normal supply as soon as the voltage is restored in all phases beyond the predetermined pickup value of the relay. Voltage sensing relays shall be of the completely solid state type and shall have field adjustable pickup and dropout values from approximately 52 to 115% of nominal line voltage. These values shall be set for 70% dropout and 90% pickup.

E. All accessories and equipment shall be front accessible for ease of maintenance or removal. The CONTRACTOR shall provide the following control accessories.

1. Adjustable time delay on engine starting;

2. Adjustable time delay emergency to normal;

3. Breaker auxiliary contacts for operation of normal source and emergency source lights as follows:

   Green - normal source
   Red - emergency source

4. Time delay for engine cool-off;

5. Frequency/voltage relay for emergency source to prevent transfer from normal to emergency until the generator has reached operating voltage and frequency;

6. Solid ground bar and solid neutral bar;

7. Engine start auxiliary contact;

8. Test pushbutton to simulate a loss of normal power;

9. Adjustable time delay for switching in both directions, during which time the load is isolated from both power sources to allow residual voltage of motors to decay before completing the switching cycle.

10. Auxiliary contacts for normal and emergency source (one NO and one NC of each source);

11. One - NEMA 4X or Alum 3R for the bank facility.

12. One – NEMA 12 for the pump station.

13. Pilot devices/relays shall be of the industrial type rated 10 amperes;

14. Transfer mechanism shall be energized only momentarily during transfer;

15. Underwriters Laboratory Certified;

16. Transfer switch shall have ratings equal or greater than shown on the Plans.

17. Seven day LOAD/NO-LOAD transfer exerciser with two-position selector switch and override feature.

F. Transfer switch and all pertaining accessories shall be supplied by the supplier of the engine generator set and shall be manufactured by ASCO, Onan, or approved equal.

G. Transfer switch shall be break-before-make type of operating transition.

3.00 EXECUTION

3.01 INSTALLATION

A. The generator unit shall be installed as shown on the Plans and meet the manufacturer's installation recommendations.

3.02 CONDUITS

A. Separate conduits shall be installed in the concrete slab for the following systems if installed:

1. Power Conductors;

2. DC start circuit and discrete signals for a remote annunciator;

3. Branch circuit conductors for heaters, 120 volts for the battery charger, 120 volt lights, and 120 volt receptacles;

4. Control cable for remote monitoring.

3.03 CONCRETE PAD

A. The generator and enclosure shall be anchored to a 6 inch thick concrete pad that is 3 inches higher than the ground. The concrete pad shall have a foundation on all sides that is 6 inches thick and extends 3 feet down from the top of the slab. The concrete pad shall have a 1 inch chamfer around all edges.

B. The concrete shall be minimum 4000 psi, air entrained.

C. The concrete pad shall be reinforced with one layer of 6X6 10/10 WWF.

D. All fill under the concrete pad shall be compacted Class II sand.

E. Refer to the Contract Drawings for further requirements.

3.04 GROUNDING

A. Four 3/4-inch diameter x 10 ft long ground rods shall be installed. The rods shall be copper-clad steel rods.

B. Connect the four rods together with #2/0 stranded, soft drawn bare copper ground cable to form a ground electrode for the generator.

C. Supply two conductors up through the concrete slab. One near the main circuit breaker and the other in the opposite corner.

D. All ground connections made underground shall either have exothermic welds or use the Burndy Hyground irreversible compression system. Coordinate with Section 16-06.

3.05 PAINTING

A. The engine, generator set, and control panel shall be painted with factory standard paints. The Owner will select the top finish color from standard factory colors.

B. The exhaust pipe, muffler tail piece and accessories shall be painted factory colors.

3.06 FIELD ACCEPTANCE TEST

A. Following installation and initial adjustment of the standby generator, the unit will be tested as set forth below. All special equipment necessary for conducting the tests shall be provided by the CONTRACTOR. The tests shall be performed by the CONTRACTOR in the presence of the ENGINEER and the manufacturer's technical representative. Prior to beginning the

tests the manufacturer's technical representative shall inspect the installation, make such initial adjustments as he deems necessary, and provide written certification that the installation meets the manufacturer's approval. A copy of the written certification shall be provided to the ENGINEER for record purposes. The CONTRACTOR will allow in his bid price the cost of the trip to the field site by the manufacturer's representative. The manufacturer's representative shall instruct the OWNER's personnel on the operation and maintenance of the unit.

3.07 TEST

A. The generator set and equipment shall be operated for a 2-hr period to show that it will pickup and carry load within voltage and frequency tolerances as specified under steady state, transient load, and motor starting operation. The test load will be the bank facility and pump station during normal operational conditions.

B. If, during the tests, the generator fails to meet the specified performance requirements, the manufacturer's representative shall be permitted to readjust the unit, in which case the entire series of tests will be repeated to the satisfaction of the ENGINEER. Failure of the generator to meet performance specification will be cause for rejection of the entire unit.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. General: This section specifically describes the Sequence of Operation and the coordination of the OWNER's facilities. It is the intent of this section to also supplement, where applicable, other sections, and therefore, information described in this section may amplify, modify, and supersede, as the case may be, other sections of this Division. If a conflict should appear, the CONTRACTOR shall solicit the ENGINEER for written clarification.

B. Control System Configuration: It is the intent to briefly describe each main system so that the CONTRACTOR is aware of the proposed operation and to ensure compatibility with the existing facilities. Certain systems described are supplied as package systems furnished under other Divisions and are so identified. Interfacing these systems is a part of the work of this Division.

C. Scope: The CONTRACTOR shall furnish, install, and test all components as indicated on the Drawings and specified herein. Included herein are functional descriptions of the process. If the CONTRACTOR requires other devices, than those shown on the drawings and specified herein, to achieve the result required by the system description, they must provide these devices to obtain the required result.

D. Existing Condition: The Moon Road station is already on the Kennedy Industries KISM system. The existing screens and SCADA backbone will be reused and updated

1.02 SEQUENCE OF OPERATION

A. General

1. The purpose of the project is to replace the control system at one (1) existing lift station, install a new completely new control system, add monitoring to pump station and allow monitoring, alarms and controls of the pump station using Microsoft Internet Explorer.

    a. The operations of the lift station(s) will be via "out of the box controllers" known as Multismart by Multitrode. These controllers will communicate to a "cloud" based WAN SCADA systems using fiber optic cable. The CONTRACTOR shall install a fibre media conversion module to provide communication with Ethernet transceivers so that the communications backbone communicates over an Ethernet topology. All controllers shall be hard-wired to the I/O points using discrete/analog points.

    b. Existing Computer located within the OWNERs office will be used for monitoring and control of the related systems and are installed at the following locations:

        i. Field Manger's Office

        ii. Superintendent's Office

        Each existing computer will be need the proper activate "x" plug-in installed and the CONTRACTOR will work directory with the OWNER's IT department in opening and testing the necessary ports and protocols for proper operation. The computer will be programmed to normally interface with Station Master.

Communications: The CONTRACTOR is responsible for installing a complete fiber optic communication system, with all accessories, including but not limited to, a fiber to ethernet media converter, fiber cable and conduit, handholes, junction boxes and connections to existing fiber panels.

c. Front End Station Master, Overall Master SCADA System for all Locations:

i. Overview

The system shall provide monitoring, control, alarming (including alarm dialing) and configuration. The system shall provide a web-based interface to the user which shall not require equipment or software installed by the user, except for Internet Explorer and an internet connection.

ii. Reliability

The software shall be hosted in a secure data-center.

The center shall have connections to the internet by multiple parties for redundancy.

The data center shall have redundancy of power systems, air conditioning, firewalls, routers, and any other network equipment including redundant phone lines.

iii. Security

a) Web Interface

The user's connection to the web interface shall be protected by a secure socket layer (SSL) to prevent hacking and unauthorized access by any other user.
The user login will be password protected.

b) User Interface- Monitoring & Control

All user interfaces will be customizable to client requirements and will be develop based on the workshops that are included in 16.12 of the specifications.

iv. The user interface shall provide the following screens for monitoring and control of the network of remote sites.

Provide an overview screen showing the individual sites with level and current alarm status. Site details pages for pump stations displaying the following:

<u>Site Details (Lift Station(s))</u>

a) Level

Level in % (the level can be transmitted from a remote reservoir if selected)
Level alarms

b) Pump

Pump mode (auto/off/hand)
Pump running/pump stopped
Pump fault details (seal, thermal, critical, non-critical, delay fail)
Pump motor fault details (under-current, over-current, motor over temperature, phase fail, earth fault and insulation resistance low)
Pump 3-phase motor currents
Pump motor winding insulation resistance value

c) Supply

3-phase supply values
DC supply voltage
Supply fault

d) Flow Monitoring

Inflow
Pump flow rates
Total station volume

e) Communications

Local communications alarms

f) Motor Operations

Hours run (today/yesterday/total)
Starts (today/yesterday/total)
Faults (today/yesterday/total)

g) Operational Parameters

Configurable analog and digital I/O status
Site details pages for pump stations with control for:

Pump mode (auto/off/manual)
Pump running
Pump start
Pump fault reset
Level alarm reset
Set digital output status
Set analog output valve

Site details pages for reservoirs displaying:

Level (The level will be transmitted to nominated remote pump station(s) via the master station system)
Communications alarms
Digital input status

v. Alarms Page

Alarms with site name, alarms details, alarms date/time, acknowledgement status.
Alarms which not yet noted shall be displayed above those that have noted.
Alarms shall show an icon for alarm dialing/alarm dial timeout/alarm noted/alarm cleared but not yet noted.

a) History Page

The history page shall allow the user to select sites, accumulator tags and a date range.
Preview the data in an on-screen graph
Email the selected data in a CSV file to the user

vi. User Interface- Configuration

The user interface shall provide the following configuration options:

a) Configure I/O

Each site shall have configurable I/O with:

User selectable names
Ability to make an I/O point an alarm point
Some or all site I/O can be copied across to multiple other sites

This site I/O configuration will be available to any user with site administrator privileges for that site.

b) Configure Alarm Points

Each site shall have all alarm points (including I/O which has been configured to be an alarm point) individually configurable with:

Dial out or info alarm
Configurable times to allow alarming to the contact list
Number of times to contact the complete alarm contact list
Time between each contact attempt
Re-alarm enabling option with configurable timeout

This site alarm configuration will be available to any user with site administrator privileges for that site.

c) Configure Alarm List for Each Site

Each site can have a different alarm contact list.

vii. Users

User with administrator privileges shall be able to:

Add/configure users including:
Username
Password
Administrative email address
Alarm contact methods (SMS, email and voice)
Change user privileges on site-by-site basis
Site-by-site privileges for view only, control, control plus configuration of I/O and alarms

viii. Alarm Lists

Users with administrator privileges shall be able to:

Create/delete an alarm list
Add/delete users and user contact methods from each alarm list (i.e. each user may have more than one contact method)
Change the order of users and user contact methods from the contact list, including having multiple users (or user contact methods) at the same level of priority (e.g. Email the supervisor and send an SMS to the first operator on call; if no one acknowledges, send an SMS to the second operator, etc.)

ix. Alarm Dialing and Notification

The system shall provide email and SMS Alarming to a list of users. The Alarm methods and the alarm list shall be configurable, including the ability to notify different users simultaneously.

The system shall allow alarms to be acknowledged via the Internet Client viewer. This acknowledgement will prevent further SMS or email contracts to the user contact list.

x. Historian

The data from the remote sites will be stored in a historian.
The historical data will be kept for at least 10 years.

e. Each lift station will have a Multi-Smart controller (duplex/triplex) standard control package with optional VFD operations and associated pump down sequence of operations. The OWNER will access via workstations located with the facility. The Multi-Smart controller(s) will transmit data via a one-year pre-paid cellular service via an APN/VPN private gateway.

B. HMI SCADA Systems.

1. All alarms shall have de-bounce timers to prevent false alarms. These timers will require adjustment during final acceptance testing.

2. All alarms shall have individual disable/enable bit selection boxes. The selection of disabling alarms will be logged. A reminder box will "pop-up" at 1:00 PM every day to confirm alarms have been disabled. The disable/enable bit selection boxes will be password protected to prevent accidental disabling of alarms.

3. All alarms will be logged, including time stamp for time of alarm, time of acknowledgement and the time when the alarm cleared.

4. All analog variables will be trended. Trend screens will be developed by the CONTRACTOR.

5. Run times for pumps will be recorded. These totals will be displayed on the HMI screens. A total reset button will be available. This button is to be password restricted.

6. Flows and chemical usage shall be displayed on the HMI. The first shall be the previous day's accumulated 24 hour flow. The second shall be the current accumulated flow for the current 24 hour period. The last is the total accumulated flow. The total accumulated flow shall be resettable with proper password.

C. PLC Input/Output Signal Level and Conditions.

1. Please refer to Input list for each individual signal type.

2. Analog signal, including inputs and outputs shall be 4-20mA +24V DC.

3. Discrete signal levels will include interposing relays and will be based on +24V DC. These relays will be provided by the CONTRACTOR.

D. Trending

1. The CONTRACTOR shall develop a method for trending.

2. All trending will be developed during the workshop.

E. Alarming

1. Alarm screen: The following alarms will be displayed with a date and time stamp. A separate line shall be produced on the screen when the alarm condition is no longer active.

   The following alarms will be generated at a minimum and sent to the dialer:

   <u>Lift Stations</u>

   a. Power Outage Alarm (DI)
   b. Load on Generator (DI)
   c. Low Low Float (DI)
   d. High High Float (DI)
   e. Low Level (DI)
   f. High Level (DI)
   g. Over or Under Voltage (AI)
   h. Over or Under Current (AI)
   i. Over or Under Frequency (AI)
   j. Phase Loss (AI)
   k. Communication Loss (DI)

Please note flow and level conditions will be an analog loop from the field devices and generated internal by set point tables by the lift station or PLC controller.

For the facilities a separate workshop (minimum of 4 hours) will be conducted to determine the alarms and associated callouts.

F. PROCESS NARRATIVE, OPERATION OF PUMPS

1. Wet Well Level: the wet well level will continuously be monitored by level sensing with two float level switches and the multitrode level probe. The level devices will be mounted within the wet well chamber, as indicated on the process drawings. The level probe will provide a level signal to the main controller indicating a level measurement. The two additional level float switches shall be used for back up protection to shut the pumps off or turn them on. The two (2) systems are impendent for true redundancy.

2. In each wet well there will be two pumps; one designated as duty and one designated as standby. Each pump can be set within the controller as duty or standby by the system operator at any point in time.

   Based on pre-determined levels and levels confirmed within the field with accurate installation details, the pumps will operate or shut down based on these levels. One pump will be selected as the duty pump and the second pump will be deemed as the standby pump.

3. Low Level: no pumps shall run.

4. High Level: one pump, the duty pump, shall run.

5. High High Level: both pumps may run to bring level down

6. In a condition where both pumps are running due to a high high level, once the level of the well reaches a pre-determined setting as the liquid level has decreased, the standby designated pump will shut off and allow the duty pump to continue running until a low level has been reached.

7. The system integrator shall submit, with their Shop Drawings, the actual process narrative as they have defined it, with all determined wet well levels and method of operation. In this submittal the mounting heights of the level float switches and the level sensing probe shall be indicated.

END OF SECTION

1.00 GENERAL

1.01 WORK INCLUDED

A. The work to be executed under this Section of the Specifications shall consist of purchasing, unloading, moving, storing, assembling, installing, and testing all equipment as shown on the Plans and as specified herein. The CONTRACTOR shall coordinate the work covered by this Section of these Specifications, with the work covered by other Sections, and with the work of other contractors, to provide a complete and workable installation ready for start-up as scheduled and when accepted by the OWNER.

B. The CONTRACTOR shall provide for the placing, shimming, anchoring, grouting, cleaning, lubricating, assembling and adjusting of the equipment. The CONTRACTOR shall provide all supervision, labor, tools, equipment, and materials for all phases of the job as required to perform the installation of equipment and accessories furnished.

C. The CONTRACTOR shall furnish, install and field check the functioning of each specified element, providing supervision of the manufacturer's representative when and as required, to assure proper installation and satisfactory operation of the equipment.

1.02 GUARANTEE

A. The CONTRACTOR shall furnish the guarantee of the manufacturer, for each item of equipment furnished, that the equipment will perform its intended service and that any parts which may be defective in design or workmanship will be replaced without expense to the OWNER, for material cost and that the entire unit will be replaced with a proper unit if it fails to perform the specified and intended function.

B. The CONTRACTOR shall guarantee to repair or replace any element which may fail to function properly due to improper design, material, workmanship or installation without expense to the OWNER.

C. The guarantee period of the manufacturer's guarantee and the CONTRACTOR's guarantee shall be one year from the date of acceptance of the project by the OWNER, unless otherwise specified in these Specifications.

1.03 INSTRUCTION MANUALS

A. The CONTRACTOR shall obtain from the manufacturer of all systems or major items of equipment, five (5) copies of instruction manuals covering operation, maintenance, service and lubrication of the system or equipment.

B. Each manual shall include a set of record drawings, which will show all changes made to them.

C. Each manual shall have a front data sheet showing the quantity, the model number, serial number, the total capacity of the unit, and other pertinent data which is required on frequent basis.

D. Any manufacturer supplying a system comprised of related equipment and controls shall supply an instruction manual that contains a section describing the operation of the complete system as well as sections describing the operation of individual components. Instruction manuals shall include descriptions of all start-up, normal operation, shut-down, troubleshooting, emergency safety, maintenance, lubrication and testing procedures necessary to insure that the supplied system or equipment can be operated and maintained

as intended by the manufacturer. Any manufacturer submitting a standard instruction manual or catalog sheets describing more than one system or piece of equipment shall clearly indicate which system or piece of equipment has been furnished. All manuals shall be filed with the ENGINEER after reviewed Shop Drawings have been returned to the CONTRACTOR and prior to 80% completion of the project.

1.04 SHOP DRAWINGS

A. The CONTRACTOR shall prepare complete Shop Drawings for all mechanical equipment and as required for his work, for review by the ENGINEER before fabrication, showing all loose and shop assembled pieces as well as all connections to other trade work construction, and all welding and bolting.

B. The CONTRACTOR shall verify all dimensions and take such field measurements as may be required to execute the work and shall assume full responsibility for figured dimensions of this work. All field measurements and verifying of field conditions shall be done before submitting shop drawings to the ENGINEER for review.

C. All Shop Drawings shall be submitted in accordance with the General Conditions.

2.00 PRODUCTS

2.01 MOTORS

A. Motors for all wastewater process equipment 3/4 hp and larger, unless otherwise noted shall be 460 volt, 3-phase, 60 Hz, totally enclosed fan cooled and designed with a 1.15 service factor. The service factor shall not be used in sizing the motor. Motors shall have Class B insulation or better. Motors shall have torque and current performance of Design B or better.

2.02 BOLTS

A. The CONTRACTOR shall furnish bolts as required for installation of equipment and connection of accessories. Where practicable, semi-finished ANSI "Heavy Series" bolts and nuts shall be used in the installation work.

2.03 COUPLINGS

A. All rotating shaft couplings shall be "Steelflex T-10" as manufactured by Falk Corp., Milwaukee, Wisc.; "Sure-Flex Couplings" as manufactured by T.B. Woods Sons Co., Chambersburg, Pa.; or equal. All couplings shall be supplied with an acceptable OSHA guard.

2.04 DESIGN, FABRICATION AND ERECTION

A. Unless otherwise noted, the material under this or separate headings shall be of steel manufactured in accordance with the American Society for Testing Materials; and the design, fabrication and erection of the steel shall be done in accordance with the applicable American Institute of Steel Construction Specifications, current issue.

B. All work shall be erected in proper lines and levels, plumb and true and in correct relation to the adjoining work.

2.05 GROUT

A. Grout shall be non-shrink non-metallic grout.

2.06 CONCRETE

A. Concrete shall conform to that as specified under Section 3.08, Monolithic Concrete.

3.00 EXECUTION

3.01 MOVING OF EQUIPMENT

A. Where possible, equipment shall be moved in one piece; where this is not possible, the CONTRACTOR shall dismantle same and reassemble at final location.

B. The CONTRACTOR shall not drag equipment without the benefit of metal skid plates or wooden skids.

C. All unloading, moving and handling of equipment shall be in accordance with best rigging practices.

3.02 STORAGE AND MATERIAL PROTECTION

A. A storage area will be provided for the CONTRACTOR by the OWNER. Such items which in the opinion of the ENGINEER require protection from the weather shall be protected by means of tarpaulins or other covering reviewed by the ENGINEER. Any item requiring inside storage shall be stored as directed by the ENGINEER.

B. The CONTRACTOR shall be entirely responsible for the condition of all equipment from time of removal from the carrier until accepted by the OWNER after installation, and shall maintain all items in first class condition during this period. This shall include any material furnished to the CONTRACTOR by the OWNER.

3.03 MODIFICATIONS

A. Equipment configuration, piping and electrical modifications may be required to accommodate equipment systems of various manufacturers. The CONTRACTOR shall be responsible to provide and coordinate such modifications at no additional cost to the OWNER.

3.04 DISPOSAL OF CRATING, PACKING AND RUBBISH

A. All crating and packing from equipment installed by the CONTRACTOR shall become the property of the CONTRACTOR. All crating and packing must be promptly removed from the buildings and disposed of away from the job site. Accumulations of such materials in the buildings or on the site will not be permitted.

B. Clean burning combustible materials may, if approved by local regulations, be burned on the site in specific areas designated by the ENGINEER. All other rubbish and debris shall be removed from the site by the CONTRACTOR.

3.05 QUALITY OF WORKMANSHIP

A. All equipment shall be installed true and level, and to exact location as shown on the Plans.

B. The CONTRACTOR shall be responsible for installation of the equipment in accordance with good practice and in a manner consistent with the performance warranties and equipment workmanship of the manufacturer.

3.06 ANCHORING

A. All equipment shall be placed on a 6-inch minimum concrete pad unless otherwise shown on the Plans.

B. Anchor bolts shall be 304 stainless steel for submerged service, galvanized steel for exterior and carbon steel for interior installations.

C. All equipment of vibratory nature installed on concrete foundations or floors shall have anchor bolts built into the concrete unless otherwise directed by the ENGINEER or shown on the Plans.

D. Any necessary anchor bolts not provided by others shall be furnished and cemented in place by the CONTRACTOR.

E. Miscellaneous items may be anchored to concrete, where approved by the ENGINEER by means of expansion shells. Expansion shells shall be of type and size indicated on the Plans or as reviewed by the ENGINEER and shall be furnished and installed by the CONTRACTOR. Expansion shells shall be Hilti Kwik bolt or Philips Red Head.

3.07 GROUTING

A. Grouting and concrete work shall include all required forms and incidental work necessary for installation of equipment.

1. The CONTRACTOR shall do all filling in with grout for pickets and openings left to receive supports, piping, etc., under this Contract.

3.08 LUBRICATION

A. The CONTRACTOR shall thoroughly lubricate all equipment and fill all lubrication systems in accordance with the manufacturer's instructions and/or as directed by the ENGINEER.

B. All lubricants shall be furnished by the CONTRACTOR.

C. The CONTRACTOR shall provide all pumps, pressure devices, grease guns, etc., as required.

3.09 TEST OPERATION AND RUN-IN

A. When any portion of the equipment as designated by the ENGINEER, including all controls and associated items, has been completely installed, and the work of the electrical and mechanical trades contractors has been completed, the CONTRACTOR shall notify the ENGINEER and shall at such time as directed by the ENGINEER, test operate the equipment to the ENGINEER's satisfaction.

B. After completion of test operations, the CONTRACTOR shall "run-in" and make ready for operation such items of equipment, which in the opinion of the ENGINEER require the same.

C. "Completely installed" shall be construed to mean that the installation is complete as concerning utility connections, adjustment, lubrication, and clean-up.

D. "Run in" shall be construed to mean sufficient operation to wear in gears, motors, bearings, and any other items requiring same in keeping with manufacturer's recommendations or in accordance with good practice.

E. "Ready for operation" shall be construed to mean fully aligned, tested under full load, adjusted, cleaned, and such general condition as to permit immediate commencement of full scale production operations.

3.10 FIELD SERVICE

A. The CONTRACTOR shall secure the services of a qualified equipment manufacturer representative to assist him in erection, inspection, and for making necessary adjustments and to initiate the start-up and for resolving start-up problems as required.

B. The CONTRACTOR shall secure additional services for instruction of OWNER's personnel in the proper operation and maintenance of the equipment. The minimum instruction time shall be as set forth in following sections.

C. The training of personnel will be scheduled and coordinated through the ENGINEER after "test operation" and "run in" as per paragraph 3.09 has been successfully completed.

D. The CONTRACTOR shall secure written reports from the equipment manufacturer for each visit. The report shall contain the findings, recommendations, and any pertinent comments, with a signature and title of the representative. At least three (3) copies of the report shall be furnished to the ENGINEER.

3.11 PAINTING

A. The CONTRACTOR shall be responsible for touching up all scratches, gouges, and bare spots on the equipment and accessories installed by him. All painting, shop and field, shall be in accordance with the Painting Section of these Specifications.

3.12 ELECTRICAL WORK

A. Electrical work and equipment in addition to that specified in Division 16.00 which is necessary for equipment specified in Division 17.00 shall meet the specifications of Division 16.00.

B. All equipment provided with automatic modes of operation shall also have manual override.

3.13 PIPING

A. Any piping connections required for equipment provided under this Section shall be done under the Pipe Work or Plumbing Sections except as otherwise specified in a subsection of this Section.

3.14 WELDING

A. All welding shall be done by the electric arc method and in accordance with the American Welding Society Code for this type of welding. All welds shall be a solid homogeneous part of the metals joined and free from pits or incorporated slag or scale. Surfaces of welds shall be smooth and regular, and of full area and length indicated and required to develop the required strength of the connection. Welds shall be continuous unless otherwise noted.

B. The CONTRACTOR shall be responsible for all welds as concerns the composition of the materials being welded and their property changes due to the work.

3.15 OPEN HOLES

A. The CONTRACTOR shall provide open holes as required for assembly of his work or for the attaching of the work of other trades.

3.16 FIELD MEASUREMENTS

A. Wherever fabricated miscellaneous iron is used in places where the work with which it must fit is in place, field measurements of the work already in place shall be taken, before fabrication of the miscellaneous iron is begun, and the work shall be fabricated accordingly.

3.17 BUILDING ALTERATIONS

A. No alterations to the buildings structure or enclosure, such as cutting or gas torch burning, shall be made by the CONTRACTOR as a means of correcting deviations or errors in his own work, unless such alterations are specifically authorized by the ENGINEER after his review.

3.18 SPECIAL TOOLS

A. Any special tools required for proper maintenance shall be furnished, tagged and placed in storage for plant use at start-up.

END OF SECTION

1.00 GENERAL

1.01 WORK INCLUDED

A. The work to be executed under this Section of the Specifications shall consist of unloading, moving, storing, assembling, installing, and testing all OWNER furnished equipment as shown on the Plans and as specified herein. The CONTRACTOR shall coordinate the work covered by this Section of these Specifications, with the work covered by other Sections, and with the work of other contractors, to provide a complete and workable installation ready for startup as scheduled and when accepted by the OWNER.

B. The CONTRACTOR shall provide for the placing, shimming, anchoring, grouting, cleaning, lubricating, assembling and adjusting of the equipment. The CONTRACTOR shall provide all supervision, labor, tools, equipment, and materials for all phases of the job as required to perform the installation of equipment and accessories furnished.

C. The CONTRACTOR shall install and field check the functioning of each specified element, providing supervision of the manufacturer's representative when and as required, to assure proper installation and satisfactory operation of the equipment.

D. It is the intent of these specifications that the CONTRACTOR shall provide all power, controls and miscellaneous items not furnished by the manufacturer for a complete and workable system, ready for service.

2.00 PRODUCTS

2.01 BOLTS

A. The CONTRACTOR shall furnish bolts as required for installation of equipment and connection of accessories. Where practicable, semi-finished ANSI "Heavy Series" bolts and nuts shall be used in the installation work.

2.02 GROUT

A. Grout shall be non-shrink non-metallic grout.

2.03 CONCRETE

A. Concrete shall conform to that as specified under Section 3.01, Concrete Work.

3.00 EXECUTION

3.01 MOVING OF EQUIPMENT

A. Where possible, equipment shall be moved in one piece; where this is not possible, the CONTRACTOR shall dismantle same and reassemble at final location.

B. The CONTRACTOR shall not drag equipment without the benefit of metal skid plates or wooden skids.

C. All unloading, moving and handling of equipment shall be in accordance with best rigging practices.

3.02 STORAGE AND MATERIAL PROTECTION

A. A storage area will be provided for the CONTRACTOR by the OWNER. Such items which in the opinion of the ENGINEER require protection from the weather shall be protected by means of tarpaulins or other covering reviewed by the ENGINEER. Any item requiring inside storage shall be stored as directed by the ENGINEER.

B. The CONTRACTOR shall be entirely responsible for the condition of all equipment from time of removal from the carrier until accepted by the OWNER after installation, and shall maintain all items in first class condition during this period. This shall include any material furnished to the CONTRACTOR by the OWNER.

3.03 DISPOSAL OF CRATING, PACKING AND RUBBISH

A. All crating and packing from equipment installed by the CONTRACTOR shall become the property of the CONTRACTOR. All crating and packing must be promptly removed from the buildings and disposed of away from the job site. Accumulations of such materials in the buildings or on the site will not be permitted.

B. Clean burning combustible materials may, if approved by local regulations, be burned on the site in specific areas designated by the ENGINEER. All other rubbish and debris shall be removed from the site by the CONTRACTOR.

3.04 QUALITY OF WORKMANSHIP

A. All equipment shall be installed true and level, and to exact location as shown on the Plans.

B. The CONTRACTOR shall be responsible for installation of the equipment in accordance with good practice and in a manner consistent with the performance warranties and equipment workmanship of the manufacturer.

3.05 ANCHORING

A. All equipment shall be placed on a 6-inch minimum concrete pad unless otherwise shown on the Plans.

B. Anchor bolts shall be 304 stainless steel.

C. All equipment of vibratory nature installed on concrete foundations or floors shall have anchor bolts built into the concrete unless otherwise directed by the ENGINEER or shown on the Plans.

D. Any necessary anchor bolts not provided by others shall be furnished and installed in place by the CONTRACTOR.

E. Injectable adhesive shall be used for installation of all threaded anchor rods into new or existing concrete. The adhesive used shall be a two component, structural grade epoxy material which meets the requirements of ASTM C-881 Types I, II, IV and V Grade 3, Classes B and C. The epoxy shall be an odorless amine based resin supplied in a two component dispensing system which keeps the resin and hardener separated until they are dispensed for direct injection into the drilled hole. The epoxy base resin and hardener shall be mixed in a 1-to-1 ratio through a motionless static mixing nozzle approved by the manufacturer of the system. The epoxy used shall have a minimum shelf life of two years. Manufacturer's instructions shall be followed. Products shall be Power-Fast as supplied by

Rawl/Powers Fastening, Inc. or approved equal. Install all anchors in strict accordance with manufacturer's recommendations.

F. Miscellaneous items may be anchored to concrete, where approved by the ENGINEER by means of expansion shells. Expansion shells shall be of type and size indicated on the Plans or as reviewed by the ENGINEER and shall be furnished and installed by the CONTRACTOR. Expansion shells shall be Hilti Kwik bolt or Philips Red Head.

3.06 GROUTING

A. Grouting and concrete work shall include all required forms and incidental work necessary for installation of equipment.

1. The CONTRACTOR shall do all filling in with grout for pickets and openings left to receive supports, piping, etc., under this Contract.

3.07 LUBRICATION

A. The CONTRACTOR shall thoroughly lubricate all equipment and fill all lubrication systems in accordance with the manufacturer's instructions and/or as directed by the ENGINEER.

B. All lubricants shall be furnished by the CONTRACTOR.

C. The CONTRACTOR shall provide all pumps, pressure devices, grease guns, etc., as required.

3.08 TEST OPERATION AND RUN-IN

A. When any portion of the equipment as designated by the ENGINEER, including all controls and associated items, has been completely installed, and the work of the electrical and mechanical trades contractors has been completed, the CONTRACTOR shall notify the ENGINEER and shall at such time as directed by the ENGINEER, test operate the equipment to the ENGINEER's satisfaction.

B. After completion of test operations, the CONTRACTOR shall "run-in" and make ready for operation such items of equipment, which in the opinion of the ENGINEER require the same.

C. "Completely installed" shall be construed to mean that the installation is complete as concerning utility connections, adjustment, lubrication, and clean-up.

D. "Run in" shall be construed to mean sufficient operation to wear in gears, motors, bearings, and any other items requiring same in keeping with manufacturer's recommendations or in accordance with good practice.

E. "Ready for operation" shall be construed to mean fully aligned, tested under full load, adjusted, cleaned, and such general condition as to permit immediate commencement of full scale production operations.

3.09 FIELD SERVICE

A. The CONTRACTOR shall secure the services of a qualified equipment manufacturer representative to assist him in erection, inspection, and for making necessary adjustments and to initiate the start-up and for resolving start-up problems as required. Erection and start-up service to be provided by the equipment manufacturer under the OWNER purchase equipment. Any additional field service required shall be secured by the CONTRACTOR.

3.10 PAINTING

A. The CONTRACTOR shall be responsible for touching up all scratches, gouges, and bare spots on the equipment and accessories installed by him. All painting, shop and field, shall be in accordance with the Painting Section of these Specifications.

3.11 ELECTRICAL WORK

A. Electrical work and equipment in addition to that specified in Division 16.00 which is necessary for equipment shall meet the specifications of Division 16.00.

B. All equipment provided with automatic modes of operation shall also have manual override.

3.12 PIPING

A. Any piping connections required for equipment provided under this Section shall be done under the Pipe Work or Plumbing Sections except as otherwise specified in a subsection of this Section.

3.13 WELDING

A. All welding shall be done by the electric arc method and in accordance with the American Welding Society Code for this type of welding. All welds shall be a solid homogeneous part of the metals joined and free from pits or incorporated slag or scale. Surfaces of welds shall be smooth and regular, and of full area and length indicated and required to develop the required strength of the connection. Welds shall be continuous unless otherwise noted.

B. The CONTRACTOR shall be responsible for all welds as concerns the composition of the materials being welded and their property changes due to the work.

3.14 OPEN HOLES

A. The CONTRACTOR shall provide open holes as required for assembly of his work or for the attaching of the work of other trades.

3.15 FIELD MEASUREMENTS

A. Wherever fabricated miscellaneous iron is used in places where the work with which it must fit is in place, field measurements of the work already in place shall be taken, before fabrication of the miscellaneous iron is begun, and the work shall be fabricated accordingly.

3.16 BUILDING ALTERATIONS

A. No alterations to the enclosure, such as cutting or gas torch burning, shall be made by the CONTRACTOR as a means of correcting deviations or errors in his own work, unless such alterations are specifically authorized by the ENGINEER after his review.

3.17 SPECIAL TOOLS

A. Any special tools required for proper maintenance shall be furnished, tagged and placed in storage for plant use at start-up.

END OF SECTION

1.00 GENERAL

1.01 DESCRIPTION

A. Furnish three (3) explosion proof submersible non-clog wastewater pumps and accessories. Pumps shall be as specified herein.

B. Pumps shall be of the submersible quick-disconnect type. The design shall be such that the pumping units can be easily removed from the wetwell for inspection or service without disconnecting or disturbing the discharge piping. The design shall permit the pumps, when lowered into place, to be automatically and firmly connected to the discharge piping by positively locking the volute in position to prevent any axial or lateral movement. There shall be no need for personnel to enter the wet well to inspect or service the pumps.

C. The nominal operating point for the pumps shall be 200 gpm at 72 feet TDH.

1.02 SUBMITTALS

A. The CONTRACTOR, prior to purchasing the pumping units, shall submit to the ENGINEER, characteristic curves and dimension sheets for the pumps which he proposes to furnish to meet the required conditions.

1.03 TESTING

A. All pumps shall be tested at the manufacturer's plant, and prior to shipment certified copies of such tests shall be submitted to the ENGINEER in triplicate for final review and acceptance. Test data shall include head capacity curves from zero head to shut-off, brake horsepower, and efficiency. Certified tests shall conform to the operating requirements specified.

1.04 MANUFACTURERS

A. The pumps shall be manufactured by Flygt.

2.00 PRODUCTS

2.01 PUMPS

A. The pumps shall be supplied with a mating cast iron 4-inch discharge connection with the following characteristics:

# of Pumps	Motor Voltage	HP	Design Points		
			Flow (gpm)	TDH (ft)	Eff. (%)
3	460V, 3 ph	11	200	72	60

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars per pump extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with a stainless steel lifting chain. Each pump shall be furnished complete with stainless steel guiderails, stainless steel intermediate guiderail brackets, and stainless steel upper guiderail brackets. The working load of the lifting system shall be 50% greater than the pump unit weight.

B. Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

C. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

   Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

D. Motors shall be sufficiently cooled by the surround environment or pumps media. A water cooling jacket is not required.

E. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.

F. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices requiring penetration of the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches set to open at 125°C (260° F) shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload

protection and shall be connected to the motor control panel. The junction chamber containing the terminal board shall be hermetically sealed from the stator housing by an elastomer compression seal. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be off sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

G. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

H. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

I. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

J. The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction which shall keep them clear of debris, maintaining an unobstructed leading edge. The impeller vanes shall have screw-shaped leading edges that are hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 6% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft and held by an impeller bolt.

K. The pump volute shall be of ASTM A-48 Class 35B gray cast iron and shall have an integral spiral shaped cast grove at the suction of the volute. The internal volute bottom or insert ring shall provide effective sealing between the pump volute and the multi-vane, semi-open impeller. The sharp spiral groove shall provide the shearing edge across which each impeller vane leading edge shall cross during its rotation in order to remain unobstructed. The clearance between the internal volute bottom and the impeller leading edges shall be adjustable.

L. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

M. Provide pumps with a sufficient length of submersible cable suitable for submersible pump applications. The power cable shall be sized according the NEC and ICEA standards.

END OF SECTION

APPENDIX A

RELEVANT INFORMATION ON OWNER FURNISHED EQUIPMENT

Kennedy INDUSTRIES
PUMPS | VALVES | REPAIRS | CONTROLS

KENNEDY INDUSTRIES PERSONNEL HAVE DONE ITS DUE DILIGENCE TO ENSURE THAT ALL PROJECT REQUIREMENTS ARE MET BY OUR SUPPLY. THE FOLLOWING DRAWINGS, SPECIFICATIONS & CUT SHEETS ARE THE OFFERINGS THAT WE SUBMIT FOR APPROVAL TO SUPPLY. KENNEDY INDUSTRIES IS A SUPPLIER AND STRIVES TO PROVIDE OUR CUSTOMERS WITH THE HIGHEST QUALITY PRODUCTS AND LEVEL OF SERVICE. IF A CHANGE OR DEVIATION FROM THE FOLLOWING IS DESIRED PLEASE ADVISE US AND WE WILL CHANGE OUR SCOPE OF SUPPLY AS REQUIRED. IF MATERIALS OF CONSTRUCTION OR SCOPE OF SUPPLY CHANGES, IT MAY IMPACT THE CONTRACT PRICE.

SUBMITTAL BILL OF MATERIALS

QTY	ITEM	DESCRIPTION	NOTES
3	FLYGT NP3127.095, 249 IMP, 11 HP, 3/208V, 3", FM, FLS	RATED 200 GPM @ 72' TDH	W/ 100" CABLE, PUMP WEIGHT= 325LBS
3	EXPLOSION PROOF	CL 1, DIV 1 RATED	
	(2) PUMPS FOR STATION (1) SPARE		
2	MIX FLUSH VALVES	#5565101	
2	DISCHARGE CONNECTION	#5401305	4" BASE ELBOW
6	GUIDE RAILS	2", 316SS	WET WELL DEPTH: ~~36~~ 34' TOS TO BOTTOM OF WET WELL.
2	UPPER GUIDE BRACKET	2", 316SS	
4	INT. GUIDE RAIL SUPPORTS	2"X6" – SPECIAL FOR 6" PIPE	
2	LIFTING CHAIN	5/16" STN. STL., ~~36'~~ LENGTH 34'	CAPACITY= 1800 LBS
2	QUICK LINKS	5/16" STN. STL.	CAPACITY= 1700 LBS
1	HALLIDAY PORTABLE HOIST	D2B36D	
1	HALLIDAY LINED HOIST SOCKET	D2S	
1	36"X54" ALUMINUM ACCESS HATCH, DOUBLE DOOR	H20 RATED, SAFETY GRATE, RECESSED PADLOCK BOX	

COMPLETED BY: CINDY WOODARD 5/27/15 CHECKED BY: ADAM MUDGE 5/27/15

CONTRACTOR REVIEW: ENGINEER REVIEW:

Kennedy INDUSTRIES
PUMPS | VALVES | REPAIRS | CONTROLS

NP 3127 SH 3~ 249

FLYGT

Performance curve

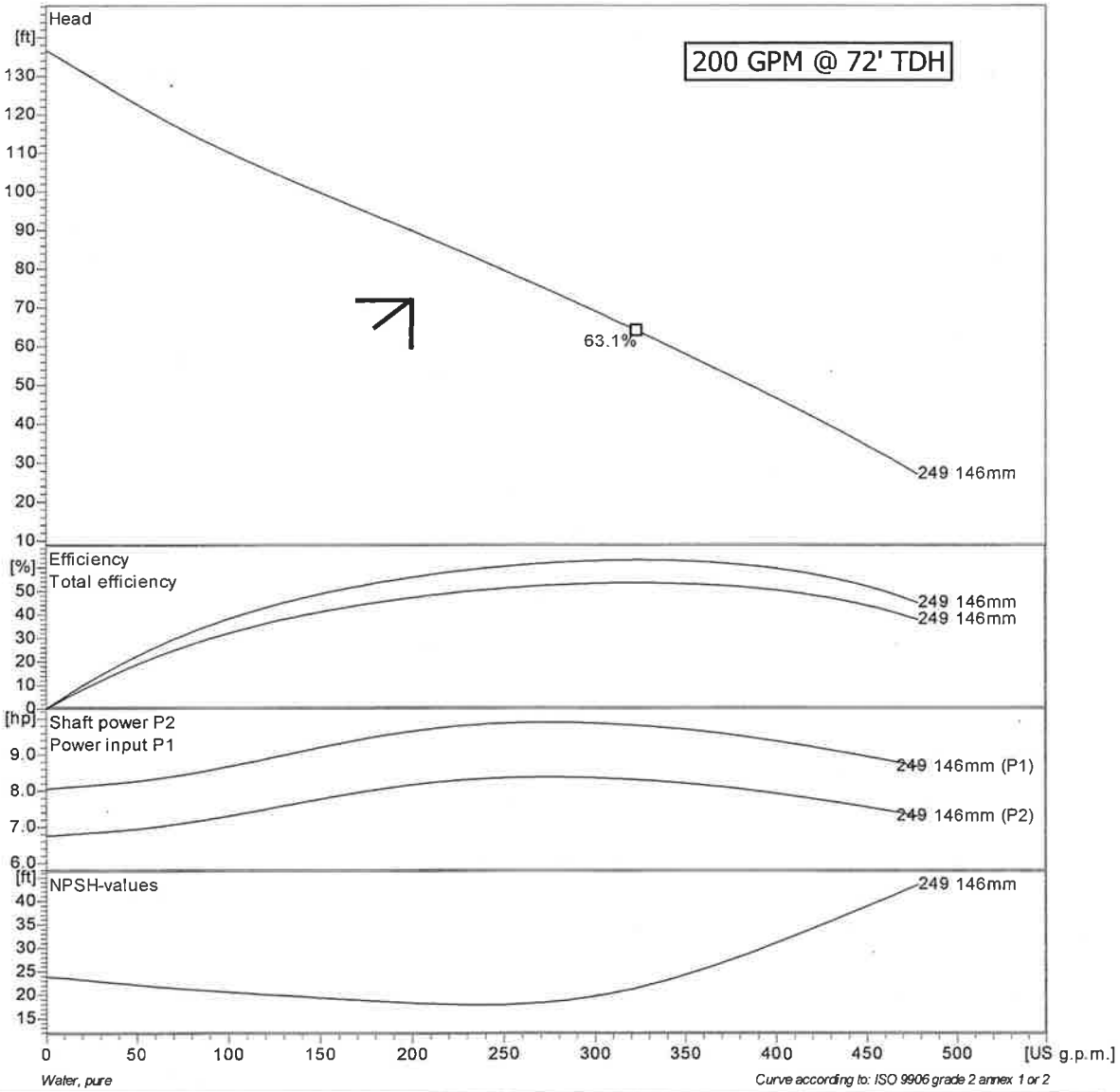
Pump

Discharge Flange Diameter	3 1/8 inch
Suction Flange Diameter	80 mm
Impeller diameter	5 3/4"
Number of blades	2

Motor

Motor #	N3127.095 21-11-2AL-W11hp
Stator variant	28
Frequency	60 Hz
Rated voltage	208 V
Number of poles	2
Phases	3~
Rated power	11 hp
Rated current	29 A
Starting current	270 A
Rated speed	3505 rpm

Power factor	
1/1 Load	0.92
3/4 Load	0.90
1/2 Load	0.85
Efficiency	
1/1 Load	84.7 %
3/4 Load	84.6 %
1/2 Load	82.4 %



Project	Project ID	Created by	Created on	Last update
			2015-05-18	

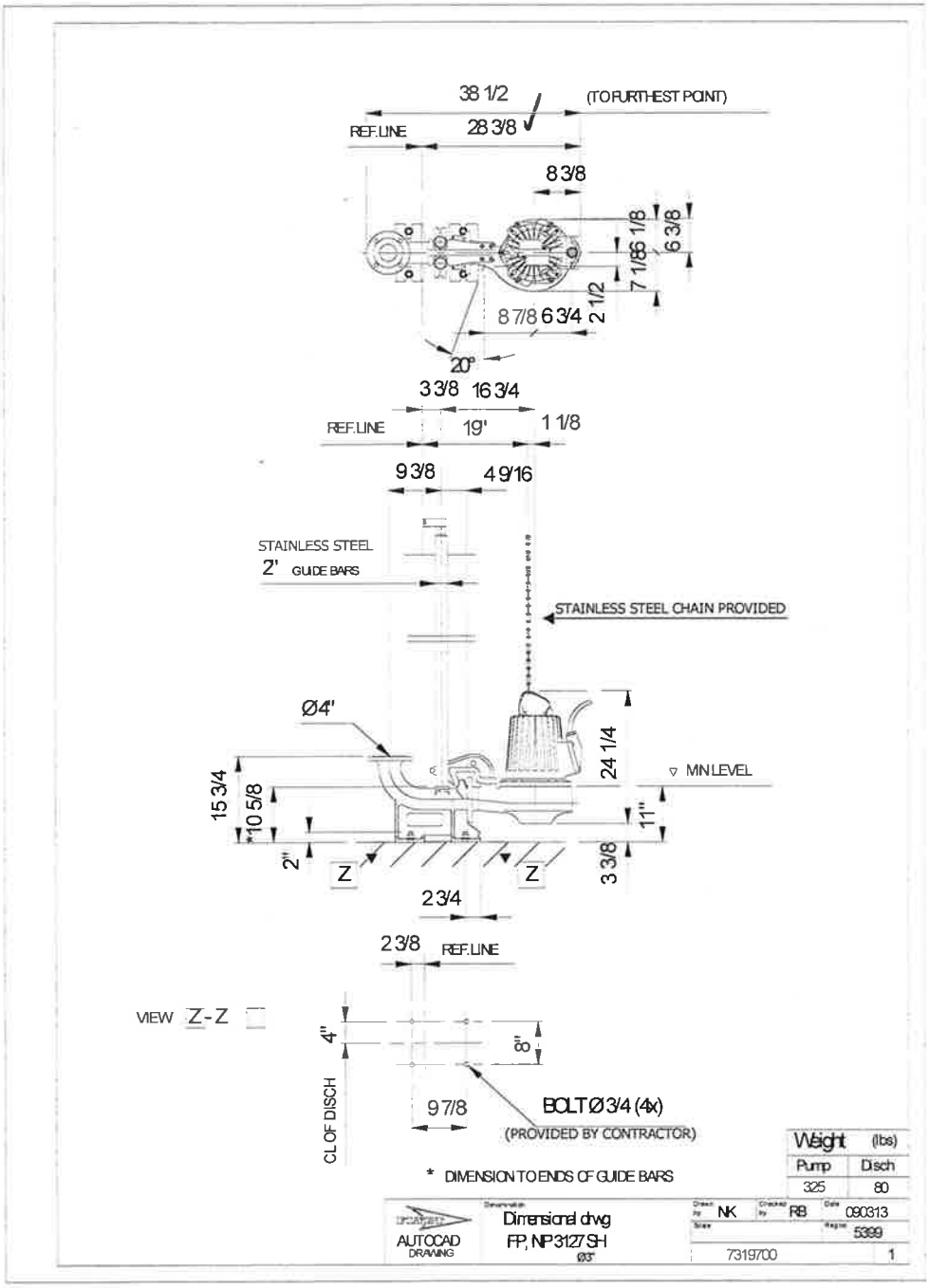
Kennedy INDUSTRIES
PUMPS | VALVES | REPAIRS | CONTROLS

248 "IN BASIS FOR DESIGN"

NP 3127 SH 3~ 249

Dimensional drawing

FLYGT



Project	Project ID	Created by	Created on	Last update
			2015-05-18	

Pump Monitor Relay PMR2

MADE IN THE U.S.A.

c UL us

UL FILE #E101681

OPERATION

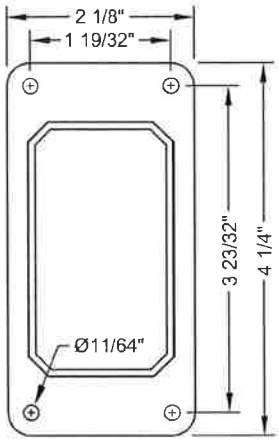
The PMR2 Pump Monitor Relay provides Motor Over Temperature and Seal Leakage alarms for submersible pumps equipped with FLS or CLS sensors.

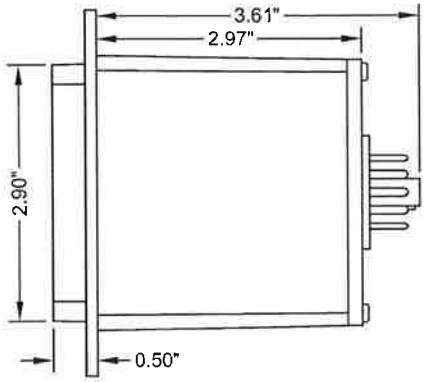
The PMR2 applies 12 VDC to the sensor and measures the current flow through the sensor. The sensor controls the current in the circuit. If the sensor current is in the normal range the Temperature Alarm Relay is energized to allow normal pump operation. If the sensor circuit becomes shorted, the 12 VDC is turned off and all LEDs flash.

Upon a High Motor Temperature condition, the sensor opens so that the sensor circuit current drops to zero. With the sensor current below the Trip Point (≤3.0 mA ±5%), the Overtemp Indication is turned on and the Temperature Alarm Relay is de-energized, preventing pump operation.

When the High Motor Temperature condition has cleared, the unit will reset based on the position of Alarm Reset Mode Select Switch (Auto or Manual). When in the Auto position, the Overtemp Alarm resets automatically. If the switch is in the Manual position, the Overtemp Reset Push-button must be pushed to clear the alarm.

Upon a Seal Leakage condition, the sensor increases the sensor circuit current above the Trip Point (≥22 mA ±5%), the Leakage Indication is turned on and the Leakage Alarm Relay is energized.





SPECIFICATIONS

Input Power:	120 VAC ±10%, 7.0 VA max 24 VAC ±10%, 3.5 VA max 24 VDC ±10%, 125 mA max
Output Rating:	8A Resistive @ 120VAC
Operating Temp:	-20 °C to +65 °C
Storage Temp:	-45 °C to +85 °C
Sensor Circuit Voltage:	12 VDC ±10%
Temp Alarm Trip Point:	≤3.0 mA ±5%
Leak Alarm Trip Point:	≥22 mA ±5%
Enclosure:	Blue Lexan
Base:	Phenolic

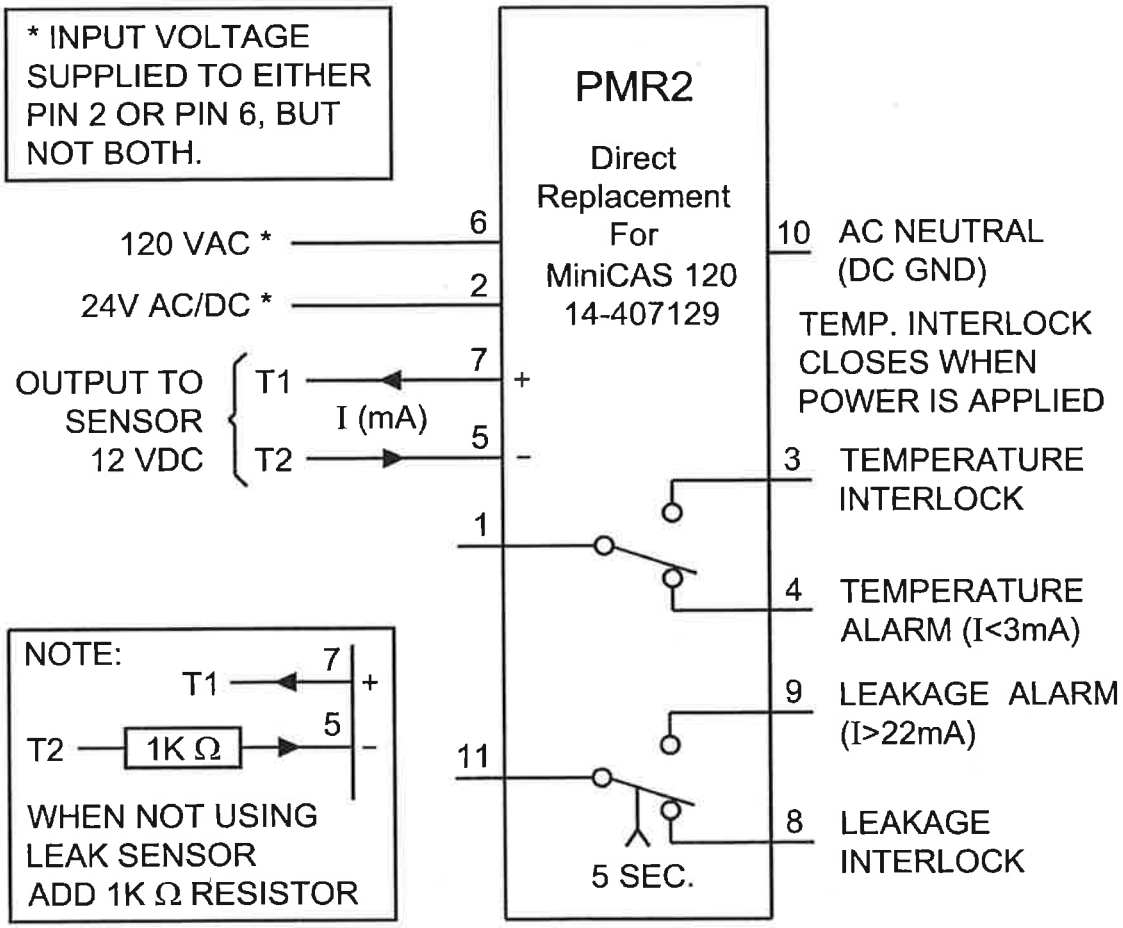
ORDERING INFORMATION

Part Number: PMR2

2464 Vulcan Road, Apopka, Florida 32703 (407) 299-3825 • www.mpelectronics.com

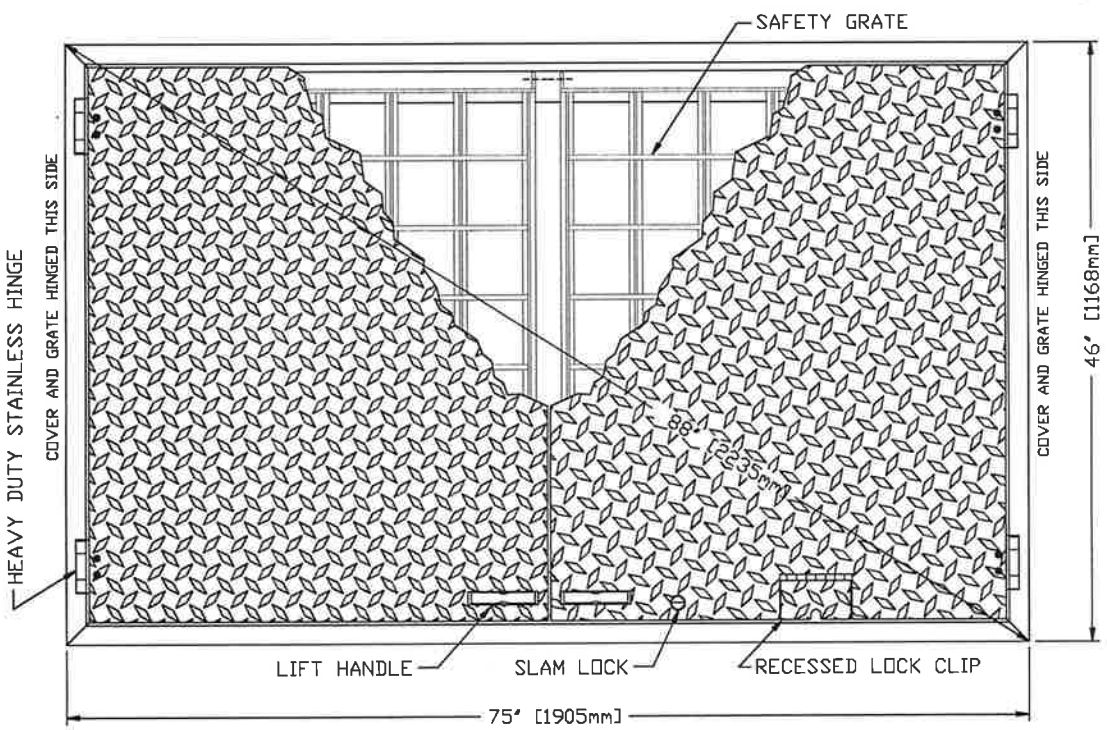
Pump Monitor Relay PMR2

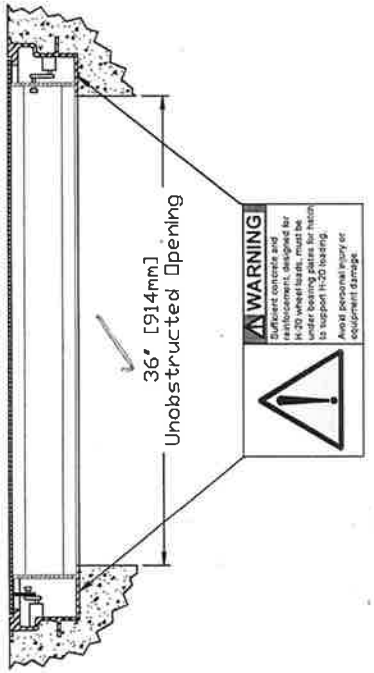
CONNECTION DIAGRAM

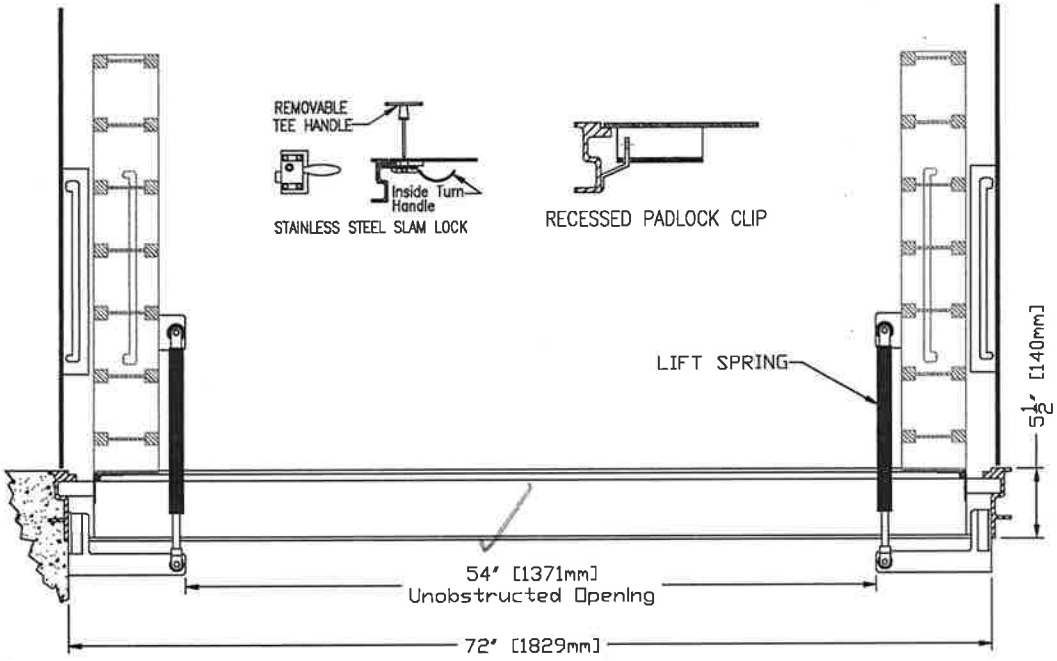


2464 Vulcan Road, Apopka, Florida 32703 (407) 299-3825 • www.mpelectronics.com

AHS2 Heavy Duty H-20 Rated SAFE HATCH®







STYLE "AHS2" ACCESS HATCH, AS MANUFACTURED BY EJ.

MATERIAL SHALL BE 6061-T6 ALUMINUM FOR BARS, ANGLES, AND EXTRUSIONS. 1/4" DIAMOND PLATE SHALL BE 5086 ALUMINUM.

UNIT DESIGNED HEAVY DUTY, FOR 16,000 LBS + 30% IMPACT H-20 WHEEL LOADS, OVER A 10" X 20" CONTACT AREA. FRAME AND BEARING PLATE MUST BE CAST INTO AND SUPPORTED BY CONCRETE DESIGNED FOR H-20 WHEEL LOADS.

UNIT NOT SUITABLE FOR WHEEL LINE PLACEMENT.

UNIT SUPPLIED WITH A HEAVY DUTY PNEU-SPRING, FOR EASE OF OPERATION WHEN OPENING SAFETY GRATE. GRATE SHALL BE COUNTERBALANCED, SO ONE PERSON CAN EASILY OPEN THE SAFETY GRATE.

EACH DOOR SHALL BE EQUIPPED WITH A GRADE 316 STAINLESS STEEL HOLD OPEN ARM. DOOR SHALL LOCK OPEN IN THE 90 DEGREE POSITION. HOLD OPEN ARM SHALL BE FASTENED TO THE FRAME WITH A 1/2" GRADE 316 STAINLESS STEEL BOLT.

ANGLE FRAME SHALL BE OF EXTRUDED ALUMINUM, WITH A CONTINUOUS 1-1/2" ANCHOR FLANGE.

COVER HINGES SHALL BE OF HEAVY DUTY DESIGN. MATERIAL SHALL BE GRADE 316 STAINLESS STEEL. EACH HINGE SHALL HAVE A GRADE 316 STAINLESS STEEL, 3/8" DIAMETER HINGE PIN. HINGE SHALL BE FASTENED TO ANGLE AND DIAMOND PLATE WITH GRADE 316 STAINLESS STEEL BOLTS AND NY-LOCK NUTS.

ALL HARDWARE SHALL BE STAINLESS STEEL.

EACH HATCH SHALL BE SUPPLIED WITH A GRADE 316 STAINLESS STEEL SLAM LOCK, WITH KEY WAY PROTECTED BY A THREADED REMOVABLE PLUG. PLUG SHALL BE FLUSH WITH THE TOP OF THE 1/4" DIAMOND PLATE. SLAM LOCK SHALL BE FASTENED WITH FOUR GRADE 316 STAINLESS STEEL BOLTS AND WASHERS.

EACH HATCH SHALL BE EQUIPPED WITH A STAINLESS STEEL LIFT HANDLE. THE LIFT HANDLE SHALL BE FLUSH WITH THE TOP OF THE 1/4" DIAMOND PLATE.

UNIT SHALL BE SUPPLIED WITH HINGED SAFETY GRATES TO PROVIDE PROTECTION AGAINST FALL THROUGH AND TO CONTROL ACCESS TO THE CONFINED SPACE.

EACH HATCH SHALL BE SUPPLIED WITH A RECESSED PADLOCK CLIP (PADLOCK BY OTHERS).

Product Number

NPR15-1873

Design Features

-Materials
Aluminum
-Design Load
Heavy Duty (Not in Driving Lane)

AHS2
-Coating
Mill Finish

Certification

WT 308 lbs

Country of Origin: Made in USA

Drawing Revision

11/01/12 Designer: TJM
5/13/15 Revised By: RGB

Disclaimer

Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

Contact

800 626 4653
ejco.com

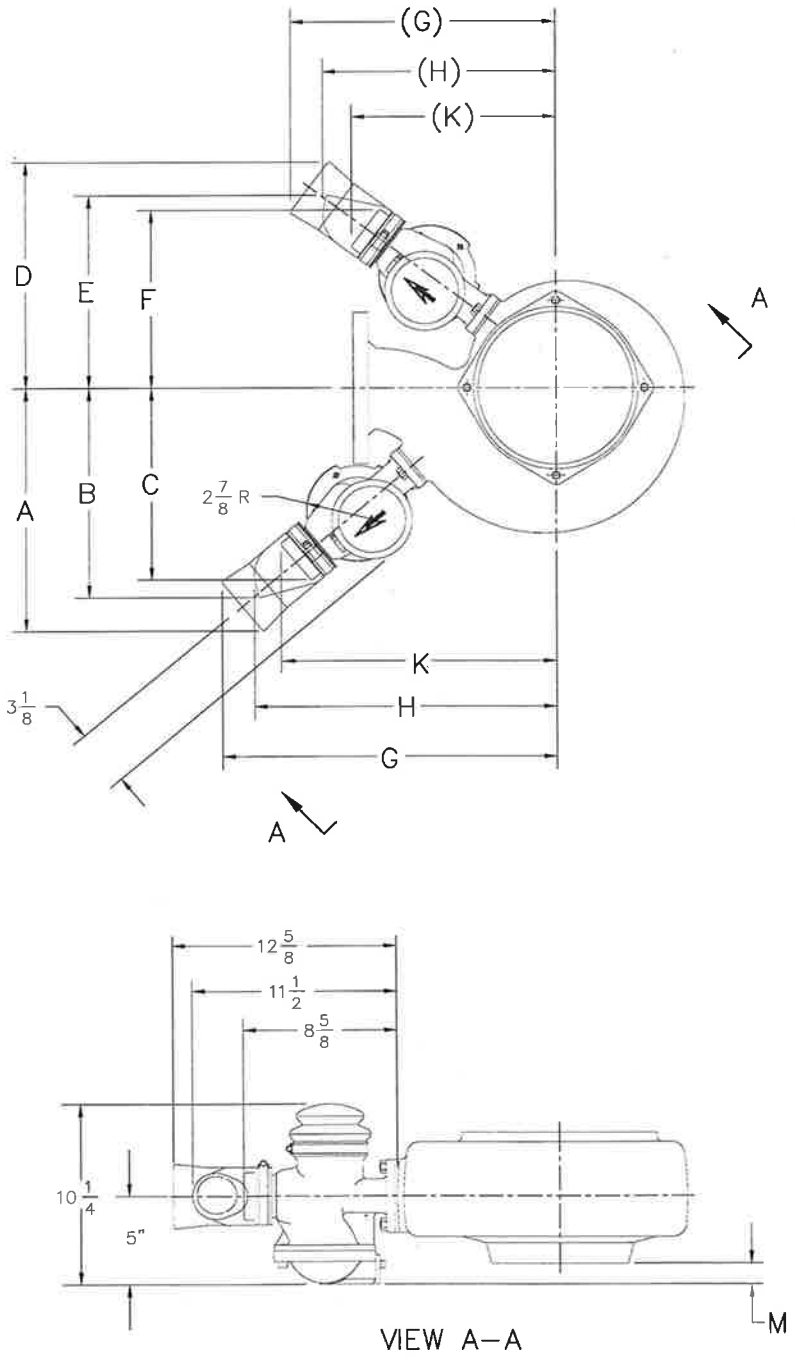
FLYGT
a xylem brand

Issued: 7/11 Supersedes: 6/02

Flygt Mix-Flush System

Mix-Flush Model 4901, With 90° Discharge Elbow

Standard Version, P/N 556 51 01 (Head must be above 10 feet, see individual curve)



VIEW A–A

*** Flush Valve for Low Head Version, P/N 556 51 02** (Head must be above 7.5 feet and below 10 feet, see individual curve)

Note: Add 2" to Dimensions A & D and 2-3/8" to B & C when using valve with straight outlet pipe.

SERIES DB PORTABLE HOIST

HALLIDAY PRODUCTS
www.HallidayProducts.com
Phone 800–298–1027
Fax 407–298–4534
Sales@HallidayProducts.com

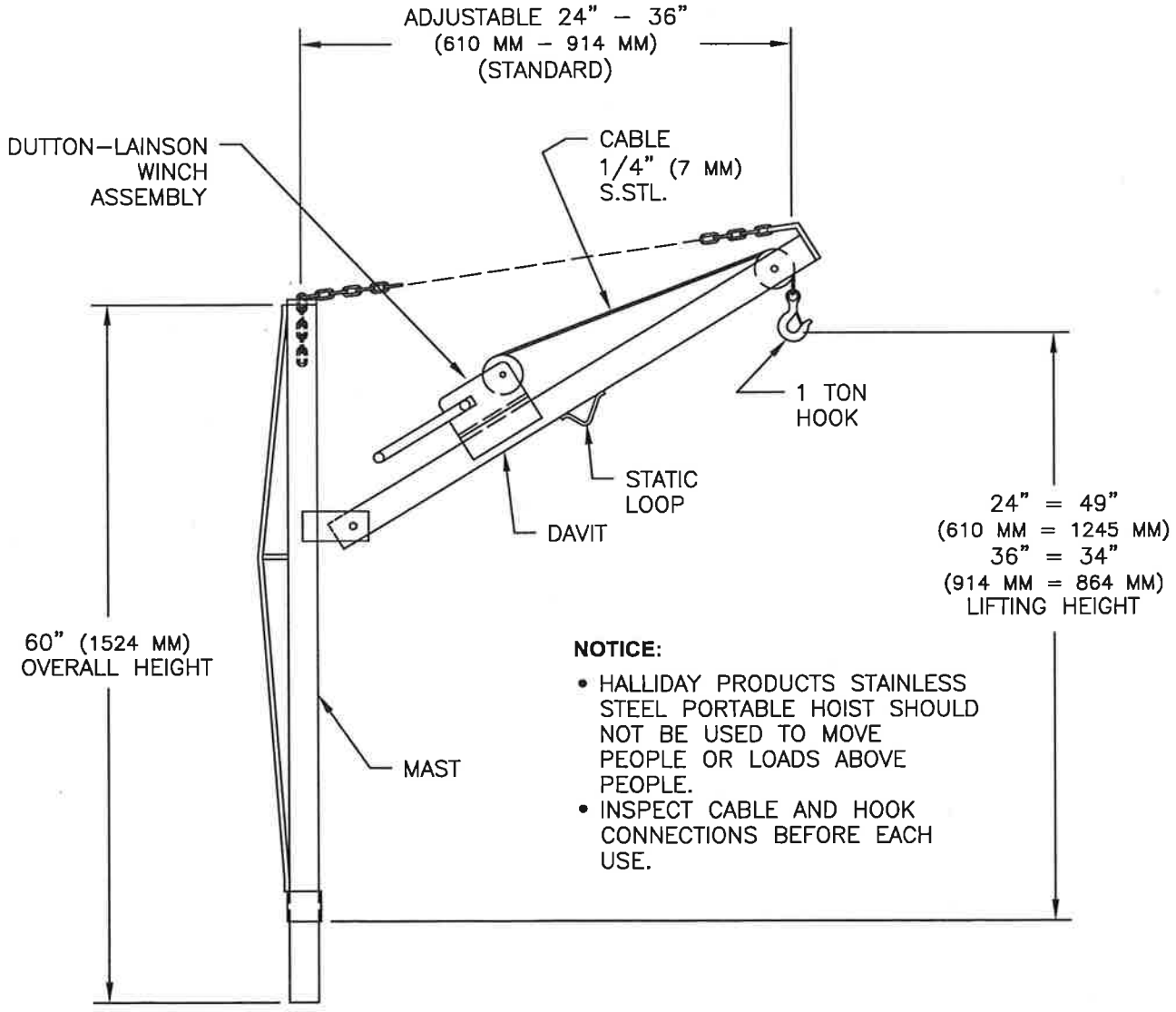
STANDARD FEATURES:

- TYPE–304 STAINLESS STEEL CONSTRUCTION
- 30 FEET (9 METERS) OF 1/4" (7 MM) STAINLESS STEEL CABLE
- GALVANIZED 1 TON HOOK
- DUTTON–LAINSON MARINE GRADE BRAKE WINCH
- ADJUSTABLE REACH IN 1" (25 MM) INCREMENTS
- 3 YEAR GUARANTEE

OPTIONS:

- TYPE–316 CONSTRUCTION
- ADDITIONAL CABLE AVAILABLE (SPECIFY LENGTH)
- STAINLESS STEEL WINCH
- STAINLESS STEEL HOOK
- OTHER REACHES AVAILABLE UPON REQUEST (CONSULT FACTORY)

STANDARD SIZES			
QTY.	MODEL NO.	MAX .LOAD LBS. (KG.)	UNIT WT. LBS. (KG.)
	D1B36C	300 (136)	73 (33)
1	D2B36D	1000 (454)	96 (44)
	D3B36E	1330 (603)	111 (50)



NOTICE:

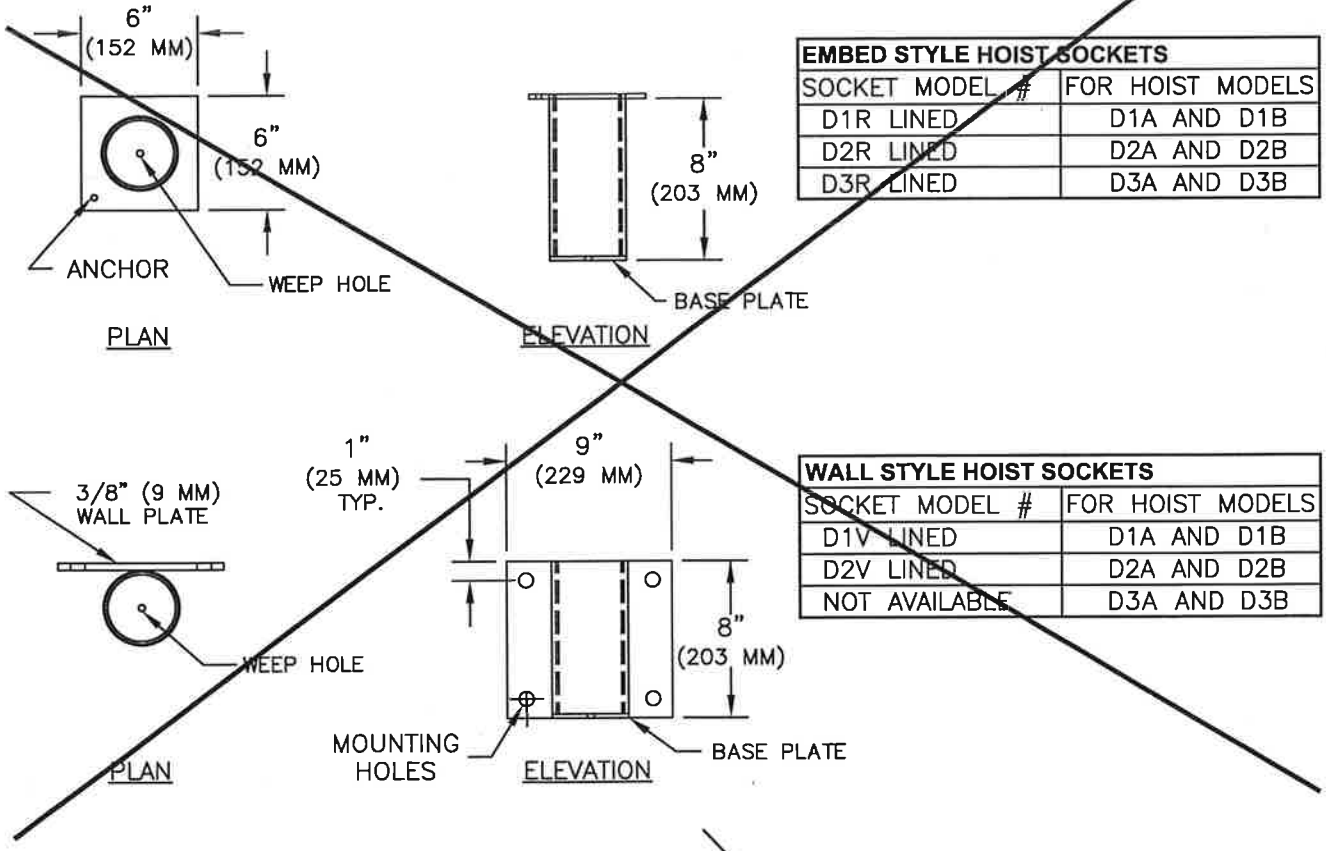
- HALLIDAY PRODUCTS STAINLESS STEEL PORTABLE HOIST SHOULD NOT BE USED TO MOVE PEOPLE OR LOADS ABOVE PEOPLE.
- INSPECT CABLE AND HOOK CONNECTIONS BEFORE EACH USE.

SERIES D HOIST SOCKETS

HALLIDAY PRODUCTS
www.HallidayProducts.com
Phone 800-298-1027
Fax 407-298-4534
Sales@HallidayProducts.com

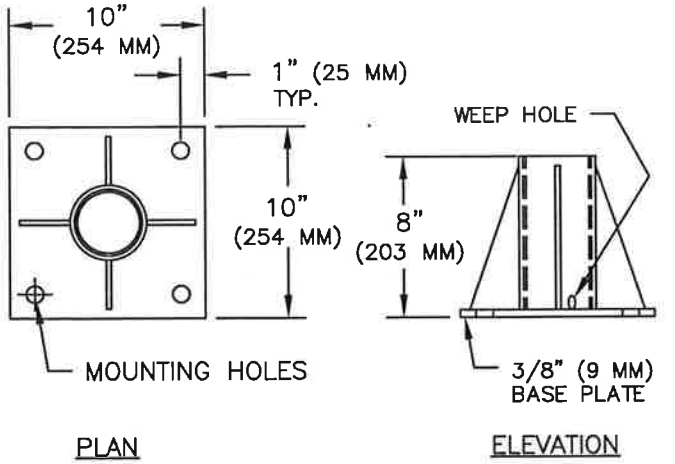
STANDARD FEATURES:

- STAINLESS STEEL TYPE-304 (STANDARD) OR TYPE-316 (OPTIONAL) CONSTRUCTION
- AVAILABLE IN 3 STYLES
- SUPPLIED WITH POLYMER LINING FOR SMOOTHER ROTATION
- 3 YEAR GUARANTEE



EMBED STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1R LINED	D1A AND D1B
D2R LINED	D2A AND D2B
D3R LINED	D3A AND D3B

WALL STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1V LINED	D1A AND D1B
D2V LINED	D2A AND D2B
NOT AVAILABLE	D3A AND D3B



FLOOR STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1S LINED	D1A AND D1B
D2S LINED	D2A AND D2B
D3S LINED	D3A AND D3B

NOTES:
MOUNTING HOLES ARE ø3/4" (ø19 MM)

APPENDIX B
PERMITS

Washtenaw County
BOARD OF COUNTY ROAD COMMISSIONERS
555 NORTH ZEEB ROAD
ANN ARBOR, MICHIGAN 48103
WWW.WCROADS.ORG

May 8, 2015

Stantec Consulting
3758 Ranchero Drive
Ann Arbor, Michigan 48108

Attention: **Eric Humesky, PE**

Regarding: **WCRC Permit Application # 11569 – Moon Road Pump Station**
Pittsfield Township

Dear Mr. Humesky:

This letter is provided in response to the applicant's plan submitted for the above referenced project. The plans meet the technical approval of the WCRC. The following administrative items must be addressed in accordance with the WCRC Procedures & Regulations for Permit Activities (PRPA) prior to the issuance of a permit:

1. An opinion of probable construction cost must be submitted, sealed by a Professional Engineer, for the work within the right-of-way.
2. An inspection fee must be submitted based on 3% of the approved engineer's estimate, minimum of $500.
3. Per Section 2.8 of the PRPA, please submit security for the right-of-way restoration based on the approved amount of the engineer's estimate or a letter of retainage from the Township.
4. Provide the name and address of the contractor who will be performing the work.
5. A certificate of general liability insurance must be submitted per Section 2.6 of the WCRC Procedures and Regulations for Permit Activities.

Once the above items have been addressed, a permit may be issued. No work in the right-of-way shall take place until WCRC permits have been issued. If you have any questions, please do not hesitate to contact me at (734) 327-6692.

Sincerely,

Gary Streight, P.E.
Project Manager

Cc: Mandy Grewal, Ph.D. / Pittsfield Township Supervisor
Alan Israel / Pittsfield Township Clerk
Craig Lyon / Pittsfield Township Municipal Services - Utilities Director
Ben Carlisle, AICP / CWA, Senior Associate Planner
Matt MacDonell, P.E. / WCRC Assistant Director of Engineering