



**Village of Hoffman Estates
Public Works**

REQUEST FOR BIDS

FOR THE

HAMPTON LIFT STATION IMPROVEMENTS

RELEASE DATE: May 8, 2026

MANDATORY PRE-BID MEETING: May 15, 2026

BID DUE DATE: June 5, 2026

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COVER SHEET

Proposal Submitted By:

Contractor's Name

Contractor's Address

City

State

Zip Code

STATE OF ILLINOIS

Local Public Agency

Village of Hoffman Estates

County

Cook

Section Number

Route(s) (Street/Road Name)

1869 Hampton Road

Type of Funds

Local

☐ Proposal Only ☐ Proposal and Plans ☒ Proposal only, plans are separate

Submitted/Approved

For Local Public Agency:

For a County and Road District Project

Submitted/Approved

Highway Commissioner Signature & Date

Submitted/Approved

County Engineer/Superintendent of Highways Signature & Date

For a Municipal Project

Submitted/Approved/Passed

Signature & Date

Official Title

Department of Transportation

Released for bid based on limited review

Regional Engineer Signature & Date

Note: All proposal documents, including Proposal Guaranty Checks or Proposal Bid Bonds, should be stapled together to prevent loss when bids are processed.

Local Public Agency	County	Section Number	Route(s) (Street/Road Name)
Village of Hoffman Estates	Cook		1869 Hampton Road

NOTICE TO BIDDERS

Sealed proposals for the project described below will be received at the office of the Village Clerk

1900 Hassell Road, Hoffman Estates, IL 60169	until	10:00 AM	on	06/05/26
Address		Time		Date

Sealed proposals will be opened and read publicly at the office of Frank Alexa Room

1900 Hassell Road, Hoffman Estates, IL 60169	at	10:00 AM	on	06/05/26
Address		Time		Date

DESCRIPTION OF WORK

Location	Project Length
1869 Hampton Road	N/A

Proposed Improvement

Demolition and installation of new sanitary sewer lift station at the northeast corner of Hampton Road and Jamison Lane in Hoffman Estates.

1. Plans and proposal forms will be available in the office of

Plans and proposal forms are available for download from the Village of Hoffman Estates website at www.hoffmanestates.org/business/rfps-rfqs-bids beginning May 8, 2026.

2. ☒ Prequalification

If checked, the 2 apparent as read low bidders must file within 24 hours after the letting an "Affidavit of Availability" (Form BC 57) in triplicate, showing all uncompleted contracts awarded to them and all low bids pending award for Federal, State, County, Municipal and private work. One original shall be filed with the Awarding Authority and two originals with the IDOT District Office.

3. The Awarding Authority reserves the right to waive technicalities and to reject any or all proposals as provided in BLRS Special Provision for Bidding Requirements and Conditions for Contract Proposals.
4. The following BLR Forms shall be returned by the bidder to the Awarding Authority:
 - a. Local Public Agency Formal Contract Proposal (BLR 12200)
 - b. Schedule of Prices (BLR 12201)
 - c. Proposal Bid Bond (BLR 12230) (if applicable)
 - d. Apprenticeship or Training Program Certification (BLR 12325) (do not use for project with Federal funds.)
 - e. Affidavit of Illinois Business Office (BLR 12326) (do not use for project with Federal funds)
5. The quantities appearing in the bid schedule are approximate and are prepared for the comparison of bids. Payment to the Contractor will be made only for the actual quantities of work performed and accepted or materials furnished according to the contract. The scheduled quantities of work to be done and materials to be furnished may be increased, decreased or omitted as hereinafter provided.
6. Submission of a bid shall be conclusive assurance and warranty the bidder has examined the plans and understands all requirements for the performance of work. The bidder will be responsible for all errors in the proposal resulting from failure or neglect to conduct an in depth examination. The Awarding Authority will, in no case, be responsible for any costs, expenses, losses or changes in anticipated profits resulting from such failure or neglect of the bidder.
7. The bidder shall take no advantage of any error or omission in the proposal and advertised contract.
8. If a special envelope is supplied by the Awarding Authority, each proposal should be submitted in that envelope furnished by the Awarding Agency and the blank spaces on the envelope shall be filled in correctly to clearly indicate its contents. When an envelope other than the special one furnished by the Awarding Authority is used, it shall be marked to clearly indicate its contents. When sent by mail, the sealed proposal shall be addressed to the Awarding Authority at the address and in care of the official in whose office the bids are to be received. All proposals shall be filed prior to the time and at the place specified in the Notice to Bidders. Proposals received after the time specified will be returned to the bidder unopened.
9. Permission will be given to a bidder to withdraw a proposal if the bidder makes the request in writing or in person before the time for opening proposals.

Local Public Agency	County	Section Number	Route(s) (Street/Road Name)
Village of Hoffman Estates	Cook		1869 Hampton Road

PROPOSAL

1. Proposal of _____

Contractor's Name _____

Contractor's Address _____
2. The plans for the proposed work are those prepared by the Village of Hoffman Estates
and approved by the Department of Transportation on _____.
3. The specifications referred to herein are those prepared by the Department of Transportation and designated as "Standard Specifications for Road and Bridge Construction" and the " Supplemental Specifications and Recurring Special Provisions" thereto, adopted and in effect on the date of invitation for bids.
4. The undersigned agrees to accept, as part of the contract, the applicable Special Provisions indicated on the "Check Sheet for Recurring Special Provisions" contained in this proposal.
5. The undersigned agrees to complete the work within _____ working days or by 03/31/27 unless additional time is granted in accordance with the specifications.
6. The successful bidder at the time of execution of the contract will be required to deposit a contract bond for the full amount of the award. When a contract bond is not required, the proposal guaranty check will be held in lieu thereof. If this proposal is accepted and the undersigned fails to execute a contract and contract bond as required, it is hereby agreed that the Bid Bond of check shall be forfeited to the Awarding Authority.
7. Each pay item should have a unit price and a total price. If no total price is shown or if there is a discrepancy between the products of the unit price multiplied by the quantity, the unit price shall govern. If a unit price is omitted, the total price will be divided by the quantity in order to establish a unit price. A bid may be declared unacceptable if neither a unit price nor a total price is shown.
8. The undersigned submits herewith the schedule of prices on BLR 12201 covering the work to be performed under this contract.
9. The undersigned further agrees that if awarded the contract for the sections contained in the combinations on BLR 12201, the work shall be in accordance with the requirements of each individual proposal for the multiple bid specified in the Schedule for Multiple Bids below.
10. A proposal guaranty in the proper amount, as specified in BLRS Special Provision for Bidding Requirements and Conditions for Contract Proposals, will be required. Bid Bonds will be allowed as a proposal guaranty. Accompanying this proposal is either a bid bond, if allowed, on Department form BLR 12230 or a proposal guaranty check, complying with the specifications, made payable to: Village of Hoffman Estates Treasurer of _____.
The amount of the check is _____ (_____).

Attach Cashier's Check or Certified Check Here

In the event that one proposal guaranty check is intended to cover two or more bid proposals, the amount must be equal to the sum of the proposal guaranties which would be required for each individual bid proposal. If the proposal guaranty check is placed in another bid proposal, state below where it may be found.

The proposal guaranty check will be found in the bid proposal for: Section Number _____.

Local Public Agency	County	Section Number	Route(s) (Street/Road Name)
Village of Hoffman Estates	Cook		1869 Hampton Road

CONTRACTOR CERTIFICATIONS

The certifications hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder.

1. **Debt Delinquency.** The bidder or contractor or subcontractor, respectively, certifies that it is not delinquent in the payment of any tax administered by the Department of Revenue unless the individual or other entity is contesting, in accordance with the procedure established by the appropriate Revenue Act, its liability for the tax or the amount of the tax. Making a false statement voids the contract and allows the Department to recover all amounts paid to the individual or entity under the contract in a civil action.
2. **Bid-Rigging or Bid Rotating.** The bidder or contractor or subcontractor, respectively, certifies that it is not barred from contracting with the Department by reason of a violation of either 720 ILCS 5/33E-3 or 720 ILCS 5/33E-4.

A violation of section 33E-3 would be represented by a conviction of the crime of bid-rigging which, in addition to Class 3 felony sentencing, provides that any person convicted of this offense, or any similar offense of any state or the United States which contains the same elements as this offense shall be barred for 5 years from the date of conviction from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent on behalf of the corporation.

A violation of Section 33E-4 would be represented by a conviction of the crime of bid-rotating which, in addition to Class 2 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be permanently barred from contracting with any unit of State of Local government. No corporation shall be barred from contracting with any unit of State or Local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent on behalf of the corporation.

3. **Bribery.** The bidder or contractor or subcontractor, respectively, certifies that, it has not been convicted of bribery or attempting to bribe an officer or employee of the State of Illinois or any unit of local government, nor has the firm made an admission of guilt of such conduct which is a matter of record, nor has an official, agent, or employee of the firm committed bribery or attempted bribery on behalf of the firm and pursuant to the direction or authorization of a responsible official of the firm.
4. **Interim Suspension or Suspension.** The bidder or contractor or subcontractor, respectively, certifies that it is not currently under a suspension as defined in Subpart I of Title 44 Subtitle A Chapter III Part 6 of the Illinois Administrative code. Furthermore, if suspended prior to completion of this work, the contract or contracts executed for the completion of this work may be canceled.

Local Public Agency	County	Section Number	Route(s) (Street/Road Name)
Village of Hoffman Estates	Cook		1869 Hampton Road

SIGNATURES

(If an individual)

Bidder Signature & Date

Business Address

City

State

Zip Code

(If a partnership)

Firm Name

Signature & Date

Title

Business Address

City

State

Zip Code

Insert the Names and Addresses of all Partners

(If a corporation)

Corporate Name

Signature & Date

Title

Business Address

City

State

Zip Code

Insert Names of Officers

President

Attest:

Secretary

Secretary

Treasurer



Schedule of Prices

Print Form

Print With Instructions

Reset Form



Contractor's Name

Contractor's Address

City

State

Zip Code

Local Public Agency

County

Section Number

Route(s) (Street/Road Name)

Schedule for Multiple Bids

Combination Letter	Section Included in Combinations	Total
+		
-		
+		
-		
+		
-		
+		
-		
+		
-		

Schedule for Single Bid

(For complete information covering these items, see plans and specifications.)

Item Number	Items	Unit	Quantity	Unit Price	Total
+					
-					
+	01 33 00-01 VIDEO DOCUMENTATION OF EXISTING CONDITIONS	LSUM	1		
-					
+	01 50 00-01 TEMPORARY FACILITIES AND CONTROLS	LSUM	1		
-					
+	01 50 00-02 TEMPORARY CONSTRUCTION FENCING	LSUM	1		
-					
+	01 55 26-01 TRAFFIC CONTROL AND PROTECTION	LSUM	1		
-					
+	01 71 13-01 MOBILIZATION AND DEMOBILIZATION	LSUM	1		
-					
+	01 71 20 CONSTRUCTION LAYOUT	LSUM	1		
-					
+	02 41 00-01 DEMOLITION	LSUM	1		
-					
+	03 00 00-01 CONCRETE EQUIPMENT PAD	SQ FT	350		
-					
+	03 40 00-01 WET WELL	LSUM	1		
-					
+	03 40 00-02 VALVE VAULT	LSUM	1		
-					
+	03 40 00-03 GENERATOR PAD	LSUM	1		
-					
+	26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	LSUM	1		
-					
+	26 05 23 CONTROL-VOLTAGE ELECTRICAL POWER CABLES	LSUM	1		
-					
+	26 05 26 GROUNDING SYSTEM	LSUM	1		
-					
+	26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS	LSUM	1		
-					
+	26 27 16 VENTED CABLE JUNCTION BOX	EACH	1		
-					

Local Public Agency		County	Section Number		Route(s) (Street/Road Name)	
Village of Hoffman Estates		Cook			Hampton Road	
Item Number	Items	Unit	Quantity	Unit Price	Total	
+26 29 20	PUMP CONTROLLER ENCLOSURE	LSUM	1			
+26 32 13	ENGINE GENERATOR	LSUM	1			
+26 36 00	AUTOMATIC TRANSFER SWITCH	EACH	1			
+26 42 00	CATHODIC PROTECTION	LSUM	1			
+26 60 20-01	ELECTRIC SERVICE	LSUM	1			
+26 60 20-02	ELECTRIC SERVICE UTILITY FEE	UNIT	1			
+27 51 25	SCADA SYSTEM	UNIT	1			
+31 11 00-01	SITE CLEARING	LSUM	1			
+31 11 00-02	TREE REMOVAL (OVER 15 UNITS DIA)	UNIT	95			
+31 11 00-03	TREE TRUNK PROTECTION	LSUM	1			
+31 20 00	EARTH EXCAVATION	LSUM	1			
+31 23 19	DEWATERING	LSUM	1			
+31 25 15-01	EROSION CONTROL FENCE	FOOT	109			
+31 25 15-02	INLET PROTECTION	EACH	8			
+31 25 15-03	DEWATERING FILTER PAD	LSUM	1			
+31 25 15-04	BMP MAINTENANCE	LSUM	1			
+31 25 15-05	CONCRETE WASHOUT	LSUM	1			
+31 25 15-06	TEMPORARY EROSION CONTROL SEEDING	POUND	20			
+31 25 15-07	TEMPORARY EROSION CONTROL BLANKET	SQ YD	946			
+31 41 00-01	EARTH RETENTION SYSTEM	LSUM	1			
+33 11 00-01	DIP PUMP DISCHARGE PIPING AND FITTINGS	LSUM	1			
+33 11 00-02	FORCEMAIN	LSUM	1			
+33 11 00-03	SANITARY SEWER 6"	FOOT	5			
+33 11 00-04	SANITARY SEWER 8"	FOOT	203			
+33 11 00-05	SANITARY SEWER 10"	FOOT	23			
+33 12 16	DISCHARGE VALVES AND FITTINGS	LSUM	1			
+33 42 00	SEWAGE PUMPS AND ACCESSORIES	LSUM	1			
+33 43 00	TEMPORARY BYPASS SYSTEM	LSUM	1			
20800150	TRENCH BACKFILL	CU YD	617			
21101615	TOPSOIL FURNISH AND PLACE, 4"	SQ YD	946			
25200110	SODDING, SALT TOLERANT	SQ YD	946			
25200200	SUPPLEMENTAL WATERING	UNIT	2			
31101100	SUBBASE GRANULAR MATERIAL, TYPE B	CU YD	82			
40604060	HOT-MIX ASPHALT SURFACE COURSE, IL-9.5, MIX "D", N50	TON	4			
42300200	PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 6 INCH	SQ YD	70			

42400200	PORTLAND CEMENT CONCRETE SIDEWALK 5 INCH	SQ FT	1,769		
42400800	DETECTABLE WARNINGS	SQ FT	70		
44000200	DRIVEWAY PAVEMENT REMOVAL	SQ YD	100		
44000500	COMBINATION CURB AND GUTTER REMOVAL	FOOT	481		
44000600	SIDEWALK REMOVAL	SQ FT	1,698		
44201747	CLASS D PATCHES, TYPE IV, 8 INCH	SQ YD	199		
550A0340	STORM SEWERS, CLASS A, TYPE 2 12"	FOOT	59		
550A0380	STORM SEWERS, CLASS A, TYPE 2 18"	FOOT	164		
55100400	STORM SEWER REMOVAL 10"	FOOT	13		
55100700	STORM SEWER REMOVAL 15"	FOOT	31		
55100900	STORM SEWER REMOVAL 18"	FOOT	49		
60255500	MANHOLES TO BE ADJUSTED	EACH	2		
60500040	REMOVING MANHOLES	EACH	1		
60500050	REMOVING CATCH BASINS	EACH	2		
60500305	FILLING INLETS	EACH	1		
66900200	NON-SPECIAL WASTE DISPOSAL	CU YD	100		
66900530	SOIL DISPOSAL ANALYSIS	EACH	1		
Z0056612	STORM SEWER (WATER MAIN REQUIREMENTS) 18 INCH	FOOT	57		
X5509900	ABANDON AND FILL EXISTING STORM SEWER	FOOT	217		
X5510011	PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE	EACH	1		
X6022712	CATCH BASINS, TYPE A, 4'-DIAMETER, WITH SPECIAL FRAME AND GRATE	EACH	1		
X6022810	MANHOLES, SANITARY, 4'-DIAMETER, TYPE 1 FRAME, CLOSED LID	EACH	2		
X6022820	MANHOLES, SANITARY, 5'-DIAMETER, TYPE 1 FRAME, CLOSED LID	EACH	3		
X6022930	MANHOLES, TYPE A, 5'-DIAMETER, WITH SPECIAL FRAME AND GRATE	EACH	1		
X6023102	MANHOLES, TYPE A, 5'-DIAMETER, TYPE 1 FRAME, CLOSED LID (SPECIAL)	EACH	1		
X6023508	INLETS, TYPE A, WITH SPECIAL FRAME AND GRATE	EACH	1		
X6025604	PROPOSED MANHOLE/CATCH BASIN CONNECTION OVER EXISTING STORM SEWER	EACH	2		
X6060079	COMBINATION CONCRETE CURB AND GUTTER, TYPE M-3.12 (SPECIAL)	FOOT	481		
	Bidder's Total Proposal				

1. Each pay item should have a unit price and a total price.
2. If no total price is shown or if there is a discrepancy between the product of the unit price multiplied by the quantity, the unit price shall govern.
3. If a unit price is omitted, the total price will be divided by the quantity in order to establish a unit price.
4. A bid may be declared unacceptable if neither a unit price or total price is shown.



Local Public Agency	County	Section Number
Village of Hoffman Estates	Cook	

WE, _____ as PRINCIPAL, and _____ as SURETY, are held jointly,

severally and firmly bound unto the above Local Public Agency (hereafter referred to as "LPA") in the penal sum of 5% of the total bid price, or for the amount specified in the proposal documents in effect on the date of invitation for bids, whichever is the lesser sum. We bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly pay to the LPA this sum under the conditions of this instrument.

WHEREAS THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that, the said PRINCIPAL is submitting a written proposal to the LPA acting through its awarding authority for the construction of the work designated as the above section.

THEREFORE if the proposal is accepted and a contract awarded to the PRINCIPAL by the LPA for the above designated section and the PRINCIPAL shall within fifteen (15) days after award enter into a formal contract, furnish surety guaranteeing the faithful performance of the work, and furnish evidence of the required insurance coverage, all as provided in the "Standard Specifications for Road and Bridge Construction" and applicable Supplemental Specifications, then this obligation shall become void; otherwise it shall remain in full force and effect.

IN THE EVENT the LPA determines the PRINCIPAL has failed to enter into a formal contract in compliance with any requirements set forth in the preceding paragraph, then the LPA acting through its awarding authority shall immediately be entitled to recover the full penal sum set out above, together with all court costs, all attorney fees, and any other expense of recovery.

IN TESTIMONY WHEREOF, the said PRINCIPAL and the said SURETY have caused this instrument to be signed by their respective officers this _____ of _____ Day _____ Month and Year

Principal

Company Name

Signature & Date
 By:

Title

Company Name

Signature & Date
 By:

Title

(If Principal is a joint venture of two or more contractors, the company names, and authorized signatures of each contractor must be affixed.)

Surety

Name of Surety

Signature of Attorney-in-Fact Signature & Date
 By:

STATE OF IL
 COUNTY OF

I _____, a Notary Public in and for said county do hereby certify that

(Insert names of individuals signing on behalf of PRINCIPAL & SURETY)

who are each personally known to me to be the same persons whose names are subscribed to the foregoing instrument on behalf of PRINCIPAL and SURETY, appeared before me this day in person and acknowledged respectively, that they signed and delivered said instruments as their free and voluntary act for the uses and purposes therein set forth.

Given under my hand and notarial seal this _____ day of _____ Month and Year .

(SEAL, if required by the LPA)

Notary Public Signature & Date

Date commission expires _____

Local Public Agency

County

Section Number

Village of Hoffman Estates

Cook

ELECTRONIC BID BOND

☐ **Electronic bid bond is allowed (box must be checked by LPA if electronic bid bond is allowed)**

The Principal may submit an electronic bid bond, in lieu of completing the above section of the Proposal Bid Bond Form. By providing an electronic bid bond ID code and signing below, the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the LPA under the conditions of the bid bond as shown above. (If PRINCIPAL is a joint venture of two or more contractors, an electronic bid bond ID code, company/Bidder name title and date must be affixed for each contractor in the venture.)

Electronic Bid Bond ID Code

Company/Bidder Name

Signature & Date

Title



Local Public Agency	County	Street Name/Road Name	Section Number
Village of Hoffman Estates	Cook	1869 Hampton Road	

All contractors are required to complete the following certification

- ☐ For this contract proposal or for all bidding groups in this deliver and install proposal.
- ☐ For the following deliver and install bidding groups in this material proposal.

Illinois Department of Transportation policy, adopted in accordance with the provisions of the Illinois Highway Code, requires this contract to be awarded to the lowest responsive and responsible bidder. The award decision is subject to approval by the Department. In addition to all other responsibility factors, this contract or deliver and install proposal requires all bidders and all bidder's subcontractors to disclose participation in apprenticeship or training programs that are (1) approved by and registered with the United States Department of Labor's Bureau of Apprenticeship and Training, and (2) applicable to the work of the above indicated proposals or groups. Therefore, all bidders are required to complete the following certification:

1. Except as provided in paragraph 4 below, the undersigned bidder certifies that it is a participant, either as an individual or as part of a group program, in an approved apprenticeship or training program applicable to each type of work or craft that the bidder will perform with its own employees.
2. The undersigned bidder further certifies, for work to be performed by subcontract, that each of its subcontractors either (A) is, at the time of such bid, participating in an approved, applicable apprenticeship or training program; or (B) will, prior to commencement of performance of work pursuant to this contract, establish participation in an approved apprenticeship or training program applicable to the work of the subcontract.
3. The undersigned bidder, by inclusion in the list in the space below, certifies the official name of each program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the bidder is a participant and that will be performed with the bidder's employees. Types of work or craft that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category for which there is no applicable apprenticeship or training program available.

4. Except for any work identified above, if any bidder or subcontractor shall perform all or part of the work of the contract or deliver and install proposal solely by individual owners, partners or members and not by employees to whom the payment of prevailing rates of wages would be required, check the following box, and identify the owner/operator workforces and positions of ownership. ☐

The requirements of this certification and disclosure are a material part of the contract, and the contractor shall require this certification provision to be included in all approved subcontracts. The bidder is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project is accounted for and listed. The Department at any time before or afterward may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. In order to fulfill the participation requirement, it shall not be necessary that any applicable program sponsor be currently taking or that it will take applications for apprenticeship, training or employment during the performance of the work of this contract or deliver and install proposal.

Bidder	Signature & Date						
<table border="1"><tr><td></td></tr></table>		<table border="1"><tr><td></td></tr></table>					
Title							
<table border="1"><tr><td></td></tr></table>							
Address	City	State	Zip Code				
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Affidavit of Illinois Business Office

Local Public Agency	County	Street Name/Road Name	Section Number
Village of Hoffman Estates	Cook	1869 Hampton Road	

I, _____ of _____, _____,
Name of Affiant City of Affiant State of Affiant
being first duly sworn upon oath, state as follows:

1. That I am the _____ of _____.
Officer or Position Bidder
2. That I have personal knowledge of the facts herein stated.
3. That, if selected under the proposal described above, _____, will maintain a business office in the
Bidder
State of Illinois, which will be located in _____ County, Illinois.
County
4. That this business office will serve as the primary place of employment for any persons employed in the construction contemplated by this proposal.
5. That this Affidavit is given as a requirement of state law as provided in Section 30-22(8) of the Illinois Procurement Code.

Signature & Date

Print Name of Affiant

Notary Public

State of IL

County _____

Signed (or subscribed or attested) before me on _____ by
(date)

_____, authorized agent(s) of
(name/s of person/s)

Bidder

Notary Public Signature & Date

(SEAL)

My commission expires _____

BIDDER'S EXPERIENCE/QUALIFICATIONS

To demonstrate the Bidder's experience/qualifications, the Bidder shall list at least five (5) similar projects equal, or greater in size, which the Bidder has successfully complete with the past ten (10) years.

<u>Client or Municipality</u>	<u>Project Description</u>	<u>Reference Name and Contact Information</u>	<u>Year Completed</u>

NOTE: THE PROPOSAL WILL BE CONSIDERED INCOMPLETE IF THE ABOVE EXPERIENCE LISTING QUALIFICATION AND REQUIREMENTS IS NOT COMPLETED.

EXCEPTIONS AND DEVIATIONS SHEET

The Bidder shall list herein all exceptions and deviations taken to the Contract Documents by Section and page number. Failure to do so may be a cause for rejection of the bid. The Bidder shall describe the material(s) and service(s) that will be provided. The Village reserves the right to accept or reject any or all exceptions.

Exceptions and deviations taken to the Contract Documents are (check one):

- ☐ None
- ☐ As Stated Below

<u>Section/Page No.</u>	<u>Description of Exception/Deviation</u>

NOTE: Exceptions and/or deviations taken may be cause for rejection of Bid.

VILLAGE OF HOFFMAN ESTATES
PRE-BID MEETING ATTENDANCE FORM

The undersigned is an authorized representative of _____,
(Name of Company)

and attended the pre-bid meeting for HAMPTON LIFT STATION IMPROVEMENTS that was
held at Village Public Works, 2305 Pembroke Avenue, at 11:00 AM on
_____, 2026.

Signed: _____

Name: _____

Position: _____

Acknowledgment of attendance:

Signed: _____

Village of Hoffman Estates

Department of Public Works

INDEX FOR SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2024

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS, frequently used RECURRING SPECIAL PROVISIONS, and LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS.

ERRATA Standard Specifications for Road and Bridge Construction
(Adopted 1-1-22) (Revised 1-1-24)

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Check Sheet for Recurring Special Provisions

Local Public Agency

County

Section Number

Village of Hoffman Estates

Cook

☐ Check this box for lettings prior to 01/01/2023.

The Following Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Recurring Special Provisions

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Local Public Agency	County	Section Number
Village of Hoffman Estates	Cook	

The Following Local Roads And Streets Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Local Roads And Streets Recurring Special Provisions

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BDE SPECIAL PROVISIONS
For the January 19 and March 8, 2024 Lettings

The following special provisions indicated by a “check mark” are applicable to this contract and will be included by the Project Coordination and Implementation Section of the Bureau of Design & Environment (BDE).

File Name	#		Special Provision Title	Effective	Revised
	80099	1	☐ Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2022
	80274	2	☐ Aggregate Subgrade Improvement	April 1, 2012	April 1, 2022
	80192	3	☐ Automated Flagger Assistance Devices	Jan. 1, 2008	April 1, 2023
	80173	4	☐ Bituminous Materials Cost Adjustments	Nov. 2, 2006	Aug. 1, 2017
	80426	5	☐ Bituminous Surface Treatment with Fog Seal	Jan. 1, 2020	Jan. 1, 2022
*	80241	6	☐ Bridge Demolition Debris	July 1, 2009	
*	50531	7	☐ Building Removal	Sept. 1, 1990	Aug. 1, 2022
*	50261	8	☐ Building Removal with Asbestos Abatement	Sept. 1, 1990	Aug. 1, 2022
	80449	9	☐ Cement, Type IL	Aug. 1, 2023	
	80384	10	☒ Compensable Delay Costs	June 2, 2017	April 1, 2019
*	80198	11	☐ Completion Date (via calendar days)	April 1, 2008	
*	80199	12	☐ Completion Date (via calendar days) Plus Working Days	April 1, 2008	
	80453	13	☐ Concrete Sealer	Nov. 1, 2023	
	80261	14	☒ Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
	80434	15	☐ Corrugated Plastic Pipe (Culvert and Storm Sewer)	Jan. 1, 2021	
*	80029	16	☐ Disadvantaged Business Enterprise Participation	Sept. 1, 2000	Mar. 2, 2019
	80229	17	☐ Fuel Cost Adjustment	April 1, 2009	Aug. 1, 2017
	80452	18	☐ Full Lane Sealant Waterproofing System	Nov. 1, 2023	
	80447	19	☐ Grading and Shaping Ditches	Jan. 1, 2023	
	80433	20	☐ Green Preformed Thermoplastic Pavement Markings	Jan. 1, 2021	Jan. 1, 2022
	80443	21	☐ High Tension Cable Median Barrier Removal	April 1, 2022	
	80456	22	☐ Hot-Mix Asphalt	Jan. 1, 2024	
	80446	23	☐ Hot-Mix Asphalt - Longitudinal Joint Sealant	Nov. 1, 2022	Aug. 1, 2023
	80438	24	☐ Illinois Works Apprenticeship Initiative – State Funded Contracts	June 2, 2021	Sept. 2, 2021
	80045	25	☐ Material Transfer Device	June 15, 1999	Jan. 1, 2022
	80450	26	☐ Mechanically Stabilized Earth Retaining Walls	Aug. 1, 2023	
	80441	27	☐ Performance Graded Asphalt Binder	Jan. 1, 2023	
	80451	28	☐ Portland Cement Concrete	Aug. 1, 2023	
*	34261	29	☐ Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2022
	80455	30	☐ Removal and Disposal of Regulated Substances	Jan. 1, 2024	
	80445	31	☐ Seeding	Nov. 1, 2022	
	80448	32	☐ Source of Supply and Quality Requirements	Jan. 2, 2023	
	80340	33	☐ Speed Display Trailer	April 2, 2014	Jan. 1, 2022
	80127	34	☐ Steel Cost Adjustment	April 2, 2004	Jan. 1, 2022
	80397	35	☐ Subcontractor and DBE Payment Reporting	April 2, 2018	
	80391	36	☒ Subcontractor Mobilization Payments	Nov. 2, 2017	April 1, 2019
	80437	37	☐ Submission of Payroll Records	April 1, 2021	Nov. 2, 2023
	80435	38	☐ Surface Testing of Pavements – IRI	Jan. 1, 2021	Jan. 1, 2023
	80410	39	☐ Traffic Spotters	Jan. 1, 2019	
*	20338	40	☐ Training Special Provisions	Oct. 15, 1975	Sept. 2, 2021
	80429	41	☐ Ultra-Thin Bonded Wearing Course	April 1, 2020	Jan. 1, 2022
	80439	42	☐ Vehicle and Equipment Warning Lights	Nov. 1, 2021	Nov. 1, 2022
	80302	43	☐ Weekly DBE Trucking Reports	June 2, 2012	Nov. 1, 2021
	80454	44	☐ Wood Sign Support	Nov. 1, 2023	
	80427	45	☒ Work Zone Traffic Control Devices	Mar. 2, 2020	
*	80071	46	☐ Working Days	Jan. 1, 2002	

Highlighted items indicate a new or revised special provision for the letting.

An * indicates the special provision requires additional information from the designer, which needs to be submitted separately. The Project Coordination and Implementation Section will then include the information in the applicable special provision.

The following special provisions are in the 2024 Supplemental Specifications and Recurring Special Provisions.

<u>File Name</u>	<u>Special Provision Title</u>	<u>New Location(s)</u>	<u>Effective</u>	<u>Revised</u>
80436	Blended Finely Divided Minerals	Articles 1010.01 & 1010.06	April 1, 2021	
80440	Waterproofing Membrane System	Article 1061.05	Nov. 1, 2021	

PROJECT SPECIAL PROVISIONS INDEX

The following Drawings shall be made part of these Contract Documents and shall form a basis for the Contract Price.

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6	Maintenance of Roadways (D-1)
6	Status of Utilities (D-1)
8	Abandon and Fill Existing Storm Sewer
8	Proposed Storm Sewer Connection to Existing Manhole
9	Sewer structures and Castings
10	Proposed Manhole Catch Basin Connection Over Existing Storm Sewer
11	Combination Concrete Curb and Gutter, Type M-3.12 (Special)
12	Storm Sewer (Water Main Requirements)
-	IDOT BDE Special Provisions and Village Forms
-	Compensable Delay Costs (BDE)
-	Construction Air Quality – Diesel Retrofit (BDE)
-	Subcontractor Mobilization Payments (BDE)
-	Work Zone Traffic Control Devices (BDE)
-	Insurance (LR 107-4)
-	Village Sales Tax Exemption Number Authorization Form

Technical Special Provisions

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01 10 00	Summary of Work
01 10 80	Abbreviations and Definitions
01 14 19	Use of Site
01 21 00	Allowances
01 25 00	Substitution Procedure
01 31 00	Project Meetings
01 32 16	Construction Progress Schedules and Liquidated Damages
01 33 00	Submittal Procedures
01 35 43	Environmental Protection and Procedures
01 41 26	Permit Requirements
01 43 00	Quality Assurance
01 50 00	Temporary Facilities and Control
01 55 26	Traffic Control and Protection
01 57 13	Erosion and Sediment Control
01 60 00	Material and Equipment
01 71 13	Mobilization and Demobilization
01 71 20	Lines and Grades

<u>SECTION</u>	<u>TITLE</u>
01 74 00	Cleaning and Waste Management
01 75 10	Equipment Testing and Startup
01 77 00	Closeout Procedures
02 41 00	Demolition
03 00 00	Cast-in-Place Concrete
03 40 00	Precast Concrete Structures
08 10 10	Access Hatches and Boxes
09 90 00	Painting and Coatings
26 05 00	General Electrical Requirements
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 23	Control-Voltage Electrical Power Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 27 16	Cabinets and Enclosures
26 27 26	Wiring Devices
26 29 20	Pump Controller Enclosure
26 32 13	Engine Generator
26 36 00	Automatic Transfer Switch
26 42 00	Cathodic Protection
26 60 20	Electric Service
27 51 25	SCADA System
31 11 00	Site Clearing and Grubbing
31 20 00	Earth Excavation
31 23 16	Trench Excavation, Backfill, and Compaction
31 23 19	Dewatering
31 25 13	Erosion Controls
31 41 00	Shoring, Sheet piling, and Bracing
33 11 00	Utility Piping
33 12 16	Utility Piping Valves
33 42 00	Sewage Pumps and Accessories
33 43 00	Temporary Bypass System

Appendix

<u>APPENDIX</u>	<u>TITLE</u>
A	Permits
B	Geotechnical Engineering Services Report

VILLAGE OF HOFFMAN ESTATES **HAMPTON LIFT STATION IMPROVEMENTS**

SPECIAL PROVISIONS

The following Special Provisions supplement the “Standard Specifications for Road and Bridge Construction”, adopted January 1, 2022 (hereinafter referred to as the “Standard Specifications”), the latest edition of the “Manual on Uniform Traffic Control Devices for Streets and Highways”, the “Manual of Test Procedures of Materials” in effect on the date of invitation of bids, the “Supplemental Specifications and Recurring Special Provisions” indicated on the Check Sheet included herein, the latest edition of the “Standard Specification for Water and Sewer Construction in Illinois”, Cook County Special Provisions, and Cook County Standards, which apply to and govern the construction, in Hoffman Estates, Cook County, and in case of conflict with any part, or parts, of said specifications, the said Special Provisions shall take precedence and shall govern.

DEFINITION

When referring to the "Department" or "State" in all IDOT Specifications and Special Provisions, the Contractor should be aware that this also means the Village of Hoffman Estates, its agents and/or representatives.

PROJECT DESCRIPTION

The improvements included in this Contract consist of furnishing all of the materials, labor and equipment required for demolishing, abandoning, and constructing a new sanitary sewer lift station, and all other work necessary to complete to work in accordance with the Plans, Standard Specifications and Special Provisions.

SCOPE OF WORK

The intent of the contract is to provide a complete outline of the work that the Contractor undertakes in full compliance with the plans and specifications. The Contractor shall perform all demolition, earthwork, mechanical, electrical, restoration, and additional work as may be necessary to complete the construction in an acceptable manner. No compensation shall be provided to the Contractor for any additional mobilization costs, required for construction phasing, or for changes to quantities.

GENERAL

The Contractor is herein notified that the Village of Hoffman Estates will require that any questions or clarifications on the contract documents must be made in writing at least three working days prior to the bid opening. No questions or clarifications received after that time will be responded to by the Village. All Contractors who submitted authorization to bid will receive written responses to all inquiries made by all Contractors during the bid process no later than two working days prior to the bid opening.

PROJECT SUPERVISOR

The Contractor shall designate an employee as Project Supervisor. The Project Supervisor shall be required to assume the responsibility for general supervision of the Contractor and subcontractors' operations. The Project Supervisor and the Engineer shall work together to properly control and complete the work for the proposed improvements.

The Project Supervisor is responsible for distribution of the plans to the appropriate construction personnel. Failure of the appropriate construction personnel, doing the actual construction, to have a set of plans with them will be considered cause for stoppage of the construction work from proceeding.

BUSINESS NOTIFICATION

The Contractor shall be responsible for providing written notification to all businesses within the project limits. Notification must be given as follows:

Three (3) days prior to work commencing.

The Village will provide the Contractor with sample notification letters. The Engineer must approve any deviations from this format.

PERMITTED HOURS OF WORK

The Hoffman Estates Municipal Code restricts all construction activity within 500 yards of a residence/business to the period from 7:00 a.m. to 7:00 p.m. on weekdays and 8:00 a.m. to 6:00 p.m. on weekends and all construction activity greater than 500 yards of a residence/business to the period from 7:00 a.m. to 10:00 p.m. on weekdays and 8:00 a.m. to 10:00 p.m. on weekends.

PROJECT SCHEDULE

Prior to commencing construction operations, the Contractor shall meet with the Engineer for the purposes of a preconstruction meeting and present, in writing, his proposed construction schedule for Hampton Lift Station Improvement Project in accordance with article 108.02 of the Standard Specifications. Once approved, the Contractor must adhere to the schedule so that business notification and field markings of all items of work may proceed in advance of actual construction.

In preparing the construction schedule, the Contractor shall follow the requirements given below:

- A. Time is of the essence to procure all material once the submittals have been reviewed by the Village and Engineer.
- B. It is essential that the Contractor maintain constant, non-interrupted construction progress.

- C. The Contractor shall not leave open trenches overnight. Any open trenches shall be covered with steel plates at the end of each workday.
- D. The Contractor shall protect the roadway at all times during construction. All lane closures shall be coordinated with the Village.
- E. Emergency vehicle access must be maintained at all times. Failure to comply will result in liquidated damages in the amount of \$2,300 per calendar day.

ITEMS INCLUDED IN THE COST OF OTHER ITEMS

The Contractor's attention is called to several specific work items as noted on the Contract Plans and Special Provisions and in addition to the lists in the Standard Specifications. Listed below is a listing of these items for general information only. The list is not intended to be all-inclusive and, therefore, the Contractor is responsible to perform all work according to the Plans, Special Provisions and the Standard Specifications.

- Whenever, during construction operations, any loose material is deposited in the flow line of drainage structures, ditches, gutters, etc. such that the natural flow of water is obstructed, the loose material will be removed at the close of each working day. At the conclusion of construction operations, all drainage structures and flow lines shall be free from dirt and debris. This work shall be considered included in the cost of the contract.
- Concrete curing materials shall be applied to all new concrete gutter flags, faces and tops of curbs, sidewalks, and driveway pavements in accordance with the requirements of Section 1022 of the Standard Specifications. The protective coat shall be a clear curing compound of similar specifications to W.R. Meadows Seal Tight 1130-Clear, ChemMasters Safe-Cure Clear, or Dayton Superior Day-Chem Rez Cure (J11W). The Contractor shall abide by the Manufacturer's specifications in the preparation and application of the membrane curing compound. This work will not be paid for separately but shall be included in the cost of the applicable pay items.
- Saw cutting shall be performed at locations as required to expose existing utility conflicts, or as directed by the engineer, and shall be considered included in the cost of applicable pay items. After saw cutting, the Contractor shall immediately remove all concrete or asphalt slurry from the work area, specifically from the pavement, driveway, sidewalk and curb and gutter which is to remain in place. In the event the concrete or asphalt slurry is not removed immediately and the concrete or asphalt slurry cures and adheres to the adjacent surface, the Contractor shall remove and replace the portion with concrete or asphalt slurry to the satisfaction of the Engineer. No additional compensation will be allowed for removal of the slurry or removal and replacement of the adjacent area due to slurry which was not immediately removed from the adjacent area.
- Contractor shall expose existing utility conflicts and this work shall be considered included in the cost of applicable pay items. The Contractor shall be responsible for notifying the utility companies/owners who will be affected by the conflict. The Contractor shall also be responsible for excavating a pot hole of the size and depth sufficient to identify and establish the location of the

existing utility. The limits of the pot hole shall be a minimum of 18" on center from JULIE markings for the existing utility line. If the Contractor is required to expand the test hole beyond this width to locate the utility, the Contractor shall coordinate the work with the Engineer. After the Contractor has verified the location of the utility, the pot hole shall be backfilled with either the excavated material or Trench Backfill, as directed by the Engineer. Any excess material shall be disposed of in accordance with Article 202.03 of the Standard Specifications. No additional compensation will be allowed for the pot hole and removal of excess material.

- The Contractor shall be required to move, secure, and store any decorative rocks, paver bricks, sprinkler heads, or landscape items that interfere with construction. Upon completion of the construction, the Contractor shall move these items back to their original location and in their original condition. Damaged items must be replaced in-kind. Sprinkler irrigation lines may be repaired with sleeves. Additional restoration may be required to ensure positive drainage for impacted brick paver driveways, aprons, or walkways adjacent to work. This work will be considered included in the cost of the associated pay item that interfered with these features.
- It is the responsibility of the Contractor to protect all pavement openings, open holes, equipment, and rubble. Open holes shall not be allowed during non-working hours. All open holes shall be backfilled or covered with steel plates at the end of each working day. The Contractor shall maintain high visibility of all temporary hazards to pedestrians and motorists. This work will be considered included in the cost of the associated removal pay items.
- The Contractor shall use all necessary precautions and protection measures required to maintain existing utilities, sewers, and appurtenances that must be kept in operation. In particular, the Contractor will take adequate measures to prevent the undermining of utilities and sewers which are still in service. Cost of this work will not be paid for separately but shall be included in the cost of the contract.
- The locations of public or private utilities shown on the plans are approximate and the Contractor shall be responsible for field verifying prior to beginning construction. The Contractor shall have the respective utility company field locate all their facilities prior to beginning construction. The Contractor shall cooperate with all utility owners in accordance with Standard Specifications, if utility relocation, adjustment, or protection is necessary. The Village of Hoffman Estates cannot be held responsible and charged by the Contractor for any time delays. The Contractor shall also verify the depths of the existing utilities if necessary to verify that grade conflicts will not occur with any proposed construction. Any relocation or lowering of utilities shall be coordinated by the Contractor. The cost of this exploration shall be included in the cost of associated pay items.
- Field painting and coatings applied to concrete structures, piping, and equipment. The cost of this work will not be paid for separately but shall be included in the cost of the associated items.

APPLICATION FOR PAYMENT

A written application for payment for work completed shall be submitted to the Village by the Contractor not more than once monthly on a date specified by the Village. The Contractor must

submit Partial Waivers of Lien from all subcontractors and suppliers for all materials and labor involved, in the amount of the sum total of the application for payment. When the request for final payment is made, Final Waivers of Lien shall be supplied by the Contractor, subcontractors and all firms which supplied materials or services under this Contract, agreeing that said Contract has been performed, constructed, finished and delivered to the Village free from all claims, liens or charges in the nature of mechanics' liens either in favor of the Contractor or any party, firm or corporation entitled to such lien. The Contractor shall furnish an affidavit stating that all Waivers submitted are the total amount of Waivers required to be submitted. No applications for payment shall be submitted by the Engineer to the Village unless the required Waivers are supplied. Waivers must be furnished by the Contractor to the Engineer at least five days prior to the application for payment submittal date. All Contractors and subcontractors shall comply with all applicable state and federal laws including, but not limited to, the Illinois Prevailing Wage Act. Certified Payroll is required from the Contractor and from all subcontractors before payment is released. Failure of the Contractor to submit correct Waivers of Lien at the required time may cause a delay in payment. The issuance of payments for work performed shall in no way lessen the responsibilities of the Contractor.

RETAINAGE

Retainage will be held in the amount of ten percent (10%) of the completed work for the first 50 percent of the contract. After 50 percent or more of the work is completed, retainage will be held in the amount of 5 percent. After 75 percent or more of the work is completed, retainage will be held at 5 percent or lower, at the discretion of the Engineer. Retainage will be withheld until all work and punch list deficiencies are completed to the satisfaction of the Engineer.

ACCIDENT REPORTING

All accidents occurring on the job which damage public or private property, or result in injuries to worker or other persons, shall be promptly reported to the Senior Project Manager and Police Department. Accidents involving utilities shall also be reported to the appropriate utility. This applies to all accidents, including, but not limited to, traffic accidents, broken pipelines, power and telephone facilities, and damage to adjacent properties.

GENERAL CONTRACTOR OR SUBCONTRACTOR HOLD HARMLESS AGREEMENT

The Contractor shall indemnify and hold harmless the Municipality, its agents, and its employees from and against all claims for personal injury or property damage, including claims against the Village, its agents, or servants, arising out of the Illinois Structural Work Act, and all losses and expenses, including attorney's fees that may be incurred by the Village, defending such claims, arising out of or resulting from the performance of the work and caused in whole or in part by any negligent act or omission of the 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 the party indemnified hereunder. In any and all claims against the Village or any of its agents, or servants by an employee of a 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 this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation of benefits payable by or for the Contractor or subcontractor under Workers' Compensation Acts, Disability Acts, or their Employee Benefit Acts.

MATERIAL INSPECTION

All Hot-Mix Asphalt and P.C. Concrete materials used on this project shall be tested and inspected for compliance with the requirements of the IDOT Standard Specifications and the Project Procedure Guide.

The Contractor shall contact the Engineer and Village's testing consultant 48-hours in advance of construction for inspection of all Hot-Mix Asphalt and PCC materials used on this project. The Contractor is to submit a Q/C plan for HMA and PCC materials to the Q/A Manager for approval prior to construction operations commencing.

All Q/C reports shall be sent to the Village's Q/A Manager as well as to the Engineer.

MAINTENANCE OF ROADWAYS (D-1)

Effective: September 30, 1985

Revised: November 1, 1996

Beginning on the date that work begins on this project, the Contractor shall assume responsibility for normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance shall include all repair work deemed necessary by the Engineer, but shall not include snow removal operations. Traffic control and protection for maintenance of roadways will be provided by the Contractor as required by the Engineer.

If items of work have not been provided in the contract, or otherwise specified for payment, such items, including the accompanying traffic control and protection required by the Engineer, will be paid for in accordance with Article 109.04 of the Standard Specifications.

STATUS OF UTILITIES (D-1)

Effective: June 1, 2016

Revised: January 1, 2020

Utility companies and/or municipal owners located within the construction limits of this project have provided the following information regarding their facilities and the proposed improvements. The tables below contain a description of specific conflicts to be resolved and/or facilities which will require some action on the part of the Department's contractor to proceed with work. Each table entry includes an identification of the action necessary and, if applicable, the estimated duration required for the resolution.

UTILITIES TO BE ADJUSTED

Conflicts noted below have been identified by following the suggested staging plan included in the contract. The company has been notified of all conflicts and will be required to obtain the necessary permits to complete their work; in some instances, resolution will be a function of the

construction staging. The responsible agency must relocate, or complete new installations as noted below; this work has been deemed necessary to be complete for the Department's contractor to then work in the stage under which the item has been listed.

UTILITIES TO BE WATCHED AND PROTECTED

The areas of concern noted below have been identified by following the suggested staging plan included for the contract. The information provided is not a comprehensive list of all remaining utilities, but those which during coordination were identified as ones which might require the Department's contractor to take into consideration when making the determination of the means and methods that would be required to construct the proposed improvement. In some instances, the contractor will be responsible to notify the owner in advance of the work to take place so necessary staffing on the owner's part can be secured.

LOCATION	TYPE	DESCRIPTION	OWNER	ACTION
Hampton Road/Jamison Lane	Electric	The Contractor is alerted that there is underground and overhead electric utility conduits/cable located within the project limits	Com Ed	Contractor to field verify for conflicts
Hampton Road/Jamison Lane	Storm, Sanitary & Water	The Contractor is alerted that there is a storm, sanitary sewer, and water main running parallel to the roadway, located within the project limits	Village of Hoffman Estates	Contractor to field verify for conflicts
Hampton Road	Gas	The Contractor is alerted that there is a gasmain running parallel to the roadway, located within the project limits	Nicor	Contractor to field verify for conflicts

No facilities requiring extra consideration (*or listed as noted above*).

The following contact information is what was used during the preparation of the plans as provided by the owner of the facility.

Agency/Company Responsible to Resolve Conflict	Name of contact	Phone	E-mail address
Astound	Alonzo Escatel	(630) 803-9660	alonzo.escatel@astound.com
ATT/Distribution	Kari Martin	(630) 573-5789	Km2618@att.com
Windstream	Lisa Zingula	(800) 289-1901	Lisa.Zingula@windstream.com
Comcast	Martha Gieras	(224) 229-5862	martha_gieras@comcast.com
Com Ed	Quinanda Candler	(630) 396-8224	QuinandaCandler@usicllc.com
Vinakom	Manuli Patel	(847) 882-8200	manuli.patel@vinakom.com
Nicor	Paul Eggen	(630) 388-2362	X2PAEGGE@southernco.com
Northwest Suburban Municipal Joint Action Water Agency (NSMJAWA)	Ron Baker	(847) 774-1255	rbaker@nsmjawa.com

The above represents the best information available to the Department and is included for the convenience of the bidder. The days required for conflict resolution should be considered in the bid as this information has also been factored into the timeline identified for the project when setting the completion date. The applicable portions of the Standard Specifications for Road and Bridge Construction shall apply.

Estimated duration of time provided above for the first conflicts identified will begin on the date of the executed contract regardless of the status of the utility relocations. The responsible agencies will be working toward resolving subsequent conflicts in conjunction with contractor activities in the number of days noted.

The estimated relocation duration must be part of the progress schedule submitted by the contractor. A utility kickoff meeting will be scheduled between the Department, the Department's contractor and the utility companies when necessary. The Department's contractor is responsible for contacting J.U.L.I.E. prior to all excavation work.

ABANDON AND FILL EXISTING STORM SEWER

Description. This work shall consist of the abandonment of the existing storm sewers to remain in place. Pipes shall be filled with Controlled Low-Strength Material (CLSM). CLSM shall meet the requirements of Section 1019.

Construction. All pipes to be abandoned and filled shall have both ends plugged with block and mortar to create a watertight seal. The upstream plugged end will include a fill pipe and 90-degree bend to receive the fill material. Care shall be taken so that the pipe is completely filled with CLSM. The storm sewer shall be filled when no longer required for MOT drainage.

Sewers are to be abandoned and filled at the locations shown on the contract plans. The CLSM shall be placed in accordance with Section 593 of the Standard Specifications.

Basis of Payment. This work will be paid for at the contract unit price per FOOT (regardless of the size of the pipe) as ABANDON AND FILL EXISTING STORM SEWER as shown in the plans or as directed by the Engineer.

PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE

Description. This work shall consist of connecting proposed pipes to existing manholes or catch basins at the locations and elevations as shown on the plans. Materials shall be according to Articles 602.02 and 1024.02 of the Standard Specifications.

Construction. The work shall be performed in accordance with applicable portions of Sections 550 and 602 of the Standard Specifications and as specified herein.

Excavation and backfill for connections to existing manholes or catch basin shall be in accordance with Articles 550.04 and 550.07, respectively. A hole adequate to receive the new pipe shall be cored into the manhole, catch basin, or inlet with proper coring equipment. The invert shall be brought into the existing manhole at the elevation shown on the plans. The pipe connection shall be made watertight using non-shrink concrete grout or equivalent method with approval of the Engineer. The downstream pipes in manholes shall be screened to prevent entry of mortar or other debris from entering the system.

After connection is made to a storm drain manhole and the grout holding the pipe in place has set, cut the pipe off evenly so that no more than two (2) inches of pipe protrudes into the manhole and any screening shall be removed. Any mortar or other debris that has entered the existing manhole or catch basin as a result of the work shall be removed.

Basis of Payment. This work will be paid for at the contract unit price per EACH for PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE.

SEWER STRUCTURES AND CASTINGS

Description. This work shall consist of constructing and installing catch basins, manholes, and inlets as shown on the Plans and as directed by the Engineer. This work shall be done in accordance with Section 602 of the IDOT Standard Specifications, and in accordance with the “Standard Specifications for Water and Sewer Main Construction in Illinois”.

Disposal of all excavated materials, existing manhole, and general cleanup shall be the responsibility of the Contractor. The work performed installing the sewer structures shall follow the details in the Plans. All bedding and trench backfill used for this work is included and will not be paid for separately. Transportation from the stockpile is the responsibility of the contractor and shall be included in this item.

Materials. For storm manholes, the frame and closed lids shall be East Jordan 00102280 with Type A lid, Neenah R-1713-W with Type B lid, or approved equal, with embossed “Village of Hoffman Estates” and “Storm” For sanitary manholes, the frame and closed lids shall be East Jordan 00102282 with Type A lid, Neenah R-1713-W with Type B lid, or approved equal, with embossed “Village of Hoffman Estates” and “Sanitary”. For inlets, catch basins, and open grate storm manholes, the frame and grate shall be East Jordan 00752530C01 or approved equal. The Contractor will be required to deliver all salvaged castings to the Village or use them elsewhere if indicated on the plans or directed by the Engineer.

Construction. Sewer structures shall be constructed on 4” of compacted CA-6 bed. Sewer connections to the manhole shall be made with a rubber boot connector conforming to ASTM C923.

The Contractor shall be responsible to block, divert, or bypass flow during sewer structure construction. The Contractor shall be solely responsible for any backups or other issues that occur due to blocking or diversion. The Contractor shall ensure that the mainline sewer and any services

remain clean and free of debris. If the sewer or services take on debris during the course of the work, the contractor shall be required to clean said sewer or service at his expense.

Sanitary Manhole Testing:

Upon completion of manhole installation, all manholes shall be tested for leakage by vacuum testing. A vacuum of 10" (254 mm) Hg shall be placed on the manhole and the time shall be measured for the vacuum to drop to 9" (229 mm) Hg. The vacuum shall not drop below 9" (229 mm) Hg for the following time periods for each size of manhole:

- a) 48-inch diameter - 60 seconds
- b) 60-inch diameter - 75 seconds

The manhole frame and adjusting rings shall be in place when testing. Any manholes that fail the test shall be sealed and re-tested until acceptable.

Method of Measurement and Basis of Payment. The constructing and installing of sewer structures will be paid for at the Contract Unit Price per each for the pay items shown in the table below, including the specified frame grate/lid, which price shall include furnishing all materials, labor, testing, bedding, trench backfill and equipment necessary to complete the work as herein specified and for the satisfaction of the Engineer.

X6022712	CATCH BASINS, TYPE A, 4'-DIAMETER, WITH SPECIAL FRAME AND GRATE	EACH
X6022810	MANHOLES, SANITARY, 4'-DIAMETER, TYPE 1 FRAME, CLOSED LID	EACH
X6022820	MANHOLES, SANITARY, 5'-DIAMETER, TYPE 1 FRAME, CLOSED LID	EACH
X6022930	MANHOLES, TYPE A, 5'-DIAMETER, WITH SPECIAL FRAME AND GRATE	EACH
X6023102	MANHOLES, TYPE A, 5'-DIAMETER, TYPE 1 FRAME, CLOSED LID (SPECIAL)	EACH
X6023508	INLETS, TYPE A, WITH SPECIAL FRAME AND GRATE	EACH

PROPOSED MANHOLE/CATCH BASIN CONNECTION OVER EXISTING STORM SEWER

Description. This work shall consist of installing a new manhole/catch basin over all existing storm sewers to be connected to the proposed structure. The work shall be done in accordance with the applicable portions of Sections 502 and 550 of the Standard Specifications. Materials shall be in accordance with Sections 550.02 and 602.02 of the Standard Specifications. Non-shrink grout shall be in accordance with Section 1024.02.

Construction. The Contractor shall carefully remove the existing storm sewers which fall within the structure. After the manhole/catch basin is installed, all pipe holes within the structure walls

shall be mortared with a non-shrink concrete grout. Damage to the existing storm sewers to remain shall be repaired by the Contractor at his own expense.

Basis of Payment. The work will be paid for at the Contract Unit Price per each for PROPOSED MANHOLE/CATCH BASIN CONNECTION OVER EXISTING STORM SEWER as shown in the plans or as directed by the Engineer, including all existing pipe connections to the structure. The manhole/catch basin and frame and grate/lid will be paid for separately.

COMBINATION CONCRETE CURB AND GUTTER, TYPE M-3.12 (SPECIAL)

Description. This work shall consist of constructing combination curb and gutter of the type specified at the locations shown on the plans or as directed by the Engineer. The work shall be done in accordance with Section 606 of the Standard Specifications, except that no extra compensation shall be allowed for variation in the thickness or height of the curb, or in the width of the gutter or transitions.

Construction. The proposed curb and gutter shall consist of the construction of combination concrete curb and gutter and shall be M3.12 as shown in the curb detail in the plans. New curb and gutters shall have a gutter thickness no less than the pavement thickness at all locations. All curb and gutter shall have two number five (5) reinforcement bars continuous throughout the length. The Engineer must approve all forming methods prior to placing any concrete for the curb and gutter.

The Contractor is responsible for verifying the established grades with the engineer prior to the construction of any new combination concrete curb and gutter. **The Contractor must notify the Engineer if positive drainage cannot be obtained.**

Once the designated areas of existing curb and gutter have been removed, all soft and yielding spots or other unsuitable material in the sub grade shall be excavated and replaced with granular material as directed by the Engineer. The excavated unsuitable material will be paid for in accordance with the Special Provision, EARTH EXCAVATION. The granular material shall be placed and paid for according to the standard specification for SUBBASE GRANULAR MATERIAL, TYPE B.

The proposed curb and gutter shall be depressed across all sidewalk ramps in accordance with Project Details, Standards 424001, 424016, 424021, and 424026, and Public Right-of-Way Accessibility Guidelines (PROWAG), and depressed to meet existing driveways, as directed by the Engineer.

Contraction joints shall be provided at a spacing not to exceed 15 feet and shall be created by saw cutting to a minimum depth of 1-1/2 inches. The saw cutting shall not be paid for separately, but shall be considered incidental to the contract. Expansion joints shall be provided at the beginning and end of all return radii, 5 feet either side of a drainage structure, at the end of a day's pour, and/or at a spacing not to exceed 105 feet.

Expansion joints shall consist of two No. 6 bars, 18 inches long, capped and greased on one end, extending through and centered on a solid 3/4-inch preformed expansion joint material cut to conform to the shape of the curb and gutter section. The curb and gutter will be properly finished after placement using approved methods incorporated immediately after final finishing. Preformed 1/2-inch expansion joints will be provided between the sidewalks and concrete driveways where they abut against the concrete curb. This work shall not be paid for separately, but shall be included in the Contract Unit Price for this pay item.

Two drilled and grouted No. 5 reinforcing bars or expansion tie anchors, 5/8" in diameter, shall be used to tie the proposed curb and gutter to the existing curb and gutter on each side. Furnishing and installing the expansion tie anchors or drilling and grouting of the No. 5 reinforcing bars shall not be paid for separately, but shall be included in the Contract Unit Price for this pay item.

Opposite each water shutoff box a "W" two (2) inches high shall be pressed into the concrete.

Backfilling of excavated or disturbed areas behind the new curb and gutter shall be done within 10 calendar days of placement of the curb and gutter, but not before 3 calendar days. Backfill material shall consist of approved clay, sand, or topsoil placed in compacted layers not less than 6-inches in depth from the top of the curb and gutter. Compaction of this material is essential and must be done in a proper manner by the contractor. This work shall not be paid for separately, but shall be considered included in the contract.

Basis of Payment. This work shall be paid for at the Contract Unit Price per foot for COMBINATION CONCRETE CURB AND GUTTER, TYPE M-3.12, (SPECIAL), which price shall include all labor, equipment, materials and incidentals to complete the work described above.

STORM SEWERS, WATER MAIN QUALITY PIPE

Description. This work consists of constructing storm sewer adjacent to or crossing a water main, at the locations shown on the plans.

Materials and Construction. The material and installation requirements shall be according to the latest edition of the "Standard Specifications for Water and Sewer Main Construction in Illinois", and the applicable portions of Section 550 of the Standard Specifications; which may include concrete collars and encasing pipe with seals if required.

Pipe materials shall meet the requirements of Sections 40 and 41-2.01 of the "Standard Specifications for Water and Sewer Main Construction in Illinois", except PVC pipe will not be allowed. Ductile-Iron pipe shall meet the minimum requirements for Thickness Class 50.

Encasing of standard type storm sewer, according to the details for "Water and Sewer Separation Requirements (Vertical Separation)" in the "STANDARD DRAWINGS" Division of the "Standard Specifications for Water and Sewer Main Construction in Illinois", may be used for storm sewers crossing water mains.

Basis of Payment. This work will be paid according to Article 550.10 of the Standard Specifications, except the pay item shall be STORM SEWER (WATER MAIN REQUIREMENTS), of the diameter specified.

COMPENSABLE DELAY COSTS (BDE)

Effective: June 2, 2017

Revised: April 1, 2019

Revise Article 107.40(b) of the Standard Specifications to read:

“(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows.

- (1) Minor Delay. A minor delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two hours, but not to exceed two weeks.
- (2) Major Delay. A major delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two weeks.
- (3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the rate of production on the work in conflict with the utility in an unanticipated location decreases by more than 25 percent and lasts longer than seven calendar days.”

Revise Article 107.40(c) of the Standard Specifications to read:

“(c) Payment. Payment for Minor, Major, and Reduced Rate of Production Delays will be made as follows.

- (1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

- (2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to two weeks plus the cost of move-out to either the

Contractor's yard or another job and the cost to re-mobilize, whichever is less. Rental equipment may be paid for longer than two weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

- (3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven calendar days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Payment for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be determined according to Article 109.13."

Revise Article 108.04(b) of the Standard Specifications to read:

"(b) No working day will be charged under the following conditions.

- (1) When adverse weather prevents work on the controlling item.
- (2) When job conditions due to recent weather prevent work on the controlling item.
- (3) When conduct or lack of conduct by the Department or its consultants, representatives, officers, agents, or employees; delay by the Department in making the site available; or delay in furnishing any items required to be furnished to the Contractor by the Department prevents work on the controlling item.
- (4) When delays caused by utility or railroad adjustments prevent work on the controlling item.
- (5) When strikes, lock-outs, extraordinary delays in transportation, or inability to procure critical materials prevent work on the controlling item, as long as these delays are not due to any fault of the Contractor.
- (6) When any condition over which the Contractor has no control prevents work on the controlling item."

Revise Article 109.09(f) of the Standard Specifications to read:

- "(f) Basis of Payment. After resolution of a claim in favor of the Contractor, any adjustment in time required for the work will be made according to Section 108. Any adjustment in the costs to be paid will be made for direct labor, direct materials, direct equipment, direct jobsite overhead, direct offsite overhead, and other direct costs allowed by the resolution. Adjustments in costs will not be made for interest charges, loss of anticipated profit, undocumented loss of efficiency, home office overhead and unabsorbed overhead

other than as allowed by Article 109.13, lost opportunity, preparation of claim expenses and other consequential indirect costs regardless of method of calculation.

The above Basis of Payment is an essential element of the contract and the claim cost recovery of the Contractor shall be so limited.”

Add the following to Section 109 of the Standard Specifications.

“109.13 Payment for Contract Delay. Compensation for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be allowed when such costs result from a delay meeting the criteria in the following table.

Contract Type	Cause of Delay	Length of Delay
Working Days	Article 108.04(b)(3) or Article 108.04(b)(4)	No working days have been charged for two consecutive weeks.
Completion Date	Article 108.08(b)(1) or Article 108.08(b)(7)	The Contractor has been granted a minimum two week extension of contract time, according to Article 108.08.

Payment for each of the various costs will be according to the following.

- (a) Escalated Material and/or Labor Costs. When the delay causes work, which would have otherwise been completed, to be done after material and/or labor costs have increased, such increases will be paid. Payment for escalated material costs will be limited to the increased costs substantiated by documentation furnished by the Contractor. Payment for escalated labor costs will be limited to those items in Article 109.04(b)(1) and (2), except the 35 percent and 10 percent additives will not be permitted.
- (b) Extended Project Overhead. For the duration of the delay, payment for extended project overhead will be paid as follows.
 - (1) Direct Jobsite and Offsite Overhead. Payment for documented direct jobsite overhead and documented direct offsite overhead, including onsite supervisory and administrative personnel, will be allowed according to the following table.

Original Contract Amount	Supervisory and Administrative Personnel
Up to \$5,000,000	One Project Superintendent
Over \$ 5,000,000 - up to \$25,000,000	One Project Manager, One Project Superintendent or Engineer, and One Clerk
Over \$25,000,000 - up to \$50,000,000	One Project Manager, One Project Superintendent, One Engineer, and

	One Clerk
Over \$50,000,000	One Project Manager, Two Project Superintendents, One Engineer, and One Clerk

(2) Home Office and Unabsorbed Overhead. Payment for home office and unabsorbed overhead will be calculated as 8 percent of the total delay cost.

(c) Extended Traffic Control. Traffic control required for an extended period of time due to the delay will be paid for according to Article 109.04.

When an extended traffic control adjustment is paid under this provision, an adjusted unit price as provided for in Article 701.20(a) for increase or decrease in the value of work by more than ten percent will not be paid.

Upon payment for a contract delay under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this provision."

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010

Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term “equipment” refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment’s respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 ^{1/}	600-749	2002
	750 and up	2006
June 1, 2011 ^{2/}	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 ^{2/}	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/cleandiesel/verification/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit

device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected.

Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

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SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: November 2, 2017

Revised: April 1, 2019

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

“This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor’s work.

Value of Subcontract Reported on Form BC 260A	Mobilization Percentage
Less than \$10,000	25%
\$10,000 to less than \$20,000	20%
\$20,000 to less than \$40,000	18%
\$40,000 to less than \$60,000	16%
\$60,000 to less than \$80,000	14%
\$80,000 to less than \$100,000	12%
\$100,000 to less than \$250,000	10%
\$250,000 to less than \$500,000	9%
\$500,000 to \$750,000	8%
Over \$750,000	7%”

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Add the following to Article 701.03 of the Standard Specifications:

“(q) Temporary Sign Supports 1106.02”

Revise the third paragraph of Article 701.14 of the Standard Specifications to read:

“For temporary sign supports, the Contractor shall provide a FHWA eligibility letter for each device used on the contract. The letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device. The signs shall be supported within 20 degrees of vertical. Weights used to stabilize signs shall be attached to the sign support per the manufacturer’s specifications.”

Revise the first paragraph of Article 701.15 of the Standard Specifications to read:

“**701.15 Traffic Control Devices.** For devices that must meet crashworthiness standards, the Contractor shall provide a manufacturer’s self-certification or a FHWA eligibility letter for each Category 1 device and a FHWA eligibility letter for each Category 2 and Category 3 device used on the contract. The self-certification or letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device.”

Revise the first six paragraphs of Article 1106.02 of the Standard Specifications to read:

“**1106.02 Devices.** Work zone traffic control devices and combinations of devices shall meet crashworthiness standards for their respective categories. The categories are as follows.

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, plastic drums, and delineators, with no attachments (e.g. lights). Category 1 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 1 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include vertical panels with lights, barricades, temporary sign supports, and Category 1 devices with attachments (e.g. drums with lights). Category 2 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 2 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions (impact

attenuators), truck mounted attenuators, and other devices not meeting the definitions of Category 1 or 2. Category 3 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2029. Category 3 devices shall be crash tested for Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals, and area lighting supports. It is preferable for Category 4 devices manufactured after December 31, 2019 to be MASH-16 compliant; however, there are currently no crash tested devices in this category, so it remains exempt from the NCHRP 350 or MASH compliance requirement.

For each type of device, when no more than one MASH-16 compliant is available, an NCHRP 350 or MASH-2009 compliant device may be used, even if manufactured after December 31, 2019.”

Revise Articles 1106.02(g), 1106.02(k), and 1106.02(l) to read:

“(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be approved for use at Test Level 3. Test Level 2 may be used for normal posted speeds less than or equal to 45 mph.

(k) Temporary Water Filled Barrier. The water filled barrier shall be a lightweight plastic shell designed to accept water ballast and be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings.

(l) Movable Traffic Barrier. The movable traffic barrier shall be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings. The barrier shall be capable of being moved on and off the roadway on a daily basis.”

State of Illinois
Department of Transportation
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
INSURANCE

Effective: February 1, 2007
Revised: August 1, 2007

All references to Sections or Articles in this specification shall be construed to mean specific Section or Article of the Standard Specifications for Road and Bridge Construction, adopted by the Department of Transportation.

The Contractor shall name the following entities as additional insured under the Contractor's general liability insurance policy in accordance with Article 107.27:

Village of Hoffman Estates

The entities listed above and their officers, employees, and agents shall be indemnified and held harmless in accordance with Article 107.26.



**VILLAGE OF HOFFMAN ESTATES
SALES TAX EXEMPTION NUMBER AUTHORIZATION FORM**

The undersigned contractor hereby agrees to use the Village of Hoffman Estates sales tax exemption number only for purchases directly related to work being done on behalf of the Village. The undersigned also agrees to be responsible for any tax due for purchases determined to be non-exempt and for purchases not made on the Village's behalf.

It is understood that the exemption from tax in the case of the sales of articles is limited to the sales of articles purchased for the exclusive use of the Village and it is agreed that if articles purchased tax free are used otherwise or are sold to others, such fact will be reported to the State of Illinois Department of Revenue. It is also understood that the fraudulent use of the exemption number to secure exemptions will subject the undersigned and all guilty parties to a fine of not more than \$10,000 or to imprisonment for not more than five years or both, together with costs of prosecutions.

NAME OF PROJECT AND/OR CONTRACT NUMBER

COMPANY NAME

ADDRESS

CITY

ZIP CODE

PURCHASER NAME & TITLE (PLEASE PRINT)

SIGNATURE

DATE

Before a Tax Exemption Letter is issued to the contractor, this form and the materials and estimated quantities form must be returned to the appropriate Village personnel. After the completed forms have been received by the Village, a Tax Exempt Letter will be mailed to the contractor.

VILLAGE OF HOFFMAN ESTATES
MATERIALS AND ESTIMATED QUANTITIES ATTACHMENT

DESCRIPTION OF MATERIALS TO BE PURCHASED	ESTIMATED QUANTITY	NAME OF VENDOR SELLING MATERIALS	VENDOR PHONE NUMBER	VENDOR'S STREET ADDRESS	VENDOR'S CITY, STATE, AND ZIP CODE
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					
9)					
10)					

TECHNICAL SPECIAL PROVISIONS

The following Drawings shall be made part of these Contract Documents and shall form a basis for the Contract Price.

<u>SHEET NO.</u>	<u>DRAWING TITLE</u>
SECTION	TITLE
01 10 00	Summary of Work
01 10 80	Abbreviations and Definitions
01 14 19	Use of Site
01 21 00	Allowances
01 25 00	Substitution Procedures
01 31 00	Project Meetings
01 32 16	Construction Progress Schedules and Liquidated Damages
01 33 00	Submittal Procedures
01 35 43	Environmental Protection and Procedures
01 41 26	Permit Requirements
01 43 00	Quality Assurance
01 50 00	Temporary Facilities and Control
01 55 26	Traffic Control and Protection
01 57 13	Erosion and Sediment Control
01 60 00	Material and Equipment
01 71 13	Mobilization and Demobilization
01 71 20	Lines and Grades
01 74 00	Cleaning and Waste Management
01 75 10	Equipment Testing and Startup
01 77 00	Closeout Procedures
02 41 00	Demolition
03 00 00	Cast-in-Place Concrete
03 40 00	Precast Concrete Structures
08 10 10	Access Hatches and Boxes
09 90 00	Painting and Coatings
26 05 00	General Electrical Requirements
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 23	Control-Voltage Electrical Power Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 53	Identifications for Electrical Systems
26 27 16	Cabinets and Enclosures
26 27 26	Wiring Devices
26 29 20	Pump Controller Enclosure
26 32 13	Engine Generator
26 36 00	Automatic Transfer Switch

SECTION	TITLE
26 42 00	Cathodic Protection
26 60 20	Electric Service
27 51 25	SCADA System
31 11 00	Site Clearing and Grubbing
31 20 00	Earth Excavation
31 23 16	Trench Excavation, Backfill, and Compaction
31 23 19	Dewatering
31 25 13	Erosion Controls
31 41 00	Shoring, Sheet piling, and Bracing
33 11 00	Utility Piping
33 12 16	Utility Piping Valves
33 42 00	Sewage Pumps and Accessories
33 43 00	Temporary Bypass System
Appendix A	IDOT BDE Special Provisions and Village Forms
	Compensable Delay Costs (BDE)
	Construction Air Quality – Diesel Retrofit (BDE)
	Subcontractor Mobilization Payments (BDE)
	Work Zone Traffic Control Devices (BDE)
	Working Days (BDE)
	Insurance (LR 107-4)
	Village Sales Tax Exemption Number Authorization Form
Appendix B	Geotechnical Engineering Services Report

SECTION 01 10 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 LOCATION OF WORK:

- A. The project is in the Hampton Lift Station Improvements, and the station is located at 1869 Hampton Road, in Hoffman Estates. The existing lift station is located on the northwest corner of the residential property and consists of a dry pit structure and concrete wet well structure. The lift station is not enclosed and serves a residential subdivision.
- B. The limits of the project location is as shown on the Drawings. Any construction easements or staging areas required by the Contractor (other than those shown on the Drawings) shall be the responsibility of the Contractor. Any specialized machinery and/or equipment due to the limited site constraints and type of work to be performed, shall be the responsibility of the Contractor.

1.02 SCOPE OF WORK:

- A. Furnish all labor, materials, equipment, supervision, and testing necessary to demolition the existing dry pit Hampton Lift Station and construct a new submersible type lift station, as shown on the Drawings and specified herein.
- B. The work includes, but is not limited to, the following:
 - 1. Cut and abandon the existing dry pit station and by-pass manhole.
 - 2. Remove existing piping, valves, and electrical equipment.
 - 3. Remove access drive.
 - 4. Tree removal.
 - 5. By-pass pumping (as required).
 - 6. Temporary electric service.
 - 7. Maintenance of traffic.
 - 8. New wet well and valve vault.
 - 9. Concrete pads.
 - 10. Discharge piping, valves, forcemain, and electrical equipment.
 - 11. New electrical service.
 - 12. Rerouting existing sanitary and storm sewers.
 - 13. Repave driveways.
 - 14. New sanitary sewer piping to connect to the new lift station.
 - 15. Site restoration.
 - 16. Sidewalk removal and replacement.

17. Patching roadway as required for installation of new piping and conduit.

1.03 WORK SEQUENCE:

- A. The existing lift station shall be maintained throughout construction. Contractor shall use the existing lift station or install and maintain a bypass pumping system throughout the duration of the project. **The lift station can only be shutdown for a maximum of 4-hours. Village Staff and residents connected to the station shall be notified a minimum of 72-hours prior to shutdown.** The Contractor shall be responsible for the sequence of construction and continuous operation of the lift stations throughout the project. The proposed sequence shall be in accordance with the schedule submitted by the Contractor and approved by the Owner.

1.04 CONTRACTOR'S USE OF PREMISES:

- A. Contractor shall limit the use of the premises for the performance of the Work and storage of materials and equipment to allow for the Owner's use in operating and maintaining the lift station.
- B. Contractor shall coordinate with the Village and Home Owner as necessary access for normal maintenance requirements.
- C. Contractor shall assume full responsibility for security of all his and his subcontractors materials and equipment stored on the site.
- D. If directed by the Owner, Contractor shall move any stored items which interfere with operations of the Owner or the convenience of the public.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work. The Village will allow equipment, vehicles, and material to be stored at Public Works. Contractor shall coordinate accordingly.
- F. Noise: The Contractor is specifically advised that the project site is located in close proximity to existing residential properties. Contractor shall employ all necessary means and methods required to mitigate the noise impacts to the adjacent residents including the use of sound barriers and/or electric driven equipment as necessary to comply with all Village Ordinances. All Contractor equipment shall be equipped with hospital grade silencers as applicable. The Contractor shall prepare a Noise Mitigation Plan for review by the Owner and Engineer.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 10 80

ABBREVIATIONS AND DEFINITIONS

PART 1 – GENERAL

1.01 ABBREVIATIONS:

- A. Where any of the following abbreviations are used in the Contract Documents, they shall have the following meaning.

AMCA	Air Moving and Conditioning Association
AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
AWG	American or Brown and Sharpe Wire Gage
ACI	American Concrete Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
ANS	American National Standard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
AWPA	American Wood-Preservers' Association
AFBMA	Anti-Friction Bearing Manufacturers Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
FS	Federal Specifications
IDOT	Illinois Department of Transportation
IBR	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards
NBS	National Bureau of Standards
NEC	National Electrical Code
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

NPT	National Pipe Thread
NSF	National Science Foundation
OSHA	US Department of Labor, Occupational Safety and Health Administration
OS&Y	Outside Screw and Yoke
PS	United States Products Standards
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
USGS	United States Geological Survey
USS Gage	United States Standard gage
WSP	Working Steam Pressure

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

--- END OF SECTION ---

SECTION 01 14 19

USE OF SITE

- A. The Contractor will confine operations at the Work Site to areas permitted by applicable laws, ordinances, permits, and by the Contract. Contractor will not unreasonably encumber the Work Site with materials or equipment nor load structures with weight that will endanger the structure. Contractor shall assume full responsibility for protection and safekeeping of products stored at the Work Site.

--- END OF SECTION ---

SECTION 01 21 00

ALLOWANCES

PART 1 – GENERAL

1.01 SUMMARY:

- A. Section Includes:
 - 1. Lump-sum allowances.
 - 2. Unit cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.

1.02 RELATED SECTIONS:

- A. Section 26 29 20 – Pump Controller Enclosure.
- B. Section 27 51 25 – SCADA System.
- C. Section 26 60 20 – Electrical Service.

1.03 INFORMATIONAL SUBMITTALS:

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit all documentation to show labor and cost for installation of allowance items.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.04 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES:

- A. Allowance shall include cost to Contractor for specific products and materials purchased by the Contractor under allowance and shall include taxes, freight, and delivery to the project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at the project site, labor, installation, overhead and profit, and similar cost related to products and materials ordered under the allowance shall be included as part of the allowance.
- C. At project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change order.

1.05 CONTINGENCY ALLOWANCES:

- A. Use the contingency allowance only as directed by the Owner or Engineer, and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Change Orders authorizing use of funds from the contingency allowance shall include Contractor's related costs associated with overhead and profit margins.
- C. At project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change order.

1.06 TESTING AND INSPECTING ALLOWANCES:

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance shall include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure.
- C. At project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change order.

1.07 ADJUSTMENT OF ALLOWANCES:

- A. To adjust allowance amounts, prepare a Change Order based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare an explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiating data for a change in scope of work, if any, claimed in the Change Orders related to unit-cost allowances.
 - 4. The Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order or Contractor's handling, labor, and installation.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 EXAMINATION:

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION:

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

3.03 APPLICATION FOR PAYMENT:

- A. Submit Certified Payrolls with each Application for Payment.
- B. Payment Period: submit at intervals stipulated in the Agreement to cover periods of entire calendar months.
- C. Submit with transmittal letter.
- D. Submit all waivers.
- E. When substantiating data is required, include the following with Application for Payment, unless otherwise directed:
 - 1. Current construction photographs.
 - 2. Environmental and anti-fraud affidavits.
 - 3. Record documents.
 - 4. Affidavits attesting to off-site stored products.
 - 5. Construction Progress Schedule.

3.04 SCHEDULE OF ALLOWANCES:

A. SCADA SYSTEM ALLOWANCE.

- 1. The Contractor shall coordinate integration of the new lift station with the Village's SCADA programming/integrator, Concentric, for the following work, which includes, but is not limited to:
 - a. Modifying the Village's existing SCADA programming to incorporate the renovated station and new equipment.
 - b. Integrate the proposed generator and automatic transfer switch.
 - c. Integrating the new pump controller cabinet, PLC, radio, and antenna.

2. This allowance specifically excludes the following:
 - a. Any wires, equipment (except those listed above) and conduits outside SCADA and pump controller enclosure. These shall be under General Contractor's scope and cannot be included in the allowance.
3. If the total cost for an allowance item is less than the allowance amount, then at project closeout, credit unused amounts remaining in the contingency allowance to Village by Change order.
4. If the total costs exceeds the allowance cost, a change order shall be submitted for any additional cost beyond the allowance amount. All Overhead and Profit including bonding costs shall be included in the Allowance amount.
5. The allowance amount shall not exceed \$60,000.

B. ELECTRIC SERVICE UTILITY FEE ALLOWANCE.

1. The Contractor shall utilize this allowance for any costs associated with Com Ed connecting the proposed electric service at the proposed service drop location as shown on the plans. Since it may not be possible for the bidder to obtain an actual quote from Com Ed for this work prior to submitting a bid, payment for any charges for this work shall be made under this allowance item.
2. This allowance includes the following work:
 - a. Installation of pole mounted transformer(s) and all connections of secondary cables to existing or proposed pole mounted transformer(s).
 - b. Connection of secondary cables to existing overhead cables.
3. This allowance specifically excludes the following work:
 - a. Secondary service conduit and cable between the Com Ed service pole (including vertical conduits, cables, and U-guard mounted to wood pole in accordance with Com Ed requirements). These shall be under General Contractor's scope and cannot be included in the allowance.
4. At the discretion of the Owner, the fee will be paid directly to the utility company by the Owner, in which case the Allowance shall be deducted from the Contract amount.

5. The allowance amount shall not exceed 5,000.

3.05 UNIT COST WORK:

- C. Actual payments made to the Contractor for unit price work shall be based solely on the product of the fixed unit price and the actual quantity of work, as measured in the field. If no unit price work is performed, then no payment shall be made for this item.

--- END OF SECTION ---

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section establishes minimum requirements for product substitutions, including submittal process for consideration.

1.02 SUBMITTAL

- A. Submittals shall be in accordance with Section 01 33 00 – Submittals.

1.03 PRODUCT SUBSTITUTION PROCEDURES

- A. Substitutions shall be considered when a product becomes unavailable through no fault of the Contractor, or as allowed by the Contract Documents.
- B. Document each request with complete data submittal substantiating compliance of proposed Substitution with Contract Documents.
- C. A request constitutes that the Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Shall provide the same warranty for the Substitution as for the specified product.
 - 3. Shall coordinate installation and make changes to other Work which may be required to complete the Work at no additional cost to the Owner.
 - 4. Waive claims for additional costs or time extensions which may subsequently result due to the Substitution.
 - 5. Shall reimburse the Owner for review and re-design services associated with Engineer's or authority having jurisdiction review of the Substitution.
- D. Substitutions shall 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.

1.04 SUBSTITUTION SUBMITTAL PROCEDURE

- A. Submit request for Substitution for consideration to the Engineer and/or Owner's Representative.
- B. Only one Substitution shall be submitted per request.
- C. Submit shop drawings, product data, warranty, and certified test results attesting to proposed product equivalence. The burden of proof is the Contractor's responsibility.
- D. The Engineer or Owner's Representative will notify the Contractor in writing of the decision to accept or reject the Substitution request.

1.05 SUBSTITUTES AND "OR APPROVED EQUAL" ITEMS

- A. Whenever a product, material, or piece of equipment is specified or described by using a proprietary product or name of a particular manufacturer or vendor, the specified item shall be understood as establishing the type, function, and quality desired.
- B. Whenever the words "or approved equal" does not appear, the Engineer or Owner are not obligated to accept a proposed substitute product.
- C. Products, materials, or equipment not specified by proprietary name and submitted as a proposed substitute shall be reviewed, approved, or rejected.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 31 00
PROJECT MEETINGS

PART 1 – GENERAL

1.01 PRECONSTRUCTION CONFERENCE:

- A. The preconstruction conference will be held in accordance with this Section.
- B. The Owner or Engineer will set the time and date of the meeting after execution of the contract by both parties.
- C. The following shall be submitted for review at the pre-construction meeting:
 - 1. Project schedule/construction sequence.
 - 2. 24-hour emergency phone number, field phone number, page number, and cellular phone number of the Contractor's superintendent.
 - 3. List of subcontractors with contact names, addresses, phone numbers, and work to be performed.
 - 4. Shop drawing list for all items to be submitted for review.
 - 5. List of material suppliers and phone numbers.
- D. Failure to submit the information in 1.01.C at the pre-construction meeting that causes delays in the Engineer's review and approval of the information shall not be grounds for an extension of the project completion date.

1.02 PROGRESS MEETINGS WITH ENGINEER:

- A. General progress meetings shall be held once a week, or as requested by the Engineer/Owner. The Engineer will coordinate meeting times and all attendees necessary for the planning, coordination or performance of work to be discussed at each meeting. Include (when applicable) consultants, separate contractors (if any), principal subcontractors, suppliers/manufacturers/fabricators, governing authorities, insurers, special supervisory personnel and others with an interest or expertise in the progress of the work.
- B. Items to be discussed will include:
 - 1. Review Contractor, Subcontractor, and Engineer's present and future needs including interface requirements, time, sequence, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, submittals, change orders, and documentation of information for payment requests.

2. Review progress schedule to determine if any work is behind schedule, needs to be expedited, and secure commitments from the entities involved in doing so.
 3. Discuss whether project schedule revisions are required to ensure that current work and subsequent work will be completed within the Contract Time.
 4. Equipment delays.
 5. Unresolved matters or conflicts.
- C. Within seven days after each progress meeting date, the Engineer will forward copies of the minutes-of-the-meeting, to the Contractor.
- D. Immediately following each progress meeting where revisions to the Progress Schedule/Critical Path Schedule have been made or recognized (regardless of whether agreed to by each entity represented), the Contractor shall revise the Schedule and reissue within 10 days after meeting.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULES AND LIQUIDATED DAMAGES

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. The Contractor shall be responsible for preparing, maintaining and submitting a construction schedule which identifies construction sequences of work and critical path.

1.02 REQUIRED COMPLETION DATES:

- A. Contract Completion Time: All work of this Contract shall be completed **313** consecutive calendar days from the date of the Notice to Proceed.
- B. Substantial Completion: The work of this Contract shall reach substantial completion **by 12/18/2026**. Substantial completion of the Work is when the facility is ready for use, but not necessarily including, final check-out, start-up testing, and placing into operation of all equipment is complete.
- C. Final Completion: Final completion shall be defined as the date when equipment start-up has successfully been completed and the equipment has been placed into satisfactory operation. Final completion shall be no later than **03/31/2027**.

1.03 LIQUIDATED DAMAGES

- A. Refer to Section 108.09 of the Standard Specifications for cost associated with failing to complete the work on time.

1.04 FORM OF SCHEDULES:

- A. The schedule shall consist of a horizontal bar chart, utilizing the critical path method of scheduling.
 - 1. Provide separate horizontal bars for each trade or operation.
 - 2. Horizontal Time Scale: Identify the first workday of each week.
 - 3. Scale and spacing to allow space for notations and future revisions.
- B. Format of Listings: Chronological order of start of each item of work.

C. Identification of Listings: By major specification section numbers.

1.05 SUBMITTAL REQUIREMENTS:

A. For initial submittal of construction schedule and subsequent revisions thereof, furnish six paper copies of schedule to Engineer, or an electronic version in Adobe Acrobat.

1.06 CONSTRUCTION SCHEDULE:

A. Contractor shall prepare and submit to Engineer for review within 14 days after Notice to Proceed, a construction progress schedule.

B. The construction schedule shall be prepared based on working hours between **7:00 AM to 5:00 PM** weekdays. No work will be allowed on Saturdays unless prior approval is granted in writing by the Owner. If work is allowed, it shall be confined to the period beginning at 8:00 AM to 5:00 PM. Any work outside the allowed time periods specified including but not limited to material deliveries, mobilization of equipment, warming up machinery, general deliveries and mobilization of equipment, may incur a penalty of \$1,000 for each occurrence.

C. Construction Progress Schedule:

1. Show complete sequence of construction by activity.
2. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to the following:
 - a. Shop drawing receipt from supplier/manufacturer submitted to Engineer, review and return to supplier/manufacturer.
 - b. Material and equipment order, manufacturer, delivery, installation, and checkout.
 - c. Performance tests and supervisory services activity.
 - d. By-pass pumping.
 - e. Piping, conduit work, and wiring installation.
 - f. Construction of various facilities.
 - g. Concrete pour sequence.
 - h. Backfilling, grading, seeding, sodding, landscaping, fence construction, and paving.
 - i. Electrical work activity.
 - j. Electric service connection.
 - k. Mechanical work activity.
 - l. Sanitary and Storm Sewer installation.
 - m. Connection to existing sewers.

- n. Forcemain installation.
- o. Subcontractor's items of work.
- p. Final cleanup.
- q. Allowance for inclement weather.
- r. Demolition.
- s. Miscellaneous concrete placement.
- t. Start-up testing and procedures.
- u. Final check-out.
- v. Maintenance transfer.

3. Show projected percentage of completion for each items as of first day of each month.

1.07 SCHEDULE REVISIONS:

- A. The Contractor shall revise the construction schedule to reflect changes in progress of work.
- B. Indicate progress of each activity at date of submittal.
- C. Revise scheduled meeting dates.
- D. Show changes occurring since previous submittal of schedule including:
 - a. Major changes in scope
 - b. Activities modified since previous submittal
 - c. Revised projections of progress and completion
 - d. Other identifiable changes.
- E. Provide a narrative report to identify:
 - a. Reason for revised schedule, problem areas, and resulting delays
 - b. Overall impacts to completion date and milestones
 - c. Corrective action recommended
 - d. Effect to Subcontractors, if applicable.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SCOPE

- A. This Section establishes minimum requirements and procedures for Submittals by the Contractor for materials and equipment provided for under the Work of this Contract. Specific details for additional drawings, data and information to be submitted shall be in accordance with the applicable requirements of other Sections of these Specifications.

1.02 SUBMITTAL PROCEDURES

- A. The Contractor shall, within 10 calendar days after receiving the Notice to Proceed, prepare and submit for review a construction schedule together with a detailed list of all the submittals which the Contractor proposes to make to meet the requirements of this and other Sections, including the dates on which the Contractor proposes to make such submittals.
- B. The Contractor shall submit submittals in electronic format in Adobe Acrobat. If hard copies are submitted, the Contractor shall submit 3 hard copies of the submittal packages to the Engineer for each submittal iteration if the submittal is provided as a hard copy.
- C. The Engineer will distribute the submittals to the Owner and other interested parties.
- D. Submittals shall be in the English language.
- E. Weights, measures, and units shall be English units.
- F. Symbols and drawings shall conform to ANSI Y32.2 / IEEE 315/SCA Z99.
- G. Substitutions shall be submitted in accordance with Section 01 25 00 – Substitution Procedures.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Review submittals prior to submission.

- B. The Contractor will need to work with the Owner to develop a salvage item lists prior to demolition. All salvage items need to be returned to the Owner

without damage. Items shall be inspected in the presence of the Engineer and Owner's Representative to document any damages and overall condition, prior to transporting the items from the site. Failure to do so will result in the Contractor repairing any damages to the salvaged items at the Contractor's expense.

C. Determine and verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance to specifications.

D. Identify applicable products, model numbers, options, and other data on the submittal. Where necessary, the Contractor shall supplement manufacturers' data/catalog information to provide a project specific submittal.

E. Coordinate each submittal with other submittals and with requirements of Work and of Contract Documents.

F. Where required by individual specification sections or as detailed on the Contract Drawings, provide shop drawings signed and sealed by a Professional or Structural Engineer, licensed in the State of Illinois, who is responsible for designing components shown on the shop drawings.

1. Include signed and sealed calculations to support design.
2. Submit drawings and calculations in a form suitable for submission to and review by the authorities having jurisdiction.
3. Make revisions and provide additional information when required by authorities having jurisdiction.

G. Notify Engineer in writing, at time of submission, of any deviations in submittals from requirements of Contract Documents. Any such deviations permitted by Engineer will require modifications of Contract Documents.

H. Provide space on Shop Drawings for Contractor and Engineer stamps.

I. When Shop Drawings are revised for resubmission, identify all changes made since previous submission.

- J. Submittals containing language imposing duties on others (such as verification of dimensions or supply of related information) inconsistent with contract language shall be null and void.
- K. Submittals shall not be used as media for inquiries for information or for verification of information that must be supplied by others to Contractor. Inquiries or verification of information shall be made by separate Contractor submittal using Request for Information (RFI) process.
- L. Equipment shall not be order, begin fabrication, or Work which requires submittal review until return of submittals by Engineer with stamp, as either "Furnish as Submitted", or "Furnish as Corrected."
- M. Distribute copies of reviewed submittals that carry Engineer stamp as either "Furnish as Submitted" or "Furnish as Corrected" as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested, or not submitted for review, shall not be recognized or processed.
- O. The Contractor's responsibility for errors and omissions in submittals is not relieved by the Engineer's review of submittals.

1.04 ENGINEER DUTIES

- A. Review required submittals within 15 calendar days or in accordance with schedule, only for conformance to design intent of Project and compliance with the Contract Documents. Any delays in review shall be agreed upon by the Engineer and Contractor.
 - 1. Review shall not extend to means, methods, sequences, techniques, or procedures of construction or to safety precautions or program incident thereto.
 - 2. Review does not relieve the Contractor of responsibility for conformity to the Contract Documents, manufacturer installation requirements, standards referenced, and required for a complete installation.
- B. The submittal will be returned with a stamp and initials or signature with the result of the review. Actions on submittals is classified as follows:
 - 1. Furnish as Submitted: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents. Contractor may proceed with purchasing items or fabrication of work in submittal.

2. **Furnish as Corrected:** Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents, except as noted by reviewer. The Contractor may proceed with purchasing items, or fabrication of work in submittal, with modifications and/or revisions as indicated by reviewer. The Contractor shall submit a revised submittal for the Engineer's and Owner's records.
 3. **Revise and Resubmit:** Submittal has been reviewed and does not appear to be in conformance to design concept of Project or with Contract Documents. Contractor shall not proceed with fabrication of work in submittal, but instead shall make any corrections required by reviewer and resubmit for review.
 4. **Rejected:** Submittal is being returned without having been reviewed because: 1) is not required by Contract Documents; 2) is incomplete; 3) does not conform with the Contract Documents; 4) cannot be reproduced; 5) lacks Contractor's completed approval stamp; or 6) is not sealed by a professional's seal, when required by law or Contract Documents. If submittal is required by Contract Documents, Contractor shall not proceed with Work as detailed in submittal, but instead shall correct defects and resubmit for review.
- C. Return one copy of submittals to Contractor. Contractor shall distribute as required.
- D. Submittals which do not contain markup, or which have minor markup that can be adequately described without referencing submittal, will not be returned. Reviewer will return signed submittal stamp with written description of Review's comments.
- E. Review of submittals shall not relieve Contractor from responsibility for any variation from Contract Documents unless Contractor has, in writing, called Engineer's attention to such variation at time of submission, and Engineer has given written concurrence pursuant to Contract Documents to specific variation, nor shall any concurrence by Engineer or other reviewer relieve Contractor from responsibility for errors or omissions in submittals.

1.05 SHOP DRAWINGS SUBMITTALS

- A. Submit for review for limited purpose of checking for conformance to information given and design concept expressed in Contract Documents. Produce copies and distribute in accordance with this section and for record documents purposes as described in Section 01 33 00 - Submittal Procedures.

- B. Designate in construction schedule, or in separate coordinated submittal schedule, dates for submission and dates that reviewed submittals will be needed.
- C. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in Work or in work of other Contractors.
- D. Present in clear and thorough manner, complete with dimensions, design criteria, materials of construction, and like information to enable review of information as required.
- E. Details shall be identified by reference to sheet, schedule, identifier, or room numbers as shown on Drawings.
- F. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- G. Equipment which is identified on Contract Documents with tag number or name shall be identified on Shop Drawing with same tag.
- H. Schedule submittals to expedite Project. Coordinate submission of related items.
- I. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- J. Shop Drawings shall be submitted in electronic format.
 - 1. Submit electronic copy to Engineer.
 - 2. Text documents shall be submitted in .pdf format.
 - 3. Drawings shall be submitted in .pdf format.
 - 4. Electronic submittal shall be suitable for reproduction in black and white.
 - 5. Submittals shall be grouped by major equipment or by special provision section number.
 - 6. Samples may be submitted to Engineer at address given in these documents, or as provided during the Pre-Construction Meeting.
- K. Submittals shall contain:
 - 1. Date of submission and dates of any previous submissions.
 - 2. Project title and number.
 - 3. Contract identification.
 - 4. Names of:
 - a. Contractor.
 - b. Supplier.

c. Manufacturer

5. Identification of product, with Specification section number and article number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8" x 3" blank space for Contractor and reviewer stamps, at a minimum.
12. Indication of Contractor's approval stamp, initialed or signed, indicating that the Contractor has reviewed and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, for compliance with the requirements of Work and Contract Documents.

L. Product Data:

1. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
2. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

M. Design Data:

1. Submit additional support for equipment submittal, as required to verify conformance with Contract Documents.
2. Submit for informational purposes for limited purpose of assessing conformance with information given and design intent expressed in Contract Documents.

N. Data sheets:

1. Data sheets may require information not known until Contractor's engineering is complete. Furnish estimated values based on good engineering judgment. Estimated values shall be identified by placement of "(est.)" next to value.
2. Data Sheets shall be updated and resubmitted by Contractor once final values are known.
3. Do not leave items blank or labeled "To Be Determined" or "Later."
4. Do not submit manufacturer Product Data instead of completed data sheets.

O. Test reports:

1. Submit as additional support for equipment submittal, as required.

2. Submit test reports for information for limited purpose of assessing conformance with information given and design intent expressed in Contract Documents.

P. Certificates:

1. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor.
2. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or product but must be acceptable to reviewer.

Q. Manufacturer's instructions:

1. 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.
2. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

R. Manufacturer's field reports:

1. Submit report in duplicate within 30 days of observation for information.
2. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

S. Erection drawings:

1. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

T. Samples:

1. Samples for selection as specified in product sections:
 - a. Submit for aesthetic, color, or finish selection.
 - b. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns for selection.

2. Submit to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
3. Include identification on each sample, with full Project information.
4. Submit model number specified in individual Specification Sections; One of which will be retained by Engineer.
5. Reviewed Samples which may be used in Work are indicated in individual Specification Sections.
6. Samples will not be used for testing purposes unless specifically stated in specification section.
7. Field Samples and mock-ups:
 - a. Erect at Project Site, at location acceptable to Engineer.
 - b. Size or area: That specified in respective Specification Section.
 - c. Fabricate each Sample and mock-up complete and finished.
 - d. Remove mock-ups upon acceptance of Work or when acceptable to Engineer.

U. Proof of equipment release:

1. Contractor shall provide written proof of equipment release upon request, or for any equipment with lead times exceeding 16 weeks.
2. Proof shall consist of one of the following:
 - a. Email correspondence between the Contractor and manufacturer.
 - b. Email correspondence between the Contractor and Supplier.
 - c. Work order.
 - d. Executed agreement.
 - e. Executed equipment invoice.

V. Proposed products list:

1. Within 15 days after date of Notice to Proceed, submit list of major products proposed to Engineer for use, with name of manufacturer, trade name, and model number of each product.
2. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

W. Operations and maintenance manuals:

1. Designate in construction schedule, or in separate coordinated schedule, dates for submission and dates that reviewed operations and maintenance manuals will be needed.
2. Operations and maintenance manuals shall be in accordance with Section 01 77 00 – Closeout Procedures.

1.06 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until stamped as either "Furnish and Submitted" or "Furnish as Corrected."
- B. Text and depictions changed on Submittal shall be back-circled (clouded).
- C. Engineer will assume that portions of Submittal not back-circled have not been changed by Contractor from previous submission.
- D. Indicate revision number and date in document revision block.

1.07 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings which carry Engineer stamp as either "Furnish and Submitted" or "Furnish as Corrected" to:
 - 1. Job site file.
 - 2. Record Documents file.
 - 3. Other affected contractors.
 - 4. Subcontractors.
 - 5. Supplier or fabricator.
- B. Distribute Samples which carry Engineer stamp as either "Furnish and Submitted" or "Furnish as Corrected" as directed by Engineer.

1.08 VIDEO DOCUMENTATION OF EXISTING CONDITIONS

- A. Prior to construction, perform video recording in all areas to be disturbed by construction. Recording shall document significant features that may be affected by construction activity. Payment for Video Documentation of Existing Conditions shall only occur if video documentation is provided prior to Contractor Mobilization / Start of Construction.
- B. Provide labor, equipment, and materials for televising and complete video documentation of construction areas.
- C. Personnel and equipment:
 - 1. Furnish equipment, supplies, and materials necessary to complete Work as specified.
 - 2. Equipment not giving proper results shall be replaced.
- D. Camera and other components shall provide clean, clear, and sharp color picture.

E. Video/photographic recording:

1. Provide complete color video recording of construction areas. Video recording media produced shall be compatible with Owner's video equipment.
2. Produce video recordings of sufficient quality to allow proper in-house viewing with minimum of distortion; no image tearing.
3. Provide voice narration on video recording to document following information:
4. Name of city, street, and date upon which video inspection was made.
5. Audio description of special features, i.e. cracked pavements, special landscaping, etc.
6. Stop camera at special features for minimum of 10 seconds to allow for photographic documentation.
7. Deliver video recording to Engineer who, after review, will deliver recording to Owner for permanent records.
8. Label each recording to identify sewer and limits of coverage.

F. A written summary of the video recording shall be included in the submittal. The summary shall include:

1. Date and time of recording.
2. Project location.
3. Starting location for video recording.
4. Personnel and equipment used.
5. Description of damage or special features noted during video recording.

G. Recording procedure:

1. Camera shall be moved at uniform rate consistent with amount of detail being recorded.
2. Take necessary steps and adopt procedures to ensure optimum viewing conditions.

1.09 SAFETY PROCEDURES MANUAL

A. Prepare and submit to Owner safety procedures manual defining Contractor's safety program for work on site. Manual shall include:

1. Safety responsibilities of Contractor's personnel.
2. Description of Contractor's safety program.
3. Requirements of use of personal protective equipment.
4. General safety-related rules of conduct.
5. Fire prevention measures.

6. Accident reporting procedures.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified under Part 1.08 of this section will be made at the lump sum price for VIDEO DOCUMENTATION OF EXISTING CONDITIONS. Payment for Video Documentation of Existing Conditions shall only occur if video documentation is provided prior to Contractor Mobilization / Start of Construction.
- B. Payment will not be made for any other Items except as listed above. All other costs associated with such Work shall be included in the prices bid for the various items to which they pertain.

--- END OF SECTION ---

SECTION 01 35 43

ENVIRONMENTAL PROTECTION AND PROCEDURES

PART 1 – GENERAL

1.01 SCOPE OF WORK:

- A. The work covered by this Section consists of furnishing all labor materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purposes of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work.

1.02 APPLICABLE REGULATIONS:

- A. Comply with all Federal, State, Permitting Agencies, local laws and regulations concerning environmental pollution control and abatement.
- B. Contractor shall conduct operations so as not to violate any applicable ordinances, regulations, rules and laws pertaining to noise and air pollution and to conform to all provisions as set forth in the Rules and Regulations Governing Control of Air Pollution and Noise Pollution State of Illinois.

1.03 NOTIFICATIONS:

- A. The Owner will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Owner, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Owner or from the regulatory agency through

the Owner, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

3.01 PROTECTION OF STREAMS, WETLANDS, AND SURFACE WATER:

- A. Care shall be taken to prevent or reduce to a minimum any damage to any stream, drainage ditch, storm drain or sewer from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Such water will be diverted through a settling basin or filter before being directed into the streams.
- B. Turbidity barriers shall be installed and maintained during construction and shall remain in place at indicated location until construction is completed and soils are stabilized.
- C. Water used during the Work which has become contaminated with oil, bitumens, harmful or objectionable chemicals, sewage or other pollutants shall be disposed of in a lawful manner and so as to avoid affecting all nearby waters and lands. Under no circumstances shall the Contractor discharge pollutants into any watercourse. The Contractor shall not allow water used in aggregate processing, concrete curing, foundation and concrete lift cleanup, dewatering activities or any other waste to directly enter a stream untreated. When water from adjacent natural sources is used in the Work, intake methods shall be such as to avoid contaminating the source of supply or becoming a source of erosion or sedimentation.
- D. Water being flushed from structures or pipelines after disinfection, with a Chlorine residual of 2 mg/l or greater, shall be treated with a dechlorination solution, in a method approved by the Engineer, prior to discharge.

3.02 PROTECTION OF AIR QUALITY:

- A. Burning. The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control. The Contractor will be required to maintain all excavations, embankments, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. Sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Owner.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 41 26

PERMIT REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. It shall be the responsibility of the Contractor to secure all permits required to initiate and complete the work under this contract, except permits obtained by the Owner. The Contractor shall be responsible for complying with all permit and approval requirements including Owner obtained.
- B. No separate or direct payment will be made to the Contractor for permits and inspection requirements, but all such costs shall be included in the applicable items in the Schedule of Prices. The Owner shall furnish signed and sealed sets of Contract Documents for permit use as required.
- C. The Contractor shall furnish to the Engineer copies of all permits and / or agreements prior to commencement of work requiring permits.
- D. The following permits are being obtained by the Owner:
 - 1. Metropolitan Water Reclamation District of Greater Chicago – Permit for Construction / Operation.
 - 2. Illinois Environmental Protection Agency – Permit for Construction / Operation.
 - 3. Village of Hoffman Estates – Building Permit.
 - 4. Clean Construction or Demolition Debris.
- E. The following permits have been initiated by the Owner and completion by the Contractor:
 - 1. None.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 43 00
QUALITY ASSURANCE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This Section covers Quality Assurance and Control requirements for this contract, which include but are not limited to the following:
1. Perform the inspections and test required by the Specifications.
 2. Provide product certifications as required by the Specifications.
 3. Test, adjust, balance, and operate mechanical and electrical equipment to demonstrate that they have been properly assembled, aligned, adjusted, wired, and connected. Make any adjustments or replacements found necessary.
 4. Observations by Engineer, Owner's Representative, inspections, tests, or approvals by other than Contractors, shall relieve Contractor from his/her obligation to perform the Work in accordance with the requirements of the Contract Documents.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, suppliers, and manufacturers and for assuring the quality specified in the Technical Specifications is achieved.

1.02 CONTRACTOR FURNISHED TESTING LABORATORY SERVICES

- A. An independent commercial testing laboratory acceptable to the Engineer shall perform all tests that require the services of a laboratory to determine compliance with the Contract Documents. The laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
- B. Preliminary Testing Services: The Contractor shall be responsible for all testing laboratory services in connection with concrete materials and mix designs, the design of asphalt mixtures, gradation tests for structural and embankment fills, backfill materials, and all other tests and engineering data required for the Engineer's review of materials and equipment proposed to be used in the Work. The Contractor shall obtain the Engineer's acceptance of the testing laboratory before having services performed, and shall pay all costs for services.
- C. The Contractor shall not retain any testing laboratory against which the Owner or the Engineer have reasonable objection, and if at any time during the construction process the services become unacceptable to the Owner, or the

Engineer, either the Owner or the Engineer may direct in writing that such services be terminated. The request must be supported with evidence of improper testing or unreasonable delay. If the Engineer determines that sufficient cause exists, the Contractor shall terminate the services and engage a different testing laboratory.

- D. Transmittal of Test Reports: Written reports of testing and engineering data furnished by the Contractor for the Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.
- E. The Contractor's testing laboratory shall furnish four copies of a written report of each test performed by laboratory personnel within three days after each test is completed. Distribution shall be two copies of each test report to the Engineer, one copy to the Owner, and one copy for the Contractor.

1.03 CONTRACTOR FURNISHED TESTING AND INSPECTION SERVICES

- A. The Contractor will employ the services of an independent testing agency to conduct concrete testing.
- B. The Contractor shall furnish a construction schedule and a minimum of 48-hour notice of readiness for testing and inspection of the work. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing as necessary to determine that materials and equipment conform with data previously furnished by Contractor and with the Contract Documents.
- C. The Contractor shall schedule the work to permit adequate time for testing and re-testing should test results not conform to the contract documents.
- D. The Contractor shall furnish material samples and cooperate in the field sampling and testing activities, interrupting the work when necessary. The Contractor shall furnish personnel, facilities and access to assist in the sampling and testing activities.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Refer to Article 3 of the Standard General Conditions of the Construction Contract, Item 3.02, Reference Standards, and applicable sections of the special provisions.
 - 1. Standard Specifications for Road and Bridge Construction, latest edition (hereinafter referred to as the "Standard Specifications.")
 - 2. Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.
 - 3. Manual of Test Procedures of Material.

- B. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer.
- C. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer authorizes such use.
- D. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.

1.05 MATERIALS AND EQUIPMENT

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless approved otherwise by the Engineer.

1.06 MANUFACTURER'S FIELD SERVICES

- A. When specified in the project/technical specifications sections, the Contractor shall arrange for and provide technical representation from manufacturer's of respective equipment, items or components. The manufacturer's representative shall be a factory trained service engineer/technician with the type and length of experience specified in the technical specifications.
- B. Services Furnished Under This Contract: An experienced, competent, and authorized factory trained service engineer/technician representative of the

manufacturer of each item of equipment for which field services are indicated in the specifications shall visit the site of the Work and inspect, operate, test, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's service representative shall be present when the equipment is placed in operation. The manufacturer's service representative shall revisit the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory to the Engineer.

C. Refer to specific Technical Specification sections for additional requirements.

1.07 CERTIFICATION FORMS AND CERTIFICATES

A. The Contractor shall be responsible for submitting the certification forms and certificates in conformance with the requirements specified in Section 01 33 00 – Submittal Procedures.

PART 2 – PRODUCTS

All materials and equipment shall be provided as required by the Contractor for any specified testing.

PART 3 – EXECUTION

3.01 QUALITY CONTROL

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, instrument calibration, surveying) shall be maintained in the Contractor's field office, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.
- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Design Requirements.
2. Construction equipment.
3. Safety precautions.
4. Roads and accessways.
5. Use of Owner property.
6. Clean up of work and disposal of trash.
7. Dust and mud control.
8. Sanitary facilities.
9. Temporary water.
10. Temporary electric.
11. Dewatering facilities.
12. Security.
13. Fencing and barricades.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Section 01 35 43 – Environmental Protection and Procedures
2. Section 01 74 00 – Cleaning and Waste Management
3. Section 31 23 19 - Dewatering

1.03 DESIGN REQUIREMENTS

- A. Locate facilities where required, and as directed by the Engineer or Owner.**
- B. Maintain temporary facilities and controls in proper and safe condition throughout duration of work.**
- C. At completion of work, or sooner when no longer needed, remove all temporary facilities, except where certain facilities are specified to remain or to be relocated for use under future contracts.**

1.04 CONSTRUCTION EQUIPMENT

- A. Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.

1.05 SAFETY PRECAUTIONS

- A. Provide and maintain barricades, fencing, shoring, pedestrian walkways including attached lights, other lights, and other safety precautions to properly guard against personal injury and property damage as prescribed by authority having jurisdiction.
- B. Maintain such items for duration of work, and repair, replace, and relocate them as necessary for safe protection.
- C. Provide such additional safety precautions as may be prescribed by Authorities Having Jurisdiction.

1.06 ROADS AND ACCESSWAYS

- A. Entrance to Work Site: The Contractor and subcontractors shall use only those access points or entrance ways as directed by the Engineer.
 - 1. Maintain access roads and parking areas in satisfactory condition during the Contract, and repair damages attributable to work of this project at intervals as needed. At completion of the Contract, roads, parking areas and entrance ways shall be left in condition at least equal to that existing at the start of the Contract, except as may be otherwise be required by the Contract Documents.
 - 2. Provide means to remove mud from Contractor's trucks and equipment, as shown on the Contract Drawings, or as directed by the Engineer due to construction activities on-site.

1.07 USE OF OWNER PROPERTY

- A. On-Site Storage and Work Areas: The Owner will allocate available on-site storage and work areas to the Contractor, subject to change as may be necessary by job progress, such as site development or intervening work.
- B. Owner Property and Right-of-Way: Operations shall be confined to Owner property and right-of-way to greatest extent and shall not encroach on areas other than those designated or approved for such use by the Owner.

1. Ascertain, observe, and comply with rules and regulations in effect, including but not restricted to, parking and traffic regulations, hours of allowable ingress and egress to main arterials, and driveways.
- C. Existing Improvements in Streets and Parking Area: Existing signs, fire hydrants, underground valves and meter boxes, manholes, and other items occurring adjacent to the site shall be left undisturbed, unobstructed, and easily accessible at all times during construction, except as otherwise indicated or agreed to between Contractor and Owner authorities.
- D. Covering, moving, trimming, or altering which may become necessary shall be done only with consent of and in cooperation with Owner authorities having jurisdiction. Contractor shall pay costs that may be incurred.
- E. Make detailed examination of such Owner property at start of work and conditions shall be noted by Contractor and confirmed by Owner.
1. The owner's streets and other existing improvements therein adjacent to the site, if damaged by this work, shall be repaired by the Contractor at intervals as needed. At the completion of the project, all such items not included in the Contract shall be left in condition at least equal to that at the start of operations.
 2. Repair work shall conform to the requirements of the Owner. This includes, but is not restricted to, temporary walks for pedestrians, cleaning of mud and debris, air pollution control, and traffic control.
- F. Protection of Trees and Shrubs: Existing trees and shrubs to remain shall not be injured during the course of this work. Trim tree only to the extent required for construction. Coordinate with Owner and Property Owner for any tree trimming required.
1. If any tree or shrub during the course of, or as a result of construction operations is injured to extent of causing its permanent disfigurement or death, the Contractor shall pay the cost of damages to the Owner for each tree or shrub so injured, amount to be agreed upon by the Village and Contractor.
- G. Protection of Existing Utilities: Protect from damage, existing utility lines not specified to be altered by Work of this Contract; any such features damaged shall be repaired or replaced to condition equal to that existing prior to commencing work of this Contract. Unless otherwise specified, maintain existing utility service at all times during construction. Utility service lines found entering site and not indicated to remain or to be incorporated in new work, shall be plugged, capped, or otherwise abandoned by Contractor in manner satisfactory to Utility Companies whose services are involved, except as otherwise required.

1.08 CLEAN UP OF WORK AND DISPOSAL OF TRASH

- A. Keep work and storage areas clean and free of rubbish and perform protective and cleanup work within one day of being so notified by the Owner.
- B. Dispose of trash resulting from work. Recycle materials to the extent practicable.

1.09 DUST AND MUD CONTROL

- A. The Contractor shall be responsible for controlling dust and mud associated with the work. Dust control shall be in accordance with Section 01 35 43 (3.02B).
- B. The Contractor shall clean roadways used for construction activities in accordance with Section 107.15 of the Standard Specifications, or by using motorized street sweeper that utilizes vacuum and water to pick up debris, when directed by the Engineer. The cost of the street sweeper shall be included in the cost of this work.

1.10 SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures at each construction location. Existing facility use is not permitted. Provide at time of project mobilization.
- B. Temporary sanitary facilities shall be in accordance with Section 107.08 of the Standard Specifications.
- C. The Contractor shall provide temporary toilet facilities as required and maintain these units during the entire period of construction under this contract, for the use of all construction personnel on the job. Enough chemical toilets shall be provided to conveniently serve the needs of all personnel. Chemical toilets and their maintenance shall meet the requirements of State and Local Health Regulations and Ordinances. Contractors cannot use Village restrooms.

1.11 TEMPORARY WATER

- A. Make arrangements for water required for construction purposes (see Section 107.18 of the Standard Specifications). The Contractor shall furnish and install temporary piping or hose to carry water to every part of construction.
- B. Where required, the Contractor shall rent a water meter for use of the Village's fire hydrant. All costs for the rental and water used during this work shall be paid for by the Contractor, at no additional cost to the Owner.

1.12 TEMPORARY ELECTRIC

- A. The site currently has a dedicated electric service for the existing lift station which may remain active until the service transfer is made between the old and new service (scheduled by the Contractor). The existing service shall not be modified in any way that impacts the operation of the existing lift station while still in service.
- B. The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, panelboards, outlets, lamps, fuses, controls, meters and accessories.
- C. The electric service shall be of sufficient capacity and characteristics to supply the proper current for the various types of construction tools, motors, welding machines, lights, heating plant, pumps, and other work required.
- D. The Contractor shall pay charges and fees by power company for providing the electrical service and for power used at no additional cost to the Owner.
 - 1. Perform all work in accordance with the power company's requirements and in manner approved by power company.
 - 2. Notify power company prior to work.
- E. The Contractor shall provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.

1.13 DEWATERING FACILITIES

- A. Provide and maintain dewatering and pumping facilities to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required. Remove dewatering facilities from site when no longer needed.

1.14 SECURITY

- A. Contractor shall be responsible for security of work involved in this project, during entire time of Contract. The Contractor shall be responsible for repairing all damage to work and loss of materials due to vandalism or theft.

1.15 TEMPORARY FENCING

- A. Provide commercial grade chain link fence to prevent trespass by public onto construction site, and to delineate limit of Contractor's work area.

- B. The temporary chain link fence shall consist of 6-foot high steel fence around the construction site. The fence shall be equipped with vehicular and pedestrian gates with locks.
- C. Coordinate location of temporary fencing with Engineer and/or Owner.
- D. Three spare keys shall be given to the Engineer for each lock intended for emergency and off-hour access, as required to access the site.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified under this section will be made at the contract lump sum price for:
 - 1. TEMPORARY FACILITIES AND CONTROLS.
 - 2. TEMPORARY CONSTRUCTION FENCING.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.
- D. Dewatering shall be paid for separately, see Section 31 23 19 – Dewatering.

--- END OF SECTION ---

SECTION 01 55 26

TRAFFIC CONTROL AND PROTECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section Includes:
 - 1. Traffic control plan.
 - 2. Notification plan and schedule.
 - 3. Traffic control requirements.
 - 4. Sidewalk control requirements.
 - 5. Project traffic coordination.
 - 6. Traffic regulation.
 - 7. Traffic maintenance requirements.
 - 8. Local access requirements.
 - 9. Traffic safety requirements.
 - 10. Traffic signage maintenance.
 - 11. Construction and maintenance of detours.

1.02 REFERENCES

- A. Division 700 of the Standard Specifications.
- B. Manual of Uniform Traffic Control Devices (MUTCD).
- C. Local Ordinances.
- D. Illinois Department of Transportation (IDOT) -Traffic Control Standard Drawings, or as otherwise shown on the plans:
 - a. Standard 701901-08 - Traffic Control Devices
 - b. Standard 701006-05 - Off Road Operations, 2L, 2W, 15' to 24" From Edge of Pavement
 - c. Standard 701301-04 – Lane Closure, 2L, 2W Short Time Operations
 - d. Standard 701501-06 - Urban Lane Closure, 2L, 2W, Undivided
 - e. Standard 701801-06 - Sidewalk, Corner, or Crosswalk Closure
 - f. Standard 701901-08 - Traffic Control Devices

1.03 SUBMITTALS

- A. Submittal shall be in accordance with Section 01 33 00 – Submittal Procedures.

B. Contractor shall submit the following plans and schedules to Engineer and Owner for review:

1. Traffic Control Plan.
2. Notification Plan and Schedule.

1.04 DESCRIPTION

A. This Section establishes minimum requirements for traffic control protection, notification schedules, temporary barricades, signs, flaggers, lights, road surfaces, detours, and other safeguards necessary to protect life, health, and safety.

1.05 TRAFFIC CONTROL PLAN

- A. The Contractor shall be responsible for obtaining Township, Village, City, and/or County approval for Traffic Control Plan prior to beginning any Work at the site.
- B. The traffic control plan shall be submitted a minimum of 30 days prior to scheduled start of Work.
- C. Show location of construction signs, location of cones/barricades, number of flaggers necessary and location(s), and other traffic control devices required for the Work.
- D. Include any traffic impacts to private property.
- E. Residential, commercial and industrial driveways shall remain open throughout the Work. The Contractor shall provide temporary driveways as required, or as shown on the plans.
- F. Unless otherwise indicated, the closing of streets is not allowed.
- G. The Contractor shall request and obtain written approval from the Engineer, Owner, or authority having jurisdiction no later than within seven days of partially closing any street. Approval is not guaranteed.

1.06 NOTIFICATION PLAN AND SCHEDULE

- A. Submit a Notification Plan and Schedule three weeks prior to Work schedule to maintain access for adjacent or affected residential or commercial properties.
- B. Update as necessary for project meetings.

C. The Notification Plan and Schedule shall include:

1. Name of affected residential, commercial, and industrial properties.
2. Address of the residential, commercial, and industrial properties.
3. Contact name and information.
4. Estimated start date for impacts to affected properties.
5. Estimated completion date for impacts to affected properties.
6. Methods to maintain access.
7. Any special issues with maintaining access.
8. Correspondence of accommodations required for emergency vehicle routing.

D. Request and obtain written approval from the Engineer, Owner, or authority having jurisdiction no later than within seven days of partially closing any street. Approval is not guaranteed.

E. Contractor shall coordinate emergency vehicle routing with Owner, local fire, law enforcement authorities, and any other affected agencies no less than 72-hours prior to construction operations, which deviate or delay traffic from the existing traffic patterns.

1.07 TRAFFIC CONTROL REQUIREMENTS

A. Contractor shall comply with the latest provisions of the "State of Illinois Manual of Uniform Traffic Control Devices" and Standard Specifications.

B. The CONTRACTOR shall at all times conduct his work so as to assure the least possible obstruction to traffic and inconvenience to the general public and provide adequate protection of persons and property in the vicinity of the work.

C. WHEN THE NORMAL FLOW OF TRAFFIC WILL BE IMPAIRED OR DISRUPTED IN ANY MANNER ON ANY STREET, THE CONTRACTOR SHALL NOTIFY OWNER AT LEAST 48 HOURS IN ADVANCE.

D. The work zone shall be maintained in accordance with Section 701 of the Standards Specifications for Road and Bridge Construction in Illinois, Current Edition. Negligence by the CONTRACTOR to follow these minimum guidelines that result in or causes damage to Owner's equipment during snow fall removal or any other similar Owner operation will be the direct responsibility of the Contractor to repair. The repair will be completed by the Owner and the cost of the repair will be deducted off the next pay request due to the Contractor.

E. When permission has been granted to close an existing roadway, or portion thereof, the CONTRACTOR shall furnish and erect signs, barricades, lights, flags and other protective devices as necessary subject to the approval of the

ENGINEER. From sunset to sunrise, the CONTRACTOR shall furnish and maintain as many yellow lights as the ENGINEER may direct.

- F. The Contractor shall be advised of the regulated weight limits within the surrounding areas of the project. No additional compensation in time or monetary value will be allowed.
- G. During working hours the CONTRACTOR shall furnish watchmen in sufficient numbers to protect and divert the vehicular and pedestrian traffic from working areas closed to traffic, or to protect any new work.
- H. No separate payment will be made for such signs, barricades, lights, flags, watchmen or other protective devices as required, with all costs thereof deemed to be included in the prices bid for the various items scheduled in the bid.
- I. The Contractor shall provide all necessary traffic control for the protection of the general public.
- J. Maintain pedestrian and bicycle access at all times.
- K. Identify work on specific streets that the Contractor determines will have traffic impacts.
- L. Provide for passage and access of emergency vehicles, police, fire, and disaster units at all times. Assume liability for damages resulting from failure to provide said access.
- M. Vehicular and pedestrian routing and traffic flow on streets where no Work is being performed shall not be affected by Work.
- N. Do not open sections of Work and leave them unfinished. Finish work in process insofar as practicable. The contractor shall provide steel plates, as allowed to cover all unfinished openings in pavement and sidewalks.
- O. Construction material stored upon the public street shall be placed so as to cause as little obstruction to the general public as is reasonably possible.
- P. Provide local access to all businesses, industrial sites, and residencies sites and driveways.
- Q. Provide fencing and concrete barriers to separate traffic and pedestrian flow from construction work, unless otherwise noted.
- R. Channel traffic flow into the work zone per accepted Traffic Control Plan.

S. Pedestrian and Cyclist Pathways:

1. Unless otherwise indicated, provide a temporary five (5) foot wide alternate pathway on the same side of the street when construction interferes with the usual pedestrian and cyclist pathways.
2. Keep pedestrians, cyclists, vehicles, and open excavations along the arterial all separate from one another to meet safety requirements.
3. Maintain minimum of three (3) crosswalks at affected intersections.

1.08 PROTECTIVE TRAFFIC COORDINATION

- A. Coordinate construction which provides the least possible obstruction and inconvenience to public.
- B. Coordinate with property and business owners in order to maintain convenient access for local traffic to private properties along the line of work at all times.
- C. Keep existing street lighting systems in operation during progress of the work at all times. When affected by the work, provide temporary lighting as required by the responsible agency.
- D. Do not open up sections of work and leave them unfinished. Finish work in process insofar as practicable.
- E. Have under construction no greater length or amount of work than can be prosecuted properly with due regards to impacts on the community.
- F. Coordinate revisions to existing traffic control with the affected agencies.
- G. Unless otherwise required by Owner keep traffic controls in operation for the benefit of the traveling public during progress of the work.
- H. As work progresses and as conditions permit, reset temporarily relocated or removed traffic and street name signs in their permanent location.
- I. Replace or repair signs and other traffic control devices damaged or lost.

1.09 TRAFFIC CONTROL REQUIREMENTS

A. Signs, Signals, and Related Devices:

1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
2. Automatic Traffic Control Signals: As approved by local jurisdictions.

B. Traffic Cones and Drums, Flares and Lights: As approved by Authority Having Jurisdiction.

C. Flag person Equipment: As required by authority having jurisdiction.

1. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
2. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:

1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
2. Confine construction traffic to designated and locally approved haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

E. Traffic Signs and Signals:

1. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain automatic and manual traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
3. Relocate as Work progresses, to maintain effective traffic control.

F. Removal of Traffic Signs, Signals and Related Equipment:

1. Remove equipment and devices at Substantial Completion.
2. Repair damage caused by installation.
3. Remove post settings completely.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 TRAFFIC MAINTENANCE REQUIREMENTS

- A. The Contractor shall take necessary measures to maintain normal flow of vehicular and pedestrian traffic to prevent accidents and to protect the Work throughout the duration of construction.
- B. Make necessary arrangements to reroute traffic.
- C. Devices provided by the Contractor shall be suitable for nighttime operation.
- D. Provide and maintain necessary barriers, cones, barricade lights, construction signs, flaggers, temporary crossings and driveways.
- E. Maintain residential, commercial and industrial normal and emergency access.
- F. Maintain vehicular traffic and minimize rerouting to the extent possible.
- G. Travel lanes shall not be blocked by the Contractor's activities, including trucks delivering and removing materials.
- H. Material deliveries and removal shall occur in the Contractor's protected work or staging areas.
- I. Restore normal traffic flow as soon as work is completed.
- J. Existing directional operation of street shall be maintained where possible.
- K. When pavement markings are damaged or removed by construction activities shall be restored by the Contractor, at no expense to the Owner. Temporary pressure sensitive pavement marking tape, traffic buttons, or delineators shall be installed in accordance with IDOT and MUTCD Standards during Work.
- L. Temporary features and traffic control devices shall be removed upon completion of Work, or when permanent pavement markings are installed.
- M. Always maintain access for emergency vehicles.
- N. Use temporary covers (including steel plates where allowed) or aggregate backfill to restore traffic flow in paved roadways, drives or parking lots.

- O. When providing facilities for pedestrian, include provisions for the safe movement of mobility and sight-impaired individuals. This shall include temporary ramps.
- P. All operations by the Contractor such as flushing, dewatering, leaking water trucks or equipment, repairs to broken water services or water main, or similar that cause freezing of water on the pavement or sidewalk shall be maintained by salting, sanding or removal of the condition by the Contractor to the satisfaction of the Engineer. This work shall be included in the cost of the Contract.
- Q. Sidewalks, gutters, drains, fire hydrants and private drives shall, insofar as practicable, be kept in condition for their intended uses. While the work is actually going on at any location, as much as half the street width at that location may be barricaded to exclude traffic entirely, but street traffic shall not be obstructed needlessly. Fire hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within ten feet of any such hydrant.
- R. "No Parking" signs must be approved by the Engineer and be POSTED AND DATED at least 24 hours before the intended date of use. "No Parking" signs shall be a minimum size of 8.5" x 11", with a contrasting background and lath or post mounted. Signage that is posted without the Engineer's consent will be fined \$500 / day until removed. No towing of vehicles shall be done by the Contractor.

3.02 LOCAL ACCESS REQUIREMENTS

- A. Unless otherwise indicated, provide local access at all times.
- B. Maintain access to private properties and businesses at all times including the work area.
- C. If access is required in the immediate work area, make provisions in the Contractor operations to provide requested access.
- D. Where, during some urgent stages of construction, temporary closure of an access to a property is unavoidable, coordinate the closure with the property owner and provide alternative access as instructed by Owner.
- E. Existing access to designated properties shall not be closed until the replacement access is available for property owner's use.

3.03 SIDEWALK CONTROL REQUIREMENTS

- A. Sidewalks adjacent to the project site shall be maintained and all appropriate standards and practices shall be maintained during construction.
- B. Sidewalks adjacent to project site shall remain open during construction, unless otherwise noted.
- C. The Contractor shall take appropriate safety measures to ensure pedestrian safety when entering and leaving the project site.

3.04 TRAFFIC SAFETY REQUIREMENTS

- A. Use adequate safeguards, safety devices and protective equipment and take other needed actions to protect life, health and safety and to protect property in connection with the performance of the work.
- B. Use flaggers, signs, and other devices, and erect and maintain barricades, guards, signs, warning signs, and detour signs, as are necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations.
- C. Where flaggers are employed, the flaggers' equipment and training shall be in accordance with local laws and regulations.
- D. Flaggers shall use all required equipment while flagging traffic.
- E. Provide and maintain temporary and permanent pavement markings including traffic markers, delineators, thermoplastic stop bars, and crosswalks to meet the current standards.
- F. When required by Owner or authorities having jurisdiction:
 - a. Provide flaggers immediately.
 - b. Provide, erect, maintain, and remove barricades and lights.
 - c. Erect, maintain, and remove standard signs.
- G. In the event traffic signal is made inoperative by or at the request of the Contractor, provide an off-duty police officer in accordance with local laws and regulations, or provide suitable traffic control devices for control and movement of traffic during the time that the signal or beacon is inoperative.
- H. Provide traffic control during the hours of construction and in a safe, prudent, operating manner.

- I. During the hours of non-construction, maintain all existing traffic lanes safe for vehicular traffic, unless otherwise noted.
- J. Leave all unfinished work in a safe, non-hazardous condition to the public.

3.05 TRAFFIC SIGNAGE MAINTENANCE

- A. Check daily each item, including weekends and holidays.
- B. Replace signs that are missing, vandalized, damaged, or not functioning properly within 24 hours of such act.
- C. Non-applicable signs shall be removed or covered during periods when they are not needed.
- D. Provide standard signs as well as other appropriate signs required by Owner as applicable and necessary for the work.
- E. Erect signs on posts and supports and maintain them in a neat and presentable condition until the necessity for them has ceased.
- F. When the need for a sign has ceased, and upon approval by Owner, take down such sign.
- G. Traffic control signs shall have a flashing beacon and a flag attached. Verify beacons are working after each work day.
- H. Control signs necessary for night-time traffic control, or remaining in place during the night, shall have a flashing beacon with a flag attached and be reflective.
- I. Safeguard and direct traffic after the existing signs have been removed.
- J. Preservation and maintenance of traffic control and street name signs shall be the sole responsibility of the Contractor.

3.06 CONSTRUCTION AND MAINTENANCE OF DETOURS

- A. Construct, maintain in a safe condition, and keep open to traffic detours that will accommodate traffic diverted from the roadway during construction.
- B. Provide for all on-site or off-site detours required or necessitated by the work, including side street crossings and temporary bridges over excavation or freshly placed concrete.
- C. Keep roadways clean to ensure the safe passage of pedestrians and vehicles.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified under this section will be made at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other Items except as listed above. All other costs associated with such Work shall be included in the prices bid for the various items to which they pertain.

--- END OF SECTION ---

TEMPORARY NO PARKING

TIME:

DATE:

CONSTRUCTION ZONE

Note – Hand written information must be dark, legible and large. Sign shall be printed on more than paper, unless laminated. Must withstand winds and stay on stake/lath.

SECTION 01 57 13

EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Furnish all work and take all measures necessary to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area.

1.02 RELATED SECTIONS

- A. Applicable sections of the following:
 - 1. Section 01 35 43 – Environmental Protection and Procedures
 - 2. Section 01 74 00 – Cleaning and Waste Management
 - 3. Section 31 23 19 – Dewatering
- B. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.
 - 1. Section 01 71 13 – Mobilization and Demobilization
 - 2. Section 02 41 00 - Demolition
 - 3. Section 31 25 13 – Erosion Controls

1.03 REFERENCES

- A. All work shall conform to Federal, State, Permitting Agency, and Local building code requirements as adopted by the County or Municipality.
- B. IEPA Standards and Specifications for Soil Erosion and Sediment Control
- C. Illinois Department of Transportation – Standard Specifications for Road and Bridge Construction.
 - 1. Section 280 – Temporary Erosion and Sediment Control
- D. Illinois Urban Manual
- E. National Resources Conservation Service
- F. Control of Air Pollution and Noise Pollution in the State of Illinois

G. Village of Hoffman Estates

1.04 SUBMITTALS

- A. Two weeks prior to the start of the work, submit to Engineer, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.

1.05 General

A. Prevention of Water Pollution

1. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
2. All earthwork, operation or moving of equipment, water control of excavations, and other operations which may create silting, shall be performed to minimize pollution of water sources or collections systems.
3. If construction materials are washed away during construction, remove materials from fouled areas.
4. Water used during the Work which has become contaminated with oil, bitumen, harmful or objectionable chemicals, sewage or other pollutants shall be disposed of in a lawful manner and so as to avoid affecting all nearby waters and lands.
5. Chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall be discharged into or alongside any body of water or into natural or man-made channels.
6. Stabilize diversion outlets by means acceptable to Engineer.

B. Noise and Air Pollution Control

1. Contractor shall conduct operations so as not violate any applicable ordinances, regulations, rules and laws, pertaining to noise and air pollution.

C. Environmental Protection

1. Contractor shall be responsible for all requirements and provisions of any permit required for the work. The Contractor shall provide adequate means of erosion and sediment control all in accordance with the herein referenced IEPA and SSRBC Standard Specifications. The Contractor shall maintain continuous surveillance and shall continuously maintain, realign, repair or replace all erosion devices required for construction activities and/or as shown on the Drawings or requested by the Owner's Representative, that are displaced or damaged by wind, water, traffic, Contractor operations or any other cause. The maintenance of the erosion

control plan shall be for the full length of the Contract unless otherwise specifically agreed upon in writing by the Owner.

2. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
3. Construction operations and clean up shall fully comply with all applicable regulations and laws concerning the protection and preservation of natural resources.

D. Dust Control

1. When required, the Contractor shall maintain dust control by use of water sprinklers or chemical dust control binder. The Contractor shall submit application and operation narrative, equipment information, and measuring devices used for review of the Engineer and Owner.

PART 2 – PRODUCTS

All products and materials shall meet or exceed the requirements of IEPA Standard Specifications for Soil Erosion and Sediment Control.

PART 3 – EXECUTION

3.01 MAINTENANCE OF SITE AND EROSION CONTROL PRACTICES:

- A. The Contractor shall sweep the roadway pavement at the end of each work day with a mechanical sweeper as deemed necessary by the Engineer. The debris shall be deposited in a self-containment type system that shall be disposed of according to Article 202.03 of the Standard Specifications for Road and Bridge Construction in Illinois, Current Edition.
- B. The Contractor will be required over the course of construction to clean inlet filter baskets weekly or prior to a forecasted rain event, whichever is sooner. In the event water is not properly running through inlet filter baskets caused by debris the Village crews may respond to resident calls about street flooding. All Village expenses incurred in labor and materials due to these calls will be back charged to the Contractor and taken off a future pay request.
- C. The Contractor will be required to perform erosion control best management practices as listed on the plans, specifications, and details during construction. Discharge of silt laden water or construction debris into the storm sewer or waterway will be grounds for a fine and the Contractor will be

responsible for cleaning all storm sewers and waterways to their preconstruction condition to the satisfaction of the Engineer. In the event an illicit discharge occurs, the Contractor shall concentrate their work efforts on remedying the situation to correct the deficiency.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 60 00

MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

- A. Furnish Proposed Manufacturers List: Within 15 calendar days of the date of the Notice to Proceed, submit to the Engineer a list of the names of proposed manufacturers, material men, suppliers, dealers and Subcontractors. Obtain approval of this list by Owner prior to submission of any shop drawings. Upon request submit evidence to Engineer that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

1.02 REFERENCES

- A. Design equipment and appurtenances shall comply with Federal, State, and Local requirements.
- B. American National Standard Institute (ANSI)
- C. American Society of Mechanical Engineers (ASME)
- D. Institute of Electrical and Electronics Engineers (IEEE)
- E. National Electrical Manufacturers Association (NEMA)
- F. Occupational Safety and Health Administration (OSHA)
- G. Architectural Glass and Metal Association (AGMA)
- H. American Institute of Steel Construction (AISC)
- I. American Water Works Association (AWWA)
- J. National Fire Protection Association (NFPA)

1.03 QUALITY ASSURANCE

- A. Provide material and equipment essential to the installation of the equipment and materials, and otherwise shown to be provided under this contract, which meet the following:

1. Equipment and appurtenances shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operation.
2. Electrical devices, motors, equipment, control panels, electrical equipment enclosures, and other electrical equipment appurtenances shall be labeled by UL or listed by another approved testing agency, in accordance with NEC requirements.
3. Complies with size, make, type, and quality specified or as specifically approved, in writing, by Engineer.
4. Ensure that it will fit into the space provided with sufficient room for operation and maintenance access, to properly connect to piping and conduits, and meet required clearances as applicable.
5. Manufacture and fabricate in accordance with the following:
 - a. Design, fabricate, and assemble in accordance with the standards referenced and the requirements given in the pertinent sections, clauses, paragraphs, and sentences, both directly and indirectly applicable thereto, in that part of the Contract Documents.
 - b. Provide equipment which is new, unused, and free from defects. It shall be of standard first-grade quality, produced by expert workmen.
 - c. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, and the like, shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.
 - d. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - e. Provide two or more items of same kind identical, by same manufacturer.
 - f. Provide materials and equipment suitable for service conditions.
 - g. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
6. Use material or equipment only for the purpose for which it is designed or specified.

B. Provide equipment lead times for Owner and Engineer review.

1.04 MANUFACTURER'S WRITTEN INSTRUCTIONS

- A. When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instructions, obtain and distribute printed copies of such instructions to parties involved in installation, including three copies to Engineer. Maintain one set of complete instructions at job site during storage and installation, and until completion of work.
- B. Material and equipment shall be stored, maintained, handled, installed, connected, cleaned, conditioned, and adjusted in accordance with manufacturer's written instructions and in conformity with Specifications.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult Engineer for direction.
 - 2. Do not proceed with work without written instructions.
- C. Perform work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.
- D. The Contractor shall document that Contractor has conformed to Manufacturer's Requirements and submit written documentation to Owner.

1.05 TRANSPORTATION AND HANDLING

- A. The Contractor shall arrange deliveries of products, materials, and equipment in accordance with Construction Progress Schedules. Deliveries shall be coordinated to avoid conflict with work and conditions at site.
 - 1. Deliver products and move from storage materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 - 2. Protect bright-machined surfaces, such as shafts and valve faces, with a heavy coat of grease prior to shipment.
 - 3. Immediately upon delivery, inspect shipments of products, materials, and equipment to determine compliance with requirements of Contract Documents and approved submittals and that material and equipment are protected and undamaged.
- B. Provide equipment and personnel to handle products, materials, and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

1.06 STORAGE, PROTECTION, AND MAINTENANCE

- A. Material and equipment shall be stored and maintained from the time of delivery until the time the Contractor transports it for installation. Provide all storage facilities and storage maintenance in accordance with these requirements.
- B. Material and equipment shall be stored with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate controlled, enclosures in an environment favorable for the product.
- D. Exterior storage areas:
 - 1. Coordinate location of storage areas with Engineer and Owner.
 - 2. Arrange on-site storage areas for proper protection and segregation of stored materials and equipment with proper drainage. Provide for safe travel around storage areas and safe access to stored materials and equipment.
 - 3. Storage site shall be located within the boundaries of the 6-foot tall security fencing specified in Section 01 50 00, and as shown on the plans.
 - 4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
 - 5. Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground.
 - 6. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment which are subject to deterioration with impervious sheet coverings, and provide adequate ventilation to avoid condensation.
- C. Interior Storage:
 - 1. Store materials and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible.
 - 2. Store materials and equipment, subject to damage by elements, in weather tight enclosures.
 - 1. Maintain temperature and humidity within ranges required by manufacturer's instructions.

- B. Arrange storage in a manner to provide easy access for inspection and inventory. Make periodic inspections of stored materials or equipment to assure that materials or equipment are maintained under specified conditions and free from damage or deterioration.
 - 1. Perform maintenance on stored materials of equipment in accordance with manufacturer's instructions, in presence of Owner or Engineer.
 - 2. Submit a report of completed maintenance to Engineer with each Application for Payment.
 - 3. Failure to perform maintenance, to notify Engineer of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.
- C. Owner assumes no responsibility for materials or equipment stored in buildings or on-site.
- D. Contractor's Responsibility:
 - 1. Contractor assumes full responsibility for protection of the equipment.
 - 2. Contractor assumes full responsibility for protection of completed construction and installation. Repair and restore damage to completed Work equal to its original condition.
- D. Only rubber tired wheelbarrows, buggies, trucks, or dollies shall be used to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.
- E. Where structural concrete is the finished surface, Contractor shall take care to avoid marking or damaging surface. Any damage as a result of the Contractor's activities shall be restored to original condition at the Contractor's expense.

1.07 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

- A. Contractor shall provide for his own use, as per manufacturer's recommendations, any and all special tools required for installation, checking, alignment, balancing, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 71 13

MOBILIZATION AND DEMOBILIZATION

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. The work consists of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

1.02 MOBILIZATION:

- A. Mobilization shall include all activities and associated costs for transportation of Contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in this specification.

1.03 DEMOBILIZATION:

- A. Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

Mobilization schedule shall be presented at the Preconstruction Meeting. Notification of changes in mobilization and demobilization schedules shall be submitted to the Owner 48 hours in advance of mobilization / demobilization activities.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified under this section will be made at the contract lump sum price for MOBILIZATION AND DEMOBILIZATION.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 01 71 20

LINES AND GRADES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Lines and grades
 - 2. Control Points
 - 3. Survey
 - 4. Construction Layout

1.02 REFERENCES

- A. Illinois Department of Transportation – Standard Specifications for Road and Bridge Construction
- B. The American Land Title Association (ALTA)
- C. National Society of Professional Surveyors (NSPS)
- D. Illinois Administration Code, Title 68, Part 1270 – Illinois Professional Land Surveyor Act of 1989
- E. Local Codes

1.03 DESIGN REQUIREMENTS

- A. The North American Vertical Datum of 1988 (NAVD88) shall be used for vertical control.
- B. See plans for additional vertical datums that should be used for the project.
- C. Topography shall reference the United States Geological Survey (USGS) Datum.

1.04 LINES AND GRADES

- A. The Contractor shall construct all work in accordance with the lines and grades shown on the Drawings and assume full responsibility for keeping all alignment and grade.
- B. Where existing grading and top of structures are to be maintained, the Contractor shall be responsible for maintaining existing rims, elevations, and grading.

1.05 CONTROL POINTS

- A. Reference control will be established and provided by the Owner on the plans or separately after the bid award. The Datum utilized for this control shall be maintained during the construction.
- B. If a control point is eliminated by construction activities, the Contractor shall be responsible for establishing new control point(s) and detailing them on the Record Drawings.

1.06 PROTECTION OF SURVEY DATA

- A. The Contractor shall take the necessary topography, locate all earthwork and structures, and establish all grades necessary for the accomplishment of the Work. The Contractor shall safeguard all points, stakes, grade marks, known property corners, monuments, and benchmarks established for the work; Reestablish them if disturbed, and bear the entire expense of checking reestablished marks and rectifying work improperly installed.
- B. The Contractor shall keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Furnish copies of such data to the Owner for use in checking the Contractor's layout. Data considered of value to the Owner will be transmitted to the Owner by the Contractor with other records on completion of the Work.

1.07 CONSTRUCTION LAYOUT

- A. The Contractor shall provide necessary field forces and equipment required to locate and layout the proposed underground structure, piping, conduit, and above grade equipment.
- B. The Contractor is responsible for ensuring all existing public and private utilities are located and field marked prior to beginning layout.
- C. The Contractor shall use wooden stakes and survey paint to layout the proposed improvements for review and approval by the Engineer and Owner.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for CONSTRUCTION LAYOUT.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 01 74 00
CLEANING AND WASTE MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Items to be Salvaged and Reused
2. Items to be Salvaged and Returned
3. During Construction
4. Completion of Work
5. Disposal of Waste

1.02 REFERENCES

- A. All work and disposal shall comply with Federal, State, and Local requirements.
- B. Illinois Environmental Protection Agency (IEPA)
- C. Metropolitan Water Reclamation District of Greater Chicago (MWRDGC)
- D. Illinois Department of Transportation (IDOT)
- E. Urban Design Manual

1.03 SUBMITTALS

- A. The Contractor shall develop a waste management plan consisting of anticipated types of waste, location and types of collection, signage, removal schedule, and disposal.
- B. The plan shall be submitted for review.

1.04 SALVAGING MATERIALS FOR REUSE

- A. Any items identified for reuse in the work shall be:
 1. Cleaned.
 2. Packed or installed in a watertight container after being thoroughly cleaned.

3. Store and protect items from damage until reinstalled. Items shall be protected from the elements, environment, rodents, and stored in accordance with the manufacturer's instructions.
4. Install salvaged items in accordance with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

1.05 SALVAGING MATERIALS FOR RETURN TO THE OWNER

- A. Any items identified to be salvaged and returned to the Village shall be:
 1. Cleaned.
 2. Packed or installed in a watertight container after being thoroughly cleaned.
 3. Store and protect items from damage until delivered. Items shall be protected from the weather, environment, and rodents.
 4. Transport items to storage area identified by Engineer or Owner.
 5. Protect items from damage during transport.

1.06 DURING CONSTRUCTION

- A. During construction, the site and the adjacent areas affected thereby, shall be cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

1.07 COMPLETION OF WORK

- A. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

- B. The Contractor shall remove from the sites of the subsurface explorations all of his plant, machinery, tools, equipment, temporary work, and surplus materials; shall, unless otherwise directed or permitted in writing, remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- C. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition. All mechanical equipment shall be left fully charged with lubricant and ready for operation.
- D. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

1.08 DISPOSAL

- A. Waste shall be removed from the project site and legally disposed of in accordance with the authorities having jurisdiction.
- B. Unless otherwise directed, waste shall not be allowed to accumulate on-site.
- C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- D. Hazardous waste shall be separated, stored, and disposed of in accordance with local authority and EPA regulations.
- E. Burning of waste material shall not be allowed.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 75 10
EQUIPMENT TESTING AND START-UP

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Contractor's Requirements.
2. Equipment Start-up Procedures.
3. Final Inspection.
4. Final Acceptance.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.

1. Section 01 32 16 – Construction Progress Schedules
2. Section 01 77 00 – Closeout Procedures

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO).
- B. American Society for Testing and Materials (ASTM).
- C. National Electric Code (NEC).
- D. Illinois Administrative Code.
- E. Standard Specifications for Water & Sewer Construction in Illinois.

1.04 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedure.
- B. Schedule: The schedule for startup shall be submitted under Section 01 32 16 - Construction Progress Schedule.

C. Start-up Plan shall include:

1. Schedules for manufacturers' equipment certifications.
2. Schedules for submitting final Technical Manuals.
3. Schedule for training Owner's personnel.
4. Electrical testing forms and inspector's review forms.
5. List of Owner and Contractor-furnished supplies.
6. Detailed schedule of operations to achieve successful pre-commissioning and commissioning.
7. Checklists and data forms for each item of equipment.
8. Designate a representative of the Contractor who has the authority to act in matters relating to startup and has experience in testing gates.
9. Start-up plan shall also designate the roles and responsibilities of any Subcontractors that may be involved in startup activities.
10. Safety, startup, and testing procedures and proposed inspection and certification forms and records.
11. Hydrostatic testing of water-holding structures and pipelines and other potable water equipment.
12. Schedule and plan shall indicate source of water, testing sequence, and the disposal of the water following completion and/or disinfection.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REQUIREMENTS

- A. Contractor shall provide the services of a qualified and experienced factory employed field service engineer from each equipment manufacturer to:
1. Verify and confirm that equipment has been installed in accordance with the manufacturer's recommended procedures.
 2. Verify and confirm that equipment is operational and ready for start-up.
 3. Make necessary repairs, corrections, and/or modifications prior to the scheduled start-up.
- B. Perform the above services at least two weeks prior to the scheduled start-up.
- C. Coordinate efforts of equipment field service engineers with construction activities.
- D. Submit Operation and Maintenance Manuals.

- E. Contractor shall schedule equipment training with Village Staff only after the equipment has been successfully started up. Training shall be between the hours of 8:00 AM and 3:00 PM, between Monday and Friday, excluding hours.

3.02 EQUIPMENT START-UP PROCEDURES

- A. Upon substantial completion of all Work specified in the Contract Documents, the Contractor shall perform final field alignments, adjustments, and tests to verify that the overall performance as specified have been satisfied. Acceptance tests conducted on the completed installation will be witnessed and subject to the approval of the Owner and Engineer.
- B. Equipment shall remain in operation a minimum of 15 calendar days, prior to scheduling start-up procedures/testing with the Owner and Engineer.
 - 1. During this operational period, the Contractor shall make such changes, adjustments, or replacement of the equipment furnished and installed under this Contract as may be required to comply with the specifications, or to replace any defective work.
 - 2. When, in the opinion of the Village Maintenance Staff and the Engineer, said changes, adjustments, or replacements of the equipment are substantial, then the test period shall be reinitiated and continue for at least 15 calendar days upon completion of the changes.
- C. Perform the facility start-up procedures in the presence of the Owner and Engineer.
- D. Prior to scheduling and performing start-up procedures for the pump equipment and controls, the Contractor shall be responsible for storing or providing sufficient water to run each pump for a minimum of 5 minutes. If sufficient water is not available through natural rainfall or groundwater intrusion, then the Contractor will be required to provide water. The Contractor shall include all costs associated with providing sufficient to test the pumps, including any portable pumping units needed to supply water, as part of his lump sump price. All pump testing shall be performed within a 5-day (maximum) timeframe.

3.03 FINAL INSPECTION

- A. When all Work has been substantially completed and the equipment has been installed, tested, placed into operation, and subsequently has satisfactorily operated, a thorough inspection will be made by the Owner and Engineer in the presence of the Contractor, and if the Work is found to comply with the Specifications, the Work will be formally accepted and the Contractor so notified in writing as to the Final Acceptance of the Work by the Owner.

- B. Should any Work be found to be inadequate, faulty, or otherwise not in accordance with these Specifications, it shall be the Contractor's responsibility to correct such Work at the Contractor's own expense, prior to Final Acceptance.

3.04 FINAL ACCEPTANCE

- A. If, in the opinion of Owner and/or Engineer, it has been demonstrated in the operation test that the equipment furnished and installed under this contract meets the performance requirements of the Contract, then the equipment furnished and installed under this Contract shall be accepted by Owner.
- B. However, if, in the opinion of Owner and/or Engineer, it has been demonstrated in the operation tests that the equipment furnished and installed under this Contract does not meet the performance requirements of the Contract, then the Contractor shall, at their own expense, make all necessary changes, betterments, or replacements in the equipment so that it will meet the performance requirements when again tested.
- C. If the Contractor fails or refuses to make changes, improvements, or adjustments, or if the improved equipment when placed into operation, shall again fail to meet the performance requirements, the Owner, with their ownership of the work, material and equipment installed, shall have the option of rejecting the equipment or of accepting the equipment at such reduced prices as may be agreed upon by the Contractor and Owner.
 - 1. In the case the Owner exercises this option and rejects the equipment, then the Contractor shall repay Owner all sums of money paid to them on progress payment for the prices bid, and upon receipt of said sums of money, Owner will execute and deliver to the Contractor a letter relinquishing their right, title, and interest in and to the equipment.
 - 2. Rejected equipment shall not be removed from the property until the Owner obtains replacement equipment to take the place of equipment rejected.
 - 3. The Owner agrees to obtain the replacement equipment within a reasonable time, and the Contractor agrees that the Owner may use the equipment furnished and installed by them without rental or other charges until the other new equipment is obtained.
- D. The period of equipment and workmanship guarantees shall commence immediately after Final Acceptance. Upon being notified of the Final Acceptance, the Contractor shall supply, to the Owner, a certificate of guarantee which shall guarantee all equipment and workmanship for a period of not less than one year from the date of final acceptance or as otherwise specified in subsequent Sections of the Specifications. Guarantees shall be unconditional. Limited guarantees are not acceptable.

PART 4 - MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section Includes:
 - 1. Closeout Procedures.
 - 2. Final Cleaning.
 - 3. Record Documents.
 - 4. Operation and Maintenance Manual.
 - 5. Spare Parts.
 - 6. Product Warranties and Bonds.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.
 - 1. Section 01 71 00 – Cleaning and Waste Management.
 - 2. Section 01 75 10 – Equipment Testing and Startup.

1.03 CLOSEOUT PROCEDURES

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

1.04 FINAL CLEANING

- A. Provide final cleaning prior to final acceptance.
- B. Clean interior and exterior, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean all sanitary manholes and storm sewer manholes, catch basins, and inlets.
- F. Clean site, sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.
- H. Remove waste and surplus materials, rubbish, broken concrete, wood scraps, wire, packaging materials, forms, and construction facilities from the site.

1.05 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
- G. 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.
- H. Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

1.06 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel 2 weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruct in a classroom environment located at the project site and instructed by a qualified manufacturer's representative who is knowledgeable about the Project.
- C. 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.
- D. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at each location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.07 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- D. Prohibit traffic from landscaped areas.

1.08 PROJECT RECORD DOCUMENTS

- A. Maintain and submit one set of the following record documents; record actual revisions to the Work:
 - 1. Record 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 maintenance.
- 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 shall consist of legible mark-ups on the Construction Drawings or CAD detailing the following:
1. Measured depths of foundations in relation to finished floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Routing of all proposed and existing utilities.
 4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 5. Field changes of dimension and detail.
 6. Details not on original Contract Drawings.
 7. Installed equipment and configuration.
 8. Installed piping/valves layout and configuration.
 9. All elevations shall be recorded on the NAVD 88 datum, consistent with the plans.

10. Record Drawings with insufficient recorded information will be rejected. In particular the contractor shall note where all elevation adjustments and alignment adjustments have been installed.
11. Record Drawings shall be turned in with the Contractors notice of completion. Failure to submit Record Drawings with the notice of completion will begin to trigger liquidated damages after the project completion date or when working days have been exhausted.
12. Record Drawing Submittal shall consist of two 11"x17" hard copies of the complete plan set; and, one USB containing a pdf copy of the complete plan set and CAD files.

G. Submit documents to Engineer with claim for final Application for Payment.

1.09 OPERATION AND MAINTENANCE MANUAL

- A. Operation and maintenance manual shall be in English language.
- B. Submit data bound in 8-1/2" x 11" text pages, 3-D side ring binders with durable plastic covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE MANUAL," title of project, and subject matter of binder when multiple binders are required.
- D. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings included in the binder shall be provided with a reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. The manual shall be separated into three volumes each with a Table of Contents. Each manual shall include, but not limited to, the following information:
 1. Volume 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers. Also, include a brief description of the equipment/system, major components, and starting/stopping procedures both for normal and emergency operation.
 2. Volume 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 finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- g. Recommended schedule for servicing including technical data sheets that indicate weights of types of oil, grease or other lubricants recommended for use and their application procedures.

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

- a. Final shop drawings and product data, including any changes made during construction.
- b. Air and water balance reports.
- c. Certificates.
- d. Originals or Photocopies of warranties and bonds.

G. Submit draft copy of completed volumes 15 calendar days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.

H. Submit 3 sets of revised final volumes, within 10 calendar days after final inspection.

I. Submit digital format of manuals in PDF format in addition to hardcopies described above.

1.10 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Provide keys and security cards for all doors, gates, and equipment.
- C. Provide all software keys and passwords.
- D. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

1.11 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten calendar days after completion of the applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- E. Verify that documents are in proper form, contain full information, and are notarized.
- F. Execute submittals when required.
- C. Provide warranties in Operation and Maintenance Manual see above section 1.09.
- D. Submit prior to final Application for Payment.
- G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 calendar 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 10 calendar days after acceptance, listing the date of acceptance as the beginning of the warranty or bond period.

1.12 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for 2 years from date of Substantial Completion.
- B. During the warranty period, the Contractor shall be responsible for troubleshooting operational issues as notified by the Village, and there will be no costs to the Village for troubleshooting services regardless of findings.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

As specified in applicable sections of the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 02 41 00

DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section Includes:
 - 1. Project site conditions.
 - 2. Site demolition requirements.
 - 3. Hazardous materials.
 - 4. Notification.
 - 5. Preparation.
 - 6. Demolition and removal.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.
 - 1. Section 01 35 43 – Environmental Protection and Procedures.
 - 2. Section 31 11 00 – Site Clearing and Grubbing.
 - 3. Section 31 20 00 – Earth Excavation.
 - 4. Section 31 23 16 – Trench Excavation, Backfill, and Compaction.
 - 5. Section 31 23 19 – Dewatering.
 - 6. Section 31 25 14 – Erosion Controls.
 - 7. Section 31 41 00 – Shoring, Sheet piling, and Bracing.
 - 8. Section 33 43 00 – Temporary Bypass Pumping System

1.03 REFERENCES

- A. Work shall be performed in accordance with the latest editions of the following standards. In case of conflict between the requirements of this Section and those of the listed standards, the most stringent shall prevail.
 - 1. American Concrete Institute (ACI)
 - 2. American Society of Mechanical Engineers (ASME)
 - 3. ASTM International
 - 4. AASHTO
 - 5. Illinois Environmental Protection Agency
 - 6. Illinois Department of Transportation (IDOT)
 - 7. Occupational Safety and Health Administration (OSHA)

1.04 SUBMITTALS

- A. Submittal shall be in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submittal shall also include the following:
 - 1. Description of demolition operations and procedures.
 - 2. Demolition schedule
 - 3. Data and information pertaining to the demolition Work.
 - 4. As specified herein.
- C. The Contractor shall submit material test reports on samples of all fill and backfill.
- D. The Contractor shall submit a material in-situ compaction test report for backfill required by the demolition operations.
- E. Provide submittals as required during utility identification, relocates and protection. Provide submittals as required by the utility involved and / or having jurisdiction. Submittals shall be directly to the utility involved with copy to the Engineer.

1.05 REGULATORY REQUIREMENTS

- A. Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Obtain and pay for all permits required.
- B. Conform to applicable requirements of local, state, and federal codes, rules and regulations applicable to demolition work including but not limited to erosion control, air pollution, noise pollution, and waste disposal.

1.06 PROJECT DESCRIPTION

- A. This work shall consist of the selective demolition of equipment, piping, structures, electrical and mechanical system from the station including, but not limited to the following:
- B. Dry Pit Station:
 - 1. Cut and remove top 5 ft of structure.
 - 2. Above grade SCADA Panel.
 - 3. Fill existing structure with CLSM as shown on the Drawings.
 - 4. All other items shall remain in place or be removed by the Contractor at no additional cost to the Owner.
- C. Wet Well:
 - 1. Interior grating.

2. Sump pump.
3. Remove floats and any remaining equipment.
4. Fill existing structure with CLSM as shown on the Drawings.
5. Form a new bench in the structure for it to be used as a manhole structure.

D. Electric Service:

1. Conduit, cables, meter and disconnect.

E. Electrical and mechanical equipment:

1. Pump controller.
2. Equipment to be salvaged and returned to the Owner:
 - a. Radio.
 - b. Antenna.
 - c. RTU panel.

F. Site features, including but not limited to:

1. Concrete pads.
2. Sanitary sewer piping in direct conflict with the new lift station, and as shown on the Drawings.
3. Storm sewer piping, and as shown on the Drawings.

G. Any additional features necessary for the construction of the proposed lift station.

H. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the work so as not to interfere with the day to day operation of the existing facilities. Do not block doorways or passageways in existing facilities.

I. Additional Requirements: Provide dust control for existing and new equipment protection and make provisions for safety.

1.07 SCHEDULING

A. Perform Work in manner which will provide least interference and most protection to public and existing construction. Contractor's operations subject to approval by Owner prior to commencement of Work.

B. The Contractor shall inspect and schedule a meeting to discuss piping and equipment condition to be demolished.

C. Carefully coordinate time and manner of demolition work with Engineer to assure continued operation of existing facilities and to maintain construction schedule requirements.

D. Owner's use of premises shall have priority over work in all Contract(s).

- E. Minimize outages of electrical systems.
- F. Coordinate electrical system outages with Owner and service utility. Notify Owner in writing at least 24-hours prior to electrical outage. Indicate system to be disabled, areas affected, proposed date and time of outage, duration, and work to be performed.
- G. Outages of following systems shall be performed only with written permission of Owner.
 - 1. Power distribution.
 - 2. Fire alarm.
 - 3. Telephone.
 - 4. Natural gas piping.
 - 5. Sanitary sewer.

1.08 PROJECT SITE CONDITIONS

- A. Conduct demolition to minimize interference with adjacent property, structures, and buildings.
- B. Maintain egress and access to project site at all times.
- C. Provide, erect, and maintain temporary barriers, fences, and security devices.
- D. Conduct operations with minimum interference to public or private thoroughfares.
- E. Do not close or obstruct roadways, driveways, and sidewalks without permits or approval by the Owner.
- F. Protect underground facilities encountered during excavation until it is determined whether they are active or inactive. Repair, without compensation, existing active facilities shown on Drawings damaged during operations.
- G. Notify Engineer and Owner of unexpected subsurface conditions and discontinue Work in area until Owner provides notification to resume Work.

1.09 HAZARDOUS MATERIALS

- A. It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials that are suspected of containing hazardous materials are encountered, the Contractor shall not disturb, and notify the Engineer and Owner immediately.

1.10 QUALITY ASSURANCE

A. Utility Identification, Relocate and Protection.

1. Perform all Work of this Section in accordance with the applicable requirements of codes and standards of the agency / utilities involved. Comply with IDOT Standard Specifications (Sections 105.07 and 107.31) for Cooperation with Utilities and Contractor Responsibility.

B. Retain services of a qualified professional soils consultant and testing laboratory. Responsibilities of soils consultant will include:

1. Sampling, testing, and approval of fill or backfill materials prior to and during placement.
2. Sampling and testing to determine moisture-density, maximum density and relative density characteristics of materials.
3. Observation of placement, selection of test locations and testing of material during placement to determine that specified compaction requirements are met.
4. Provide reports to Owner giving information on materials and testing performed.
5. Bind all reports and recommendations in one report at end of Project and submit to Owner.
6. Soils consultant shall provide evidence of professional registration in state where Work is performed and Professional Liability Insurance covering its activities in investigation, evaluation and production of reports dealing with subsurface soils investigations.

C. Temporary electrical construction necessary to maintain existing system during construction shall comply with NEC Article 590, local ordinance and electric utility company (where applicable).

PART 2 – PRODUCTS

2.01 MATERIALS OWNERSHIP

- #### A. Items or materials to be reused, salvaged, reinstalled, or to remain property of the Owner shall be as shown on the Drawings, or as directed by the Owner.

- B. All other demolished/removed materials shall become Contractor's property and shall be removed, recycled, or disposed from Project Site in an appropriate EPA - approved landfill acceptable to the authority having jurisdiction and in accordance with Article 202.03 of the Standard Specifications.

2.02 CONTROLLED LOW STRENGTH MATERIAL

- A. The Contractor shall submit to the Engineer a mix design for the flowable fill used on the project. The mix design shall generally conform to the following mix as designed by Prairie Material Mix #6115811, or as approved by the Engineer:

Cement:	80 Pounds
Fly Ash:	910 Pounds
Sand:	1850 Pounds
Water:	54.7 Gallons
A/E:	1 – 25%
Slump:	10 ± 1"

PART 3 – EXECUTION

3.01 NOTIFICATION

- A. Contractor, prior to any excavation work, shall notify (1) a designated locating service; (2) all utilities, governmental agencies, entities, known to, or which can reasonably be assumed to have above or below ground pipe, conduit cables, structures, or similar items within limits of project; to locate and mark location of such items.
- B. In accordance with Illinois Statute 220 ILCS 50, "Illinois Underground Utility Facilities Damage Protection Act," every "Person" as defined in 50/2.1 shall be solely responsible to provide advance notice to "Julie, Inc." (800-892-0123) or, within the City of Chicago, to "Digger" (312-744-7000) not more than fourteen nor less than two working days prior to commencement of any Excavation or Demolition, as defined in the statute, required to perform work contained in this Project, and further said "Person" shall comply with all other requirements of this Statue relative to Excavator's Work.

3.02 UTILITY IDENTIFICATION, RELOCATES AND PROTECTION

- A. Active utilities which do not interfere with the Work shall be supported and protected from damage. After Engineer review and obtaining the utility's approval, relocate or remove active utilities which will interfere with Work. The Contractor shall pay for all damage to active utilities and for relocation or removal of all interfering utilities which are ascertainable from Drawings, surveys or site inspection, including J.U.L.I.E meet to be scheduled by the Contractor.

- B. Inactive or abandoned utilities and appurtenant structures encountered shall be filled or removed to avoid interference as directed by the Owner, Engineer, and/or the Utility. Exposed ends of abandoned lines shall be plugged or capped in a water-tight manner.

3.03 VERIFICATION OF SITE CONDITIONS

- A. Inspect structures where demolition is required. Review existing Drawings of buildings and structures. Drawings are available from Owner. The Owner does not guarantee that existing conditions are same as those indicated in the Contract Drawings.
- B. Determine actual Site conditions, extent to which demolition is required, and method of demolition.
- C. Perform excavation and dewatering necessary to accomplish Work.
- D. Schedule work with Owner and work in other parts of these Contract Documents.
- E. Perform surveys as required prior to demolition and as Work progresses to detect hazards resulting from demolition activities.
- F. Record the condition of items to be removed and salvaged. The Contractor shall provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.04 PREPARATION

- A. Conduct demolition operations and remove C&D materials to ensure minimum interference with roads, streets, sidewalks, and other adjacent occupied and utilized facilities.
- B. Do not close or obstruct streets, driveways, and sidewalks, or other adjacent occupied or utilized facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area, by providing necessary temporary protection consisting of fencing, steel plates, barriers, and barricades.
- D. Protect existing Site improvements, appurtenances, and landscaping that are designated to remain in place.

- E. Prevent movement or settlement of adjacent structures scheduled to remain.
- F. Provide bracing and shoring of adjacent structures scheduled to remain.
- G. Disconnect, cap, and remove designated utility lines, including sewer and water services within demolition areas as shown on the Drawings, or in accordance with Authority having jurisdiction.
- H. Cooperate and work with local utility company to provide removal and disconnection of designated electrical and communication services.
- I. Mark location of disconnected utilities. Identify utilities and indicate capping locations on project record documents.

3.05 DEMOLITION AND REMOVAL

- A. Remove all structures, foundations, slabs, utilities, utility services, and underground storage tanks as shown on the Drawings.
- B. Immediately remove demolished material from site unless approved demolition procedure and schedule submitted.
- C. Demolish and remove designated concrete and HMA pavement which includes:
 - 1. Curb and gutter.
 - 2. Driveways.
 - 3. Barriers.
 - 4. Guardrail.
 - 5. Roadways, as shown on the Drawings.
 - 6. Concrete pads.
- D. Neatly saw cut all pavement edges at right angle to surface to complete depth of pavement prior to shattering or mechanical removal.
- E. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose. Obtain permits, water meter, and pay for water usage as required by Local Water Utility.
- F. Backfill areas excavated, open pits, and holes caused as a result of demolition with subsoil or aggregate, as shown on the Drawings, or as directed by the Engineer.
- G. Rough grade and compact areas affected by site demolition to maintain and blend site grades and contours shown on the Drawings.

3.06 DEMOLITION AND REMOVAL OF UNDERGROUND ITEMS

- A. Below-grade construction: Demolish foundation walls and other below-grade construction, as follows:
 - 1. Pipes abandoned in place shall be cut and capped as indicated on drawings.
 - 2. Any below-grade valves demolished shall be removed, and remaining pipe cut and capped.
 - 3. Below-grade areas: Completely fill below-grade areas and voids resulting from demolition operations to street level with satisfactory soil materials, or low strength concrete, as indicated on the Drawings.
 - 4. Foundations, walls, and structures shall be removed to 5 feet below grade, or as indicated on the Drawings.
- B. Promptly repair damages to adjacent facilities caused by demolition operations.
- C. Remove existing construction as specified and shown and as required to permit new construction.
- D. Perform removal in manner that will minimize dust, noise, and other nuisance. Maintain haul routes for disposal of material clean and free of debris.
- C. Remove existing construction carefully providing for neat and orderly junctions at construction to remain in place. Final appearance of exposed surfaces shall be similar and equal to that of adjacent existing work. Grind off rough surfaces to remove sharp projections.
- D. Any portion of existing construction whether structural, or accessory which has become unstable through removal of other parts of construction shall be removed as soon as practicable, and no such unstable part shall be left free-standing or inadequately braced against causes of collapse at end of each day's work.
- E. No demolition shall be performed on piping, electrical circuits, or equipment until system has been isolated by owner of the utility. Contractor shall verify isolation of system.
- F. Contractor shall relocate existing active miscellaneous piping, conduit, and electrical circuits and devices not detailed on Drawings but required for installation of equipment and items installed by this Contract.

3.07 DEMOLITION OF MECHANICAL ITEMS

- A. Remove mechanical equipment and materials as shown on Drawings and as specified.
- B. Removal shall include but not limited to piping, valves, equipment, pipe hangers/supports, and associated accessories.

3.08 DEMOLITION OF ELECTRICAL ITEMS

A. Examination:

- 1. Trace existing wiring to power source to verify that electrical cable to be removed is only connected to equipment and items to be abandoned.
- 2. Demolition drawings are based on cursory field observation and existing record documents. Report discrepancies to Engineer and Owner before disturbing existing installation.

B. Preparation:

- 1. Before beginning underground demolition, contact Owner, and local utilities locating service JULIE at least 24 hours before digging.
- 2. Contact Owner to determine equipment items are to be salvaged and delivered to storage area. Other equipment shall become property of Contractor and shall be removed from job site.
- 3. Coordinate utility service outages with utility company.
- 4. Provide temporary wiring and connections to maintain existing systems in service during construction.
- 5. Existing electrical service: maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

C. Demolition and extension of existing electrical work:

- 1. Remove, relocate, and extend existing installations to remain to accommodate new construction.
- 2. Abandoned existing wiring, unless otherwise shown on the Drawings.

3. Conduit shall be cut down to 1 foot below grade and abandoned, unless otherwise shown on the Drawings.
4. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
5. Disconnect and remove following:
 - a. Electrics service.
 - b. Controller(s).
 - c. Panelboards and distribution equipment.
 - d. Devices and equipment serving utilization equipment that has been removed.
 - e. Abandoned light fixtures, including brackets, stems, hangers, and other accessories.
6. Repair adjacent construction and finishes damaged during demolition and extension work.
7. Maintain safe access to existing electrical installations which remain active.

3.09 HANDLING OF DEMOLISHED MATERIALS

- A. Salvageable materials, except items specified to remain property of Owner, shall become property of Contractor and shall be removed from Site as Work progresses.
- B. Promptly re-use, salvage, recycle, or dispose of demolished materials. Removed materials shall not accumulate or be stored on-site for more than 5 days.
- C. Storage of materials to be disposed of shall not be permitted to accumulate on site. The Contractor shall promptly remove and dispose of unsalvageable equipment and materials.
- D. Certain equipment and material shall be removed and reinstalled as indicated on Drawings and specified herein. Contractor shall remove such items, store if required, and reinstall as indicated. In event of loss or damage to such material or equipment, Contractor shall replace items without additional cost to Owner.
- E. Burning of demolished materials shall not be allowed.
- F. Debris shall not be allowed to accumulate on roofs, floors, or in areas outside of and around any buildings being removed. Waste materials and debris resulting

from Work shall be removed and disposed of daily by Contractor in disposal area obtained by Contractor.

- G. No material, obstructions, or debris shall be placed or allowed to accumulate within 15 feet of any fire hydrant. Fire hydrants shall be accessible at all times.

3.10 DISPOSAL OF MATERIALS

- A. Transport demolished materials from construction sites and legally recycle or dispose of materials.
- B. Special Waste and Hazardous Materials: If special waste and/or hazardous materials are encountered in areas other than those indicated on the Drawings during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, disposal, and protection against exposure or environmental pollution.

3.11 REPAIR AND RESTORATION

- A. Contractor shall be responsible for damage to personnel, public, roadways, streets, structures, utilities, facilities, and equipment caused by operations and shall repair any damage at its own expense or replace items damaged beyond repair.
- B. Do not operate vehicles or equipment on existing construction or roadways that could be damaged.
- C. Backfill applicable excavated areas, open pits, and other depressions as work progresses. Backfill materials shall conform to requirements of Drawings and other specification sections.
- D. Grade areas disturbed by construction to smooth, uniform surfaces sloped to drain.
- E. Replace construction removed to facilitate operations with construction of equal quality to that removed.

3.12 CLEAN-UP

- A. Maintain public streets, alleys, or other thoroughfares used in carrying out disposal free of litter or soil attributable to this operation.
- B. Contractor shall be responsible for preventing liquid leakage, debris or material escaping/blowing off from trucks delivering or hauling from the project site.

- C. Any cost incurred by Owner in cleaning up such litter will be charged to Contractor and deducted from monies due or to become due it under this contract.
- D. Upon completion of demolition work in each area, thoroughly clean area of materials not to remain.
- E. Remove materials (except paint) adhered to construction to remain.
- F. Leave areas in broom clean and vacuumed condition.

3.13 EXPOLOSIVES

- A. Explosives: Use of explosives shall not be permitted.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the contract lump sum price for DEMOLITION.
- B. Removal of driveways, sidewalks, curb/gutter, storm sewer, storm inlets, and HMA pavement shall be paid for under separate pay items, under the Schedule of Prices for the project.
- C. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- D. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 03 00 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cement
2. Aggregate
3. Fly Ash
4. Water
5. Admixtures
6. Reinforcing Steel
7. Forms
8. Curing Material
9. Grout
10. Concrete
11. Controlled Low Strength Material
12. Ready Mix Concrete

1.02 RELATED SECTIONS

- A.** The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.

1. Section 03 40 00 – Precast Concrete Structures.
2. Section 08 10 10 – Access Hatches and Boxes.
3. Section 09 90 00 – Painting and Coatings.

1.03 REFERENCES

- A.** Work shall be performed in accordance with the latest editions of the following standards. In case of conflict between the requirements of this Section and those of the listed standards, the most stringent shall prevail.

1. America Concrete Institute (ACI)
2. American Society of Mechanical Engineers (ASME)
3. ASTM International
4. AASHTO
5. Standard Specifications for Road and Bridge Construction

1.04 DESCRIPTION

- A. The Contractor shall be responsible for providing the following cast-in-place concrete items:
 - 1. Concrete equipment pad.
 - 2. Other concrete pads as shown on the Drawings.

1.05 SUBMITTALS

- A. Submittal shall be in accordance with Section 01 33 00 – Submittals.
- B. Material Test Reports:
 - 1. Tests, or certificates of compliance with standards specified in this Section at least 14 days prior to commencing concrete placement for:
 - a. Cement: From each car from which cement will be used.
 - b. Fly ash: From each separate shipment from which fly ash is being used.
 - c. Aggregates: For each size aggregate from each source of aggregate, for grading, deleterious substances, and soundness.
 - 2. Testing laboratory reports required at least 14 days prior to commencing concrete placement for each class of concrete and each size aggregate:
 - a. Proposed concrete design mix.
 - b. Tests on concrete cylinders from trial batch of proposed mix.
 - 4. Testing laboratory reports for tests on concrete cylinders taken in the field.
- C. Material Certificates/Product Data: The Contractor shall provide each of the following materials signed by the material manufacturers.
 - 1. Admixtures
 - 2. Waterstops
 - 3. Curing compounds
 - 4. Bonding agents
 - 5. Joint fillers
 - 6. Sealants
 - 7. Attachment accessories
 - 8. Any data on specific items requested by Engineer.

1.06 QUALITY ASSURANCE

A. Contractor shall retain services of qualified independent testing laboratory.

B. Responsibility of testing laboratory shall include:

1. Obtaining, making samples and trial batches and performing laboratory and field testing specified.
2. Provide reports to Engineer giving information on materials, concrete design mixes and testing performed.
3. Reports shall indicate whether or not materials meet specifications.

C. Perform Work in accordance with ACI 117 and 301.

D. Tests:

1. Establish proposed concrete design mix proportions on basis of either field experience and/or trial mixtures in accordance with ACI 318, Chapter 5, except specific requirements shall conform to requirement of these specifications. Determine and submit supporting data, standard deviation, trial batch tests, required average strength, proportions, air content, and slump range for each mix.
2. Concrete strength tests:
 - a. Comply with ASTM C39 for testing and ASTM C31 or C192 for preparation of cylinders.
 - b. Field tests: Sample in accordance with ASTM C172; make and test 3 cylinders from each sample on basis of not less than one sample from each day's placement for each class of concrete.
 - c. Cylinders shall be laboratory cured. Test one laboratory cured cylinder at 7 days and other two at 28 days for average strength.
 - d. If tests indicate deficient strength as defined by ACI 318, immediately adjust mix to increase average of subsequent test results and, when directed, perform drilled core testing, ASTM C42. Testing and remedial work shall be at no additional cost to Owner.
3. Slump tests:
 - a. Test each batch as delivered; comply with ASTM C172 and C143.

- b. If slump exceeds Specifications, promptly remove batch from Work and dispose of off-site at location selected by Contractor. Do not add water in excess of specified water-cement ratio to batch to achieve desired slump.

4. Air content tests:

- a. Sample on basis specified above for field strength tests.
- b. Obtain samples from concrete after it has been placed and consolidated.
- d. Determine air content by pressure method; comply with ASTM C231.
- c. If air content does not meet Specifications, remove deficient concrete from Work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Cement: Keep clean, dry, and free from weather damage.
- B. Aggregates: Stockpile each gradation separately on clean, noncontaminating surface.

PART 2 – PRODUCTS

2.01 CEMENT

- A. Portland cement: ASTM C150, Type I.
- B. High-early-strength Portland cement: ASTM C150, Type III. May be used instead of Type I cement at Contractor's option, unless specified otherwise, to achieve 28-day strength at 7 days. Do not use in concrete where least dimension of concrete section exceeds 3'-0" (900 mm).
- C. White cement: Non staining, ASTM C150, Type I.
- D. Use only one brand of each type of cement.

2.02 AGGREGATE

- A. Regular aggregate: Strong, durable, well-graded minerals conforming to ASTM C33 requirements for grading, deleterious substances and soundness.

B. Aggregates not conforming exactly to above specifications may be used provided special tests or actual service establish that such aggregates will produce concrete of quality specified.

C. Coarse aggregate nominal size:

1. 1-1/2" to No. 4: Use for all concrete unless specified otherwise.

2. 3/4" to No. 4: Use for slabs and thin sections and areas where clear spacing between reinforcing bars is less than 3".

2.03 FLY ASH

A. Conform to ASTM C618.

B. Fly ash for total Project shall be obtained from single source.

C. Design concrete mixes to include fly ash in amount of approximately 15% to 20% of cement by weight.

D. May be used at Contractor's option for all concrete.

2.04 WATER

A. Clean, fresh, free from injurious amounts of oil, alkali, acid, salts, organic materials, or other substances that may be deleterious to concrete or steel. Mix water shall comply with ASTM C1602.

2.05 ADMIXTURES

A. Water-reducing and set-controlling admixture, ASTM C494, type as required. Use for all concrete.

B. Air entraining agent, ASTM C260. Use in accordance with manufacturer's recommendations.

2.06 REINFORCING

A. Bars: ASTM A615 or ASTM A706, Grade 60 (420) deformed bars.

1. Bend bars cold to conform to required details.

B. Smooth Dowels: Smooth dowels shall be ASTM A615, Grade 60 plain bars.

C. Threaded Dowels: Threaded dowels shall be ASTM A36.

- D. Welded wire fabric: ASTM A185 plain wire in coiled rolls. Where welded wire fabric is shown, but not size on Drawings, the Contractor shall use a 6" x W2.9 x W2.9 WWF, minimum.
- E. Tie Wire: Minimum 16 gauge, annealed type.
- F. Accessories: Accessories for proper installation of reinforcement shall conform to CRSI "Manual of Standard Practice for Reinforced Concrete Construction."

2.07 FORMS

A. Acceptable materials:

1. Douglas fir, exterior type, concrete form plywood, 5/8" thick, Grade B-B, conforming to High Density Overlay Concrete Form Panels, Class I or II.
2. Removable metal forms with surfaces equal to Douglas fir, exterior type, concrete form plywood.
3. Fiber tube forms: Cylindrical fiber reinforced forms.

B. Form ties: Snap-off type, galvanized metal, fixed length, with waterproofing washer, free of defects.

1. Ties shall not leave any metal within 1" of finished surface after removal of forms.

C. Form coating:

1. Wood forms: Nonstaining mineral oil or commercially produced form-release agent that will not bond with, stain, or adversely affect concrete surfaces and curing, and will not impair bond or adhesion of subsequent treatment of concrete surfaces, "Nox-Crete Form Coating," by Nox-Crete Chemicals, or equal.
2. Metal forms: Treat surfaces as recommended by manufacturer before placing reinforcing.
3. Fiber tube forms: Treat surfaces as specified for wood forms or as recommended by manufacturer.

2.08 CURING MATERIALS

A. Liquid membrane-forming compound:

1. ASTM C309, Type 1 with fugitive dye, except Type 2 with white pigment for surfaces exposed to direct rays of sun.

2. Do not use compounds containing wax, oil, resin, varnish, or other bases that will prevent bonding of finishes such as floor coverings, tile, additional concrete, paint, and similar applied finishes.
3. Use for curing at Contractor's option except where other products are specified for particular application.

B. Plastic film:

1. Polyethylene plastic film, white, nonstaining, conforming to ASTM D2103.
2. Minimum 4-mil thickness.
3. Use for curing at Contractor's option except where other products are specified for particular application.

C. Absorptive mat:

1. ASTM C171, Cotton fabric, burlap fabric, or burlap-polyethylene material woven or bonded to prevent separation.
2. Material shall be clean and nondetrimental to concrete or finish.
3. Use for curing at Contractor's option except where other products are specified for particular application.

2.09 GROUT

A. Patching grout:

1. One part Portland cement to three parts fine aggregate with sufficient water to maintain adequate workability. Substitute white cement for normal Portland cement to match color of adjacent concrete.
2. Minimum strength: 4,000 psi at 28 days.
3. Use for patching.

B. Cement Grout:

1. One part Portland cement to one part sand with water to a thick paint consistency. Add white cement for normal Portland cement to match color of adjacent concrete. Sand shall pass a No. 18 sieve.

C. Non-shrink grout:

1. Nonmetallic and free of chloride, gypsum or corrosive-type materials; ASTM C1107, Grade A; formulation suitable for application.
2. Minimum strength: 5,000 psi at 28 days.
3. Use for grouting beneath baseplates.

D. Epoxy Bonding Compound:

1. Epoxy bonding compound for joining new to existing concrete. Bonding compound shall be Sikadur Hi-Mod by Sika Chemical Co., Thiopoxy by W.R. Grace, Euco Epoxy 452 or 620 by Euclid Chemical Co., or Owner approved equal.

E. Non-Epoxy Bonding Compound:

1. Non-epoxy bonding compound for joining new to existing concrete where bonding compound cannot be placed immediately prior to pouring of new to existing concrete where bonding compound cannot be placed immediately prior to pouring of new concrete shall be Weld-crete by Larsen Products Corporation, Euco Weld by Euclid Chemical Co., or Owner approved equal. Rewettable bonding compound shall be protected from all sources of moisture prior to pouring new concrete.

2.10 CONCRETE DESIGN AND USE

- A. Each concrete design mix shall be established in strict accordance with ACI 318 by proportioning on basis of either experience and/or trial mixtures.

B. Strength classifications:

1. Class A:

- a. Compressive Strength (f'_c) = 4,000 psi.
- b. Required Average Compressive Strength (f'_{cr}) = 5,200 psi.

- C. Required average compressive strengths: Produce concrete of average strengths noted above unless test results substantiate a lower permissible average strength based on standard deviation criteria set forth in ACI 318. Strengths listed above are 7-day strengths for concrete using high-early-strength cement and 28-day strengths for concrete using other type cements.

- D. Maximum water-cement ratio: 0.48% by weight. Where pozzolan fly ash is used, water-cement plus pozzolan ratio shall not exceed specified ratio.

E. Air entrainment: Concrete shall contain entrained air within following limits.

1. Nominal Maximum Size of Coarse Aggregate = $\frac{3}{4}$ "
 - a. Total Air Content, Percent By Volume = 4 – 8%
2. Nominal Maximum Size of Coarse Aggregate = 1-1/2"
 - a. Total Air Content, Percent By Volume = 3 – 6%

F. Workability:

1. Proportions of concrete shall produce a mixture, suited to placement methods, which will work readily into corners and angles of forms and around reinforcement and embedded items. Segregation of materials or presence of free water will not be permitted.
2. Slump of concrete: Use minimum practical; vary within limits given to suit placement conditions; in no case is slump to be increased by addition of water in excess of design mix quantity:
 - a. Type of Construction
 - i. All concrete unless otherwise noted: Slump = 2 in Min, 5 in Max.
 - ii. Building Columns: Slump = 3 in Min, 5 in Max.

G. Class A concrete: Use for all concrete unless specified otherwise.

2.11 COATINGS

A. Exterior below grade concrete structures shall be coated as follows, or as otherwise directed by the Engineer.

1. Surface Preparation: Surfaces shall be free of oils, dirt, form release agents, and other contamination.
2. Primer: Tnemec Series 446 Perma-Shield MCU @ 7-9 mils.
3. Topcoat: Tnemec Series 446 Perma-Shield MCU @ 7-9 mils.

B. See Section 09 00 00 – Painting and Coatings for additional requirements.

2.12 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. CLSM shall conform to the Illinois Department of Transportation requirements for controlled low strength material.

2.13 READY MIX CONCRETE

- A. Provide concrete from an established, approved ready-mix plant. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC-3.
- B. Equipment and methods: Conform to ASTM C94.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Subgrade and/or bedding shall be compacted and free from frost.
- B. Mud slabs shall be provided where necessary to obtain a dry and stable working platform for placement of slabs.
- C. Where required provide geosynthetic filter fabric below aggregate bases to reduce migration of fines into backfill material.
- D. Construct forms strong, straight, adequately braced and securely fastened.
- E. Remove laitance from previously placed or existing concrete; thoroughly clean surface before placing additional concrete.
- F. Apply form coating on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

3.02 PLACING CONCRETE

- A. Clean transporting equipment, reinforcing, and embedded items before placing concrete. Remove water and debris from places to be occupied by concrete.
- B. Place no concrete until forms, reinforcing, and embedded items have been verified as adequately supported and accurately placed. Place no concrete over water-covered, muddy, or frozen soil.
- C. Immediately remove concrete where water, soils, or other deleterious substances are permitted to mix with concrete, form or embedded item movement occurs, or inadequate consolidation is obtained.
- D. Hot weather concreting:
 - 1. Applies to concrete placed when ambient temperature exceeds 90° F.
 - 2. Conform to ACI 305R recommendations and requirements.

E. Cold weather concreting:

1. Applies to concrete placed when ambient temperature is below 40° F.
 2. Conform to ACI 306R recommendations and requirements.
 3. If temporary heating facilities used are of type which produce an atmospheric condition of high carbon dioxide content, seal off concrete in such manner that no damage will result to concrete surface.
- F. Concrete shall be deposited in accordance with the requirements of ACI 318 and as close as possible to its final position to avoid re-handling.
- G. Employ best industry practices to prevent segregation during placing. Do not drop concrete more than 5' (1500 mm). Use tremied or pumped concrete to provide proper placement. Place in layers approximately 18" (450 mm) deep.
- H. Place concrete continuously in each section until completed. Permit not more than 30 minutes between depositing adjacent layers of concrete within each section, unless an acceptable set retarder is used in concrete mix.
- I. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items. Use internal vibration where size of section permits.
- J. Maintain concrete placing temperature between 50°F and 90°F except as specified for hot and cold weather concreting.
- K. Place sections of concrete in sequence that eliminates shrinkage effects to greatest extent practicable.
- L. Protect concrete from injury due to sun, cold weather, running water, construction operations, and other causes until properly cured.

3.03 REINFORCEMENT PLACEMENT

- A. Remove scale, loose flaky rust, dirt, grease, curing compound, and other coatings that would impair bond.
- B. Maintain concrete cover around reinforcement in accordance with ACI 318.
- C. Install slab-reinforcing bars in correct position by use of preformed bolsters and spacers, except concrete blocks may be used to position bars in concrete placed on grade. Concrete block shall have compressive strength equal to that of surrounding concrete.
- D. Space bars properly, and tie securely in position before placing concrete. Tack welding to keep reinforcing in place shall not be permitted.

- E. Lap wire fabric not less than 8".
- F. Welding of reinforcing bars: Conform to AWS D1.4.

3.04 CONSTRUCTION JOINTS

- A. Install only where shown or where specifically permitted.
- B. Provide keyway 1-1/2" deep covering approximately 1/3 area of construction joint, unless shown otherwise.
- C. A delay, until concrete is no longer plastic, shall occur after placing concrete for columns or walls before placing concrete for slabs, beams, or girders supported thereon.
- D. Provide methods of achieving a leakproof joint.
- E. Slabs-on-grade: Place concrete in continuous side-by-side strips. Saw-cut control joints as soon as practicable after concrete hardens. Allow initial shrinkage of concrete to take place (ideally 90-120 days) before applying sealant.

3.05 WATERSTOPS

- A. Provide continuous waterstops.
- B. Embed approximately half of the waterstop on each side of the joint. Field splice and join PVC waterstop with heat sealing butt joint.
- C. All splices and joints shall be installed in accordance with the manufacturer's recommendations to produce a water-tight joint.

3.06 EMBEDDED ITEMS

- A. Install items required under this contract to be embedded in concrete including structure steps at 16" centers. Install items required by others for embedding in concrete, if so instructed before placing concrete.
- B. Fasten embedded items securely in proper position before placing concrete.
- C. Access hatches shall be installed in accordance with the manufacturer's installation requirements, and as shown on the drawings.
 - 1. Contractor shall adjust hardware after installation for proper operation and to operate easily with out binding. Touch-up marred finishes in accordance with manufacturer's recommended procedure.

2. Equipment which has been warped, bowed, or otherwise damaged shall be removed and replaced.
- D. Conduit or pipe embedded in slabs or walls.
1. Locate in center of slab or wall and space not closer than 3 diameters on center; locate to avoid impairing strength of concrete.
 2. Coordinate placing of reinforcing with conduit or pipe location. Do not cut reinforcing to clear conduit or pipe.
- E. Aluminum pipe shall not be embedded in concrete. Where aluminum projects into or rests against surface of concrete, coat surfaces of aluminum to prevent direct contact with concrete.

3.07 GROUTING

- A. Roughen concrete surfaces by light chipping to remove laitance to approximately 1/2". Do not expose reinforcing steel.
- B. Remove materials which might interfere with bond; prepare surfaces in strict conformance to manufacturer's instructions.
- C. Mix, place, and cure grout in strict accordance to manufacturer's instructions.
- D. Remove shims after grout is placed. Fill shim voids with grout.

3.08 FINISHING

- A. Flatwork:
1. Tamp concrete to force coarse aggregate down from surface.
 2. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations; slope uniformly to drains.
 3. Dusting of surface with dry cement or sand during finishing operations is not permitted.
 4. Apply curing compounds and similar materials in accordance with manufacturer's instructions during or after finishing.
 5. Finish surfaces within following tolerances as measured with a 10' straightedge:

- a. Slabs: 3/16".
- b. Top surfaces of structures other than slabs: In accordance with ACI 117.

6. Float finish:

- a. Float surface to true, even plane.
- b. Float second time to uniform finish with wood or cork float; use edger on exposed edges.

B. Formed surfaces:

- 1. Remove fins, projections, and loose material.
- 2. Clean surfaces of form oil.
- 3. Patch honeycomb, aggregate pockets, voids, and holes as follows:
 - a. Chip out until sound concrete is exposed to minimum depth of 1".
 - b. Prepare patching mortar with approximately 2 parts normal portland cement, one-part white cement, 9 parts fine aggregate; vary proportions of cement as necessary to match color of adjacent concrete.
 - c. Saturate surfaces with water and fill cavities with patching mortar.
- 3. Fill holes left by form ties with patching mortar.
- 4. Cure patches as specified for concrete.

3.09 FORM REMOVAL

A. Minimum time before removal after placing concrete, unless permitted otherwise:

- 1. Footings: 24 hours.
- 2. Walls, piers, and columns: 48 hours (24 hours for metal-lined forms).
- 3. Self-supported beams and slabs: 14 days.
- 4. Time specified above represents cumulative time during which temperature of concrete is maintained above 50°F and for concrete without set-controlling admixtures.

B. Reduce removal time by half for high-early-strength cement concrete.

- C. In any event, do not remove supporting forms and shoring until concrete has acquired sufficient strength to safely support own weight plus construction loads.
- D. Take care when removing forms that concrete is not marred or gouged and that corners are true, sharp and unbroken.

3.10 CURING

- A. Cure all concrete; begin curing as soon as possible after placement of concrete.
- B. Use of liquid membrane-forming curing compound permitted for all concrete except where product would impair bond of other applied materials to surface or where other method of curing is specified for particular use.
- C. Plastic film curing:
 - 1. Dampen surface of concrete and lay plastic film with minimum 6" side laps and free of wrinkles; tape side laps.
 - 2. Hold film in place with lumber or use similar provisions to prevent exposure of concrete for a minimum of 7 days after placing.
 - 3. Immediately repair tears in film.
- D. Water curing:
 - 1. Keep concrete continuously wet for seven days after placing.
 - 2. Use on concrete surfaces not receiving compound or plastic film curing.
 - 3. Clean, nonstaining absorptive mat may be used with water curing.
 - 4. Do not use for curing cold weather concrete.

3.11 FINISHING CONCRETE

- A. Patching:
 - 1. After concrete has been inspected, tie holes and areas identified by Engineer, shall be patched. Where necessary, the areas to be patched shall be chipped out to a minimum depth of 1 inch. Wet the area to be patched and the surrounding 6 inches to prevent absorption of water from the patching mortar and/or apply a brush coat of bonding compound or cement grout immediately prior to patching with mortar.

2. Patches shall be thoroughly compacted in place, leaving the patch slightly higher than the surrounding surface. For holes passing entirely through the wall a plunger grout gun shall be used to force the mortar through the wall, starting at the back face. Leave the patch undisturbed for a period of one to two hours to permit initial shrinkage before final finishing. The patch shall be finished to match the texture and appearance of the adjoining surface.

B. Smooth Finish:

1. Unless otherwise indicated on the Drawings, concrete shall have a smooth finish for all interior and exterior cast-in-place concrete surfaces permanently exposed to view.
2. After patching, joint marks and finish shall be ground smooth using a fine carborundum or abrasive stone with clean water. Remove all oil soils by scrubbing the surface with stiff bristle brushes and a 5 to 10 percent muriatic acid solution. After the stains are removed, rinse the surface thoroughly with clean water.

C. Rubbed Finish:

1. Where indicated on the Drawings, the Contractor shall produce a rubbed finish on exterior and interior cast-in-place concrete surfaces permanently exposed to view. Do not provide a rubbed finish where a waterproof coating is required.
2. Rubbing operations for any one area shall proceed continuously, completed the same day it is started.

3.12 MISCELLANEOUS CONCRETE WORK

A. Concrete Stairs and Steps:

1. Provide non-slip nosing for treads and landings. Remove the forms as soon as the concrete develops sufficient strength. Provide non-slip aggregate treads and landings, and a rubbed finish on the exposed vertical surfaces.

B. Equipment Pads and Supports:

1. Provide concrete equipment pads and supports as indicated on the Drawings. Equipment, devices, and accessories shall be mounted by templates or setting diagrams furnished by the manufacturer.

2. Install anchor rods accurately and in accordance with manufacturer recommendations.

3.13 MANHOLE TESTING

- A. All manholes shall be inspected and leakage tested in accordance with ASTM C1244-93 or C969-94. This work shall be included in the price of the manhole.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Concrete structures shall be measured for payment as lump sum.
- B. Concrete equipment pads shall be measured per square foot installed in place. Increases in quantities shall be ordered in writing by the Engineer.
- C. All work included in this specification shall not be measured for payment.

4.02 PAYMENT:

- A. Payment for the Work specified in this Section will be made at the contract unit price for the below listed items:
 1. CONCRETE EQUIPMENT PAD.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Access hatches, boxes, fall protection bases/receivers shall not be paid for separately. The cost shall be included as part of the cost of the individual structures in which they are installed.
- D. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 03 40 00

PRECAST CONCRETE STRUCTURES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Design Requirements.
 - 2. Flat Slab Top.
 - 3. Manholes.
 - 4. Access Hatches.
 - 5. Frames and Lids.
 - 6. Fall Protection Bases.
 - 7. Coatings.
 - 8. Accessories.
 - 9. Concrete Mix.
 - 10. Concrete Finishes.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.
 - 1. Section 03 00 00 – Concrete Work.
 - 2. Section 08 10 10 – Access Hatches and Boxes.
 - 3. Section 09 90 00 – Painting and Coatings.

1.03 REFERENCES

- A. Work shall be performed in accordance with the latest editions of the following standards. In case of conflict between the requirements of this Section and those of the listed standards, the most stringent shall prevail.
 - 1. America Concrete Institute (ACI).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. ASTM International
 - a. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
 - b. ASTM C858 – Standard Specification for Underground Precast Concrete Utility Structures.
 - 4. AASHTO.

5. Standard Specifications for Road and Bridge Construction.
6. Standard Specifications for Water and Sewer Main Construction in Illinois.
7. Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).

1.04 DESIGN REQUIREMENTS

- A. Design structures for minimum loads in accordance with ASTM C857 and ASTM C890.
- B. Wheel loadings in following paragraph are:

ASTM	AASHTO	LOADS	USES
A-16	HS20-44	16,000 lb (71.2 kN) each wheel	Heavy traffic
A-12	HS15-44	12,000 lb (53.4 kN) each wheel	Medium traffic
A-8	H10	8,000 lb (35.6 kN) each wheel	Light traffic
A-0.3		300 psf (14.4 kPa)	Walkways

- C. Box Culvert Roof Live Load: AASHTO S99-HB HS20 including impact load.
- D. Equipment Loads: as indicated on Drawings, or as supplied by equipment manufacturers.
- E. Dead Loads: Actual weight of materials producing static load.

1.05 PROJECT DESCRIPTION

- A. The Contractor shall be responsible for providing the following precast concrete structures for the project:
 1. Wet well and flat slab top with access hatches.
 2. Valve vault and flat slab top with access hatch and access boxes.
 3. Flow meter manhole and flat slab top with access hatch.
 4. Sanitary sewer manholes.
 5. Storm sewer manholes.

1.06 SUBMITTALS

- A. Submittal shall be in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings:
 1. Indicate structure locations, elevations, sections, equipment supports, piping, conduit, and sizes/elevations of all penetrations.
 2. Indicate design, construction, and installation details, typical reinforcement, and additional reinforcement at openings, for each custom type, size, and configuration.

C. Product Data:

1. Submit data for access hatches, frames, covers, steps, component construction, features, configuration, and dimensions.

D. Samples:

1. Submit two precast concrete samples in size illustrating exposed view finishes.

E. Design Data:

1. Submit concrete mix design for each different mix used.
2. Submit design calculations for custom fabrications signed and sealed by a structural engineer licensed in the State of Illinois.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Calculations shall be stamped and sealed by a structural engineer licensed in Illinois.

1.07 QUALITY ASSURANCE

A. Obtain precast structures from a single source.

B. Perform structural design in accordance with ACI 318.

C. Perform work in accordance with NPCA Quality Control Manual for Precast Plants.

D. Perform welding in accordance with the following:

1. Structural Steel: AWS D1.1.
2. Reinforcing Steel: AWS D1.4.

E. Perform Work in accordance with Standard Specifications for Road and Bridge Construction.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

- B. Installer: Company specializing in performing work of this section with minimum ten years documented experience.
- C. Design custom utility structures under direct supervision of Professional Structural Engineer experienced in design of this Work and licensed in State of Illinois.
- D. Welders: AWS qualified within the previous 12 months.

1.09 SOURCE QUALITY CONTROL

- A. Perform the following tests for each 150 cy (114 cubic meter) of concrete placed, with minimum one set of tests each week.
 - 1. Slump: ASTM C143/C143M.
 - 2. Compressive Strength: ASTM C31/C31M.
 - 3. Air Content: ASTM C231 or ASTM C173.
 - 4. Unit Weight: ASTM C138.
- B. Visually inspect completed precast structures for defects.
 - 1. Repair defects affecting exposed to view surfaces to achieve uniform appearance.
 - 2. Repair honeycomb by removing loose material and applying grout to produce smooth surface flush with adjacent surface.
 - 3. Repair major defects only when permitted by Engineer.
- C. Make test results available to Engineer upon request.
- D. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Engineer at least seven days before inspections and tests are scheduled.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast structures. Lift structures from designated lifting points.
- B. Do not deliver products until concrete has cured 5 days or attained minimum 75 percent of specified 28-day compressive strength.
- C. Store precast concrete structures to prevent damage to public or private property. Repair property damaged from materials storage.
- D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 – PRODUCTS

2.01 PRECAST CONCRETE

- A. Furnish materials in accordance with the Standard Specifications for Road and Bridge Construction
- B. Precast Concrete Utility Structures: Reinforced precast concrete.
- C. Foundation Slab: Cast-in-place or Precast concrete of type specified in Section 03 00 00 – Cast-in-Place Concrete, leveled top surface.

2.02 PRECAST FLAT SLAB TOP

- A. The flat slab top shall be a precast concrete flat top conforming to standard ASTM C478 manholes. Size shall be as indicated on the Drawings or a suitable match for the diameter of the structure(s) wet well. Precast flat top(s) shall have the access hatch cast into the top, with the hatch flush with the top of the concrete.

2.03 ACCESS HATCHES

- A. Access hatches cast into the slab shall be in accordance with Section 08 10 10 – Access Hatches and Boxes.
- B. Hatches shall be H-20 rated unless otherwise indicated on the Drawings.
- C. Orientation of hatch and door opening shall be based on the Drawings, or as otherwise directed.
- D. Hatches shall open away from fall protection devices and equipment.
- E. Access Hatch: Aluminum construction, single or double door, as shown on the Drawings.
 - 1. Size: 30 x 30 inch minimum, or as shown on the Drawings.
 - 2. Cover: Diamond plate reinforced with structural stiffeners to support required loads.
 - 3. Frame: Angle type with integral seat to support cover stiffeners; anchor flange straps around frame perimeter.
 - 4. Hinges: Stainless steel.
 - 5. Lift Handle: Flush drop handle, non-removable type mounted in cover.
 - 6. Lifting Mechanism: Stainless steel compression springs with automatic hold open and dead stop to retain cover in open position. Cover springs to prevent contact by personnel entering utility structure.

7. Latch Mechanism: Stainless steel lock with removable external handle and permanent internal release mechanism.
8. Hardware: Stainless steel.

2.04 FALL PROTECTION BASE

- A. Base shall be a bolt on type, mounted to the flat slab top, or embedded type at locations shown on the Drawings. This work shall be coordinated with the precast manufacturer so that inserts or bases are installed to facilitate installation in the field.

2.05 FRAMES AND COVERS

- A. Furnish materials in accordance with the Standard Specifications for Road and Bridge Construction, and as shown on the Drawings.
- B. Product Description: ASTM A48 (ASTM A48M), Class 30B Cast iron construction.
 1. Lid: Machined flat bearing surface, removable closed, open checkerboard grille cover design; live load rating in accordance with Section 550 of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction.
 2. Grate: Bicycle Safe grate.
 3. Nominal Lid and Grate Size: As required for each location.
- C. All closed storm, sanitary, and water lids shall have the appropriate words cast into them: Village of Hoffman Estates, "Sanitary", "Storm", or "Water". Additionally, all casting shall be heavy duty and coated with a non-toxic, water base asphalt coating complying with AWWA C104.
- D. The frames, grates, and lids (with the "Village of Hoffman Estates" and the "designation" cast into them) shall be manufactured by East Jordan Iron Works and are specified as follows:

Sanitary MH (Self-sealing w/gasket)	Sanitary	EJIW 00102282
Storm MH	Storm	EJIW 00102280
Catch Basin/Inlet	Storm	EJIW 0752530C01
Valve Vault	Water	EJIW 00102280

2.06 ACCESSORIES

- A. Membrane Curing Compound: ASTM C1315 Type I, Class A
- B. Steps: Formed cast iron, or steel reinforced with plastic coating, rungs.

1. Diameter: 3/4 inch (19 mm).
2. Width: 12 inch (300 mm).
3. Spacing: 16 inch (400 mm) on center vertically or as indicated on Drawings.

C. Inserted and Embedded Items:

1. Structural Steel Sections: ASTM A36/A36M; with ASTM A123/A123M, minimum 1.25 oz/sq ft (380 g/sq m) galvanized coating.

D. Joint Sealants and Joint Gaskets:

1. Gasket Joints for Circular Concrete Pipe: ASTM C443 (ASTM C443M); standard rubber gaskets.
2. External Sealing Bands: ASTM C877 (ASTM C877M); Type II and ASTM C1244 standards.
3. Preformed Joint Sealants for Concrete Pipe and Box Sections: ASTM C990.
4. Elastomeric Joint Sealants: ASTM C920; silicone or polyurethane; Grade NS, Class 25.

E. Pipe Entry Connectors: Resilient pipe connectors shall be in accordance with ASTM C923 (ASTM C923M) requirements and be cast or fitted into manhole walls for each pipe.

F. Grout:

1. Cement Grout: Portland cement, sand and water mixture with stiff consistency to suit intended purpose.
2. Non-Shrink Grout: ASTM C1107, Grade A; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi (17 MPa) in 48 hours and 7,000 psi (48 MPa) in 28 days

G. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic.

H. Bench: Sanitary manholes shall have factor or field formed channels and benches. Manhole shall have a 1% invert slope through the manhole, and benches shall have a 4% slope.

2.07 COATINGS

A. Exterior below grade concrete structures shall be coated as follows, or as otherwise directed by the Engineer.

1. Surface Preparation: Surfaces shall be free of oils, dirt, form release agents, and other contamination.
2. Primer: Tnemec Series 446 Perma-Shield MCU @ 7-9 mils.
3. Topcoat: Tnemec Series 446 Perma-Shield MCU @ 7-9 mils.

B. See Section 09 00 00 – Painting and Coatings for additional requirements.

2.08 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 318, ACI 211.1, and Standard Specifications.

B. Provide concrete to the following criteria:

1. Compressive Strength: 4,000 psi (27.6 MPa) at 28 days.
2. Water Cement Ratio:
 - a. Concrete Exposed to Freezing and Thawing: Maximum 0.45 percent by mass.
 - b. Watertight Concrete Not Exposed to Freezing and Thawing: Maximum 0.45 percent by mass.
 - c. Concrete Exposed to Corrosive Conditions: 0.40 percent by mass.
3. Air Content:

Maximum Aggregate Size inch (mm)	Air Content, Percent	
	Severe Exposure	Moderate Exposure
3/8 inch (9 mm)	6.0 to 9.0	4.5 to 7.5
1/2 inch (13 mm)	5.5 to 8.5	4.7 to 7.0
3/4 inch (18 mm)	4.5 to 7.5	3.5 to 6.5
1 inch (25 mm)	4.5 to 7.5	3.0 to 6.0
1-1/2 inch (38 mm)	4.5 to 7.0	3.0 to 6.0

C. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved through submittal process.

1. Do not use calcium chloride.

2.09 FABRICATION

A. Fabricate precast concrete utility structures in accordance with ACI 318, and NPCA Quality Control Manual for Precast Plants.

B. Fabricate precast concrete utility structures to size, configuration, knock out panels, and openings as indicated on Drawings.

- C. Construct forms to provide uniform precast concrete units with consistent dimensions.
- D. Clean forms after each use.
- E. Install reinforcing by tying or welding to form rigid assemblies. Position reinforcing to maintain minimum 1/2 inch (13 mm) cover. Secure reinforcement to prevent displacement when placing concrete.
- F. Position and secure embedded items to prevent displacement when placing concrete.
- G. Deposit concrete in forms. Consolidate concrete without segregating aggregate.
- H. Provide initial curing by retaining moisture using one of the following methods:
 - a. Cover with polyethylene sheets.
 - b. Cover with burlap or other absorptive material and keep continually moist.
 - c. Apply curing compound in accordance with manufacturer's instructions.
- I. Provide final curing in accordance with manufacturer's standard.
- J. Remove forms without damaging concrete.

2.10 CONCRETE FINISHES

- A. Formed Surfaces Not Exposed to View: As formed.
- B. Unformed Surfaces: Finish with vibrating screed or hand float.
 - 1. Permitted: Color variations, minor indentations, chips, and palls.
 - 2. Not Permitted: Major imperfections, honeycomb, or other defects.
 - 3. Exposed to View Finishes: Troweled and medium broom.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify correct size and elevation of excavation.
- C. Verify subgrade and bedding is properly prepared, compacted and ready to receive Work of this section.

3.02 PREPARATION

- A. Subgrade and/or bedding shall be compacted and free from frost.
- B. Mud slabs shall be provided where necessary to obtain a dry and stable working platform for placement of slabs.
- C. Coordinate placement of inlet and outlet pipe(s) or duct sleeves required by other sections.
- D. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- E. Inspect precast concrete structures immediately prior to placement in excavation to verify are internally clean and free from damage. Remove and replace damaged units.

3.03 EMBEDDED ITEMS

- A. Access hatches shall be installed in accordance with the manufacturer's installation requirements, and as shown on the drawings.
 - 1. Structural elements of the access hatch shall be embedded and supported to maintain the H20 rated.
 - 2. Contractor shall adjust hardware after installation for proper operation and to operate easily with out binding. Touch-up marred finishes in accordance with manufacturer's recommended procedure.
 - 3. Equipment which has been warped, bowed, or otherwise damage shall be removed and replaced.

3.04 INSTALLATION

- A. Install underground precast utility structures in accordance with ASTM C891.
- B. Lift precast concrete structures at lifting points designated by manufacturer.
- C. When lowering structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
- D. Install precast concrete base to elevation and alignment indicated on Drawings.
- E. Install cast-in-place concrete foundation slab in accordance with Section 03 30 00, trowel top surface level.

- F. Install precast concrete utility structures to elevation and alignment indicated on Drawings.
- G. Assemble multi-section structures by lowering each section into excavation.
 - a. Clean joint surfaces.
 - b. Install watertight joint seals in accordance with manufacturer's instructions using gasket joints, external sealing bands, preformed joint sealants, elastomeric joint sealants, or grout.
- H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with grout.
- I. Connect pipe to structure and seal watertight. Cut pipe flush with interior of structure.
- J. Grout base to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel.
- K. Set frame and cover and access hatch level without tipping, to elevations shown on Drawings.
 - a. Set cover and access hatch 2 inch (50.8 mm) above finished grade for structures located within unpaved areas to allow area to be graded away from cover beginning 1 inch (25.4 below top surface of frame.
 - b. Connect drain from access hatch frame to drainage system, to structure sump, or as shown on Drawings.
- L. Touch up damaged galvanized coatings.
- M. Backfill excavations for structures in accordance with Section 31 23 16 – Excavation, Fill and Grading.
- N. All sanitary manholes are required to have external chimney seals installed over the frame and around the manholes to prevent infiltration.
- O. Each manhole cone and barrel section joint shall be externally sealed with a 9-inch (min) wide sealing band of rubber and/or polyethylene with an under layer of rubberized mastic meeting the requirements of ASTM C-877, Type II or Type III.

3.05 TESTING

- A. Perform the following test and inspections for all manholes and structures that shall be watertight:
 - 1. Vacuum Test: ASTM C1244.

2. Hydrostatic Exfiltration Test: In accordance with manufacturer's recommendations.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Wet well and valve vault concrete structures, including flat slab top, shall be measured for payment as lump sum.
- B. Manhole structures, including frame and lid, shall be measured for payment for each.
- C. Generator concrete pad shall be measured for payment as lump sum.

4.02 PAYMENT:

- A. Payment for the Work specified in this Section will be made at the contract unit price for the below listed items:
 1. WET WELL.
 2. VALVE VAULT.
 3. GENEATOR PAD.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Access hatches, boxes, fall protection bases/receivers, and frame and lids shall not be paid for separately. The cost shall be included as part of the cost of the individual structures in which they are installed.
- D. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 08 10 10
ACCESS HATCHES AND BOXES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Access Hatches
2. Cast Iron Valve Boxes
3. Fall Protection Devices
4. Frames and Covers
5. Related Accessories

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.

1. Section 03 00 00 – Cast-in-Place Concrete.
2. Section 03 40 00 – Precast Concrete Structures.

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO)
- B. American Society for Testing and Materials (ASTM)
- C. Occupational Safety and Health Administration (OSHA)

1.04 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Product technical data: Manufacturer's data.
- C. Shop Drawings: Include sections, dimensions, and accessories.

PART 2 - PRODUCTS

2.01 ACCESS HATCHES

A. Manufacturers:

1. Bilco
2. Halliday
3. U.S.F Fabrication
4. East Jordan Iron Works
5. Neenah
6. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Performance requirements:

1. Access hatches shall be:

- a. Single or double leaf and size as indicated in the Drawings.
- b. Recessed and lockable handles to prevent outside entry.
- c. Odor gaskets and debris gaskets.
- d. Drain.

2. Performance characteristics:

- a. Cover shall be reinforced to support AASHTO H-20 wheel loads with maximum deflection of $1/150^{\text{th}}$ of the span. Concrete support beams shall be provided in accordance with manufacturer's requirements.
- b. Operation shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
- c. Operation shall not be affected by temperature.
- d. Entire access hatch, including all hardware components, shall be corrosion resistant.

3. Cover:

- a. Minimum 1/4-inch thick 5086 aluminum diamond pattern.
- b. Equipped with a hold open arm, fastened to the frame with a 1/2" grade 316 stainless steel bolt.

- c. Cover, including all hardware components, shall be highly corrosion resistant.

4. Frame:

- a. Material shall be 6061-T6 Aluminum with a continuous 1-1/4" anchor flange.
- b. Dovetail groove shall be extruded into the seat of the frame for a 1/8" silicone gasket.
- c. Drain shall be piped to the wet well or valve vault floor drain.

5. Hinges:

- a. 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.
- b. Hinge shall be fastened to the channel frame and diamond plate with Grade 316 stainless steel bolts and NY-Lock Nuts.

6. Safety Grating:

- a. Safety grating shall be designed in accordance with OSHA 29 CFR 1926.502(C) and controlled confined space entry per OSHA Standard 1910.146.
- b. Access hatches shall have a permanently installed fall through protection grate system that provides continuous safety assurance in both its closed and open position. Single or double grate system shall be aluminum with an OSHA safety orange finish.
- c. Grating shall be designed to withstand a minimum live load of 300 pounds per square foot using 17,300 psi as the design stress for the aluminum.
- d. Each grate shall be provided with a hinging system, which will lock the grate in the 90-degree position once opened.
- e. Grates shall be provided with an opening arm, which allows for opening of the grate. The opening arm shall be equipped with a controlled confined space entry lock (lock provided by others). This locking device shall prevent unauthorized entry to the confined space.

7. Gaskets:

- a. Debris gasket: continuous EPDM gasket mechanically fastened to the perimeter of the frame to reduce the amount of dirt and debris that enters the frame.

8. Lifting mechanisms:

- a. Unit shall be supplied with a heavy-duty pneumatic spring, for ease of operation when opening safety grate. Grate shall be counterbalanced, so one person can easily open the safety grate.

9. Hardware:

- a. Each hatch shall be equipped with a 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 ½" grade 316 stainless steel bolt.
- b. Each hatch shall be supplied with a stainless steel slam lock, with the key way protected by a threaded aluminum plug. The plug shall be flush with the top of the ¼" diamond plate. The slam lock shall be fastened with Grade 316 stainless steel bolts and washers.
- c. Each hatch shall be equipped with a recessed padlock clip (padlock provided by others).
- d. Each hatch shall be equipped with a stainless steel lift handle. Lift handle shall be flush with top of ¼" diamond plate.
- e. Each hatch shall be supplied with a 1-1/2" threaded drain coupler on the underside of channel frame, for pipe connection.

10. Finishes:

- a. Factory finish: mill finish aluminum.
- b. Bituminous coating: apply to the exterior of the frame.

11. Hatch doors shall mount flush to the frame when in the closed and locked position.

12. Locks shall be provided for all hatches and shall be keyed alike. Four (4) sets of keys shall be provided. Locks provided shall be of the hasp type and keyed alike to the City's existing code.
13. Signage shall be provided and securely fastened to the interior side of the access hatch advising that proper ventilation must be provided prior to entering; and that the area is considered to be a "confined space" and as such proper precautions must be taken prior to entry. Signage shall be of a corrosion resistant material and shall be held in place by stainless steel fasteners. Signage shall be positioned such that when the hatch is opened the sign shall be in full view and easily legible.

2.02 CAST IRON VALVE BOXES

A. Manufacturers:

1. East Jordan Iron Works
2. Neenah
3. Tyler Union
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Performance requirements

1. Box: ASTM A48, Class 35B, Gray Iron or ASTM A536, Grade 80-55-06 for ductile iron.
2. Cover: ½" thick minimum; heavy-duty rated with load bearing exceeding 16,000 lbs. or as indicated on the Drawings.
3. Lettering:
 - a. Plain lid for access boxes embedded in wet well/valve vault flat slab tops or equipment pads.
 - b. "Sewer" or "Valve" for valve boxes.
4. Finish:
 - a. Castings embedded in concrete shall be unfinished.
 - b. Castings for valves installed underground shall have an asphaltic bituminous coating, applied a minimum thickness of 1.5 mils.
5. Extensions: Provide extension and adjustable risers as required for installation.

2.03 FALL PROTECTION BASES AND SLEEVES

A. Manufacturers:

1. Pelsue
2. 3M
3. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Performance requirements:

1. Bases:

- a. Shall receive fall protection post.
- b. Consist of a base plate, with tie-off anchor, and 2-ear pin mount bolt-on type, or as directed by the Owner.
- c. Contractor shall field paint the base plates safety yellow as direct by the Engineer.

2.04 FRAMES AND COVERS

A. Furnish materials in accordance with the Standard Specifications for Road and Bridge Construction, and as shown on the Drawings.

B. Product Description: ASTM A48 (ASTM A48M), Class 30B Cast iron construction.

1. Lid: Machined flat bearing surface, removable closed, open checkerboard grille cover design; live load rating in accordance with Section 550 of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction.
2. Grate: Bicycle Safe grate.
3. Nominal Lid and Grate Size: As required for each location.

C. All closed storm, sanitary, and water lids shall have the appropriate words cast into them: Village of Hoffman Estates, "Sanitary", "Storm", or "Water". Additionally, all casting shall be heavy duty and coated with a non-toxic, water base asphalt coating complying with AWWA C104.

D. The frames, grates, and lids (with the "Village of Hoffman Estates" and the "designation" cast into them) shall be manufactured by East Jordan Iron Works and are specified as follows:

Sanitary MH (Self-sealing w/gasket)	Sanitary	EJIW 1020 AGS
Storm MH	Storm	EJIW 1020 A EJIW 1020 M2

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with the construction documents, shop drawings, and manufacturer's installation instructions.
- B. Provide all necessary shims, grout, anchors, and other items required for installation.
- C. Covers and lids shall be installed flush with finished grade/concrete.
- D. Contractor shall coordinate materials and work with the precast concrete manufacturer or concrete Contractor.

3.02 ADJUST AND CLEAN

- A. Adjust hardware after installation for proper operation and to operate easily without binding.
- B. Touch-up marred finishes in accordance with manufacturer's recommended procedures.
- C. Replace units which cannot be restored to factory-finish appearance. Remove and replace items which are warped, bowed, or otherwise damaged.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 09 90 00
PAINTING AND COATINGS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Painting.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements.
2. Section 03 00 00 – Cast-in-Place Concrete.
3. Section 03 40 00 – Precast Concrete Structures.
4. Section 33 11 00 – Utility Piping.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. Army Corps of Engineers (CRD)
- C. NSF International (NSF)
- D. Society for Protective Coatings (SSPC)
- E. National Association of Corrosion Engineers
- F. American Concrete Institute (ACI)
- G. Local codes and ordinances

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop drawings shall include:

1. Manufacturer's Data: Submit copies of manufacturer's technical information including paint label analysis, application instructions for each material proposed for use, and paint color charts.

2. Project schedule.
3. Surface preparation, including pipe identification schedule.
4. Submit complete listing of proposed products for each system, including primer and finish coat.
5. Application instructions for each type of coating to be used.
6. Color samples for selection.

1.05 SYSTEM DESCRIPTION

- A. This Section includes all labor, materials, equipment and related services necessary to provide finishes indicated on the Drawings or specified herein.
- B. Complete finishes of all areas and items shown on drawings and/or specified herein, including, but not limited to:
 1. Ductile iron piping, valves and appurtenances. Do not paint the stainless steel rodding or fasteners – if painted, the paint will be required to be removed. All piping proposed in wet well shall be factory or shop painted to finish coat.
- C. Coordinate painting specified herein with shop and prime coats on materials specified under applicable Sections.
- D. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, linkages, sending devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- E. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- F. Stainless steel components shall not be painted.

1.06 ABBREVIATIONS

- A. The term "coating", as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, whether used as prime, intermediate, or finish coats.

1.07 QUALITY ASSURANCE

- A. Only Licensed Installers will be allowed to apply these products. The installer shall be responsible for all preparation of the surfaces to receive this coating and shall comply with Part 3 of these specifications and in accordance with

manufacturer's recommendations. Coating shall be applied to the walls and base of the structure.

1.08 DELIVERY AND STORAGE

- A. Deliver materials in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Name of title of the material
 - 2. Manufacturer's stock number and date of manufacture
 - 3. Manufacturer's name
 - 4. Color, name and number
 - 5. Application instructions
- B. Store materials as recommended by the manufacturer and as necessary to protect against adverse conditions. Mix and store materials in designated areas only. Provide safety precautions as necessary to prevent fire or injury to persons or property.

1.09 JOB CONDITIONS

- A. Apply paint only within the manufacturer's limitations for temperature, humidity and other weather conditions.

1.10 SPARE PAINT

- A. The Contractor shall provide the Owner with one spare unopened container of each paint furnished for the Work.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Acceptable paint:
 - 1. Tnemec - Tnemec Co., Inc. – North Kansas City, MO
 - 2. Sherwin Williams – Cleveland, OH
 - 3. PPG Protective & Marine Coatings – Alsip, IL
 - 4. Engineer approved equal.

2.02 PRODUCT MATERIALS

- A. All materials used in the work except oils, thinners and driers, shall be of the brands and qualities specified.
- B. All cleaners, thinners, driers, and other additives and surface pretreatment materials shall only be those approved for use by the manufacturer of the coatings.

- C. Do not dilute paints except as recommended by the paint manufacturer.

2.03 COATING SYSTEMS

A. Galvanized and Non-Ferrous Metals

1. Used for non-galvanized, ferrous metals, in non-potable water applications, including but not limited to the following:
 - a. Submerged piping and piping subject to splashing.
 - b. Piping located in below grade structures.
 - c. Exposed above grade piping.
 - d. Submerged miscellaneous metal, equipment, etc. without a factory-applied final finish.
2. Surface Preparation:
 - a. None if primer is applied by pipe manufacturer.
 - b. Or SSPC SP 16 if field applied primer is used.

3. Above grade or exposed pipe:

Sherwin Williams:

- a. Prime Coat: Pipe manufacturer primer
- b. Intermediate: Macropoxy 646 Epoxy at 4-8 mils
- c. Finish Coat: Hi Solids Polyurethane at 2-3 mils

Tnemec:

- a. Prime Coat: Pipe manufacturer primer
- b. Intermediate: Series N69 HB Epoxoline at 2-3 mils
- c. Finish Coat: Series 73 Endura-Shield at 2-3 mils

4. Below grade pipe located within structures:

Sherwin Williams:

- a. Prime Coat: Pipe manufacturer primer
- b. Intermediate: Sherglass FF Epoxy at 8-12 mils
- c. Finish Coat: Sherglass FF Epoxy at 8-12 mils

Tnemec:

- a. Prime Coat: Pipe manufacturer primer
- b. Intermediate: Series N69 Hi-Build Epoxoline II Primer at 2-3 mils
- c. Finish Coat: Series N69 Hi-Build Epoxoline II Primer at 2-3 mils

B. Concrete Structures - Interior

1. Used for cast-in-place and precast concrete structures, including but not limited to the following:
 - a. Wet Well.
 - b. Valve Vault.
2. Surface Preparation:
 - a. Allow concrete to cure for 28 days.
 - b. Then Prepare in accordance with SSPC SP 13, Surface Profile CSP 1-3.

Sherwin Williams:

- a. Prime Coat: Macropoxy 646 Epoxy at 5 mils
- b. Intermediate: Macropoxy 646 Epoxy at 5 mils
- c. Finish Coat: Macropoxy 646 Epoxy at 5 mils

Tnemec (Corrosive Environments):

- a. Prime Coat: Epoxytech Mortartec Ceramico minimum 1/8"
- b. Intermediate: Series 434 Perma-Shield at 125 mils
- c. Finish Coat: Series G435 Perma-Glaze at 15 to 20 mils

Tnemec (Non-Corrosive Environments):

- a. Prime Coat: Epoxytech Mortartec Ceramico minimum 1/8"
- b. Finish Coat: Epoxytech CPP minimum 125 mils

C. Concrete Structures - Exterior

1. Used for precast concrete structures, including but not limited to the following:
 - a. Wet Well.
 - b. Valve Vault.
2. Surface Preparation: SSPC SP 13, Surface Profile CSP 1-3

Sherwin Williams:

- a. Prime Coat: Hi Mil Sher Tar at 8 mils
- b. Finish Coat: Hi Mil Sher Tar at 8 mils

Tnemec:

- a. Prime Coat: Series 46-465 H.B. Tnemcol at 8 mils
- b. Finish Coat: Series 46-465 H.B. Tnemcol at 8 mils

D. Aluminum Equipment and Electrical Conduits

1. Used for aluminum equipment as indicated on the plans and electrical conduits located below grade in concrete structures.
2. Surface Preparation: Clean surface, solvent clean (SSPC SP 16), and allow to dry.

Sherwin Williams:

- a. Prime Coat: Macropoxy 646 Epoxy at 2 mils
- b. Intermediate: Macropoxy 646 Epoxy at 2 mils
- c. Finish Coat: Macropoxy 646 Epoxy at 2 mils

Tnemec:

- a. Prime Coat: Series N69 Hi-Build Epoxoline II at 2 mils
- b. Finish Coat: Series Series 73 Endura-Shield at 2-3 mils

E. Ferrous Metals

1. Used for ferrous metals, in non-potable water applications, including but not limited to the following:
 - a. Submerged piping and piping subject to splashing.
 - b. Piping located in below grade structures.
 - c. Exposed above grade piping.
 - d. Submerged miscellaneous metal, equipment, etc. without a factory-applied final finish.
2. Surface Preparation:
 - a. Steel – Immersion SSPC SP-10 Near White Metal Blast Cleaning. Scarify if shop applied epoxy primer is more than 60 days old.
 - b. Steel – Non-Immersion SSPC SP-6 Commercial Blast Cleaning
 - c. Ductile Iron Pipe NAPF 500-03-04.
 - d. Cast Ductile Fittings NAPF 500-03-05.
 - e. Scarify shop applied prime coat if more than 60 days old.

3. Above grade or exposed pipe:

Tnemec:

Interior, Not exposed to UV:

- a. Shop applied prime Coat: Series N140 Pota-Pox Plus at 4 to 6 mils
- b. 1st coat: Series N69 HB Epoxoline II at 4 to 6 mils

- c. 2nd coat: Series N69 HB Epoxoline at 4 to 6 mils

Exterior:

- a. Shop applied prime Coat: Series N140 Pota-Pox Plus at 4 to 6 mils
- b. 1st coat: Series N69 HB Epoxoline II at 4 to 6 mils
- c. 2nd coat: Series 73 Endura-Shield 3 to 5 mils

Immersion Service

- a. Shop applied prime Coat: Series N140 Pota-Pox Plus at 4 to 6 mils
- b. 1st coat: Series N69 HB Epoxoline II at 6 to 8 mils
- c. 2nd coat: Series N69 HB Epoxoline at 6 to 8 mils

2.04 EQUIPMENT

- A. The Contractor shall provide all containment materials and rigging equipment to safely access the work area and control the escape of dust and debris generated during surface preparation, application of lining system and clean-up activities. This shall include, but not be limited to, dust collectors, vac trucks, commercial vacuums equipped with High Efficiency Particulate Air (HEPA) filtration, containment materials and ground covers, scaffolds, and staging. All containment material shall be fire retardant.
- B. Specific containment requirements when disturbing protective coatings containing lead and other toxic metals are found in other sections.
- C. All cleaning and application tools and equipment shall be provided by the Contractor, including but not limited to, compressors, blast pots, hand tools, power tools, brushes, rollers, and spray equipment.
- D. All necessary personal protective clothing and equipment shall be provided by the Contractor to assure that all installers are protected from hazards during all phases of Work. This includes any special equipment and respirators, monitors, and hand wash/shower facilities that may be needed when disturbing existing protective coatings containing lead or other toxic materials.
- E. The Contractor shall provide all inspection and testing equipment need to perform quality control inspections of the surface preparation and protective coatings process.

2.05 WASTE CONTAINERS

- A. The Contractor shall provide and label all containers required for the collection, handling storage, transportation, and disposal of hazardous and non-hazardous waste generated by the Work.

PART 3 – EXECUTION

3.01 GENERAL

- A. Do not proceed with the application of paint until the manufacturer recommended conditions are met for the following:
 - 1. Temperature
 - 2. Humidity
 - 3. Dust free spaces
 - 4. Surface Preparation
- B. Handle and store materials in accordance with the provisions of the Flammable and Combustible Liquids Code, NFPA 30. All materials shall be handled and stored to avoid fire and explosion.
- F. Furnish inspection devices, in good working condition, for the detection of holidays on inside wetted surfaces, and the measurement of coating film thickness (wet and dry). Inspect surfaces to be painted and conditions of the area before starting Work. Report any defects that render any area or surface unfit to receive paint.
- G. Provide masks, gloves, and other protective materials or clothing and furnish special ventilation as necessary or recommended by the paint manufacturer.

3.02 DELIVERY TO SITE

- A. All materials furnished shall be labeled. Each label shall indicate the manufacturer's name, the brand name, the type of material as specified, the class of flammability or combustibility if applicable, the color, and the mixing and application instructions. Each container shall be stenciled or embossed at the factory with the product number and name as it appears in the manufacturer's catalog. Deliver materials to the site in unbroken, unopened containers, with labels affixed on each container by the manufacturer.

3.03 VENTILATION

- A. Provide adequate ventilation for safe application and for proper drying of coatings on interior surfaces.

3.04 CURING

- A. General: Coating systems shall be allowed to cure in accordance with manufacturer's recommendations.
- B. Air Circulation: Do not lay plastic sheeting directly on the coating as air contact/ventilation is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of coating system.

- C. Protection: During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 36°F (2°C). If plastic sheeting is used for protection, it must be raised off coating to allow sufficient air circulation.

3.05 INTERFACE WITH OTHER MATERIALS

- A. Backfilling: Do not backfill for 36 hours after application. If backfill takes place within seven days after application, then backfill material shall be moist so as not to draw moisture from coating.
- B. Paint, Epoxy or Similar Coatings: Do not apply paint or other coatings until coating system has cured and set for a minimum of 28 days.

3.06 APPLICATION OF PAINT

- A. All work shall be performed by skilled painters. Surfaces shall be free of drops, ridges, waves, laps and brush marks. Edges of paint adjoining other colors or materials shall be sharp and true.
- B. Do not apply coating in temperatures below 50 degrees F, except where manufacturer allows lower temperatures. No exterior painting shall be done during inclement weather when relative humidity exceeds 85%, or under conditions identified by the manufacturer as unsuitable.
- C. The average rate of application shall not exceed the theoretical rate of coverage recommended by the coating manufacture for the type of surface involved, less an allowance for losses. Average dry film thickness shall not be less than thickness set forth under Painting Systems. Not more than 10-20% of points inspected may be less than 90% of the specified thickness. Deficiencies shall be corrected by application of additional coating.
- D. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color. Each coat shall be carefully examined, and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Comply with coating manufacturer's recommendations for drying time between coats.
- E. Items to be attached to similar or dissimilar materials shall be back coated as specified for the exposed surfaces of those items. Mask or protect finished surfaces in area being coated. Remove, replace, and protect finished items adjacent to surfaces to be coated. Reinstall items when painting is complete.
- F. Protect adjacent walls, floors, and ceilings against splash or overspray. Remove materials from surfaces not designated to receive such materials.
- G. In the event that the finished surfaces are not acceptable, completely refinish entire unit areas or sections as necessary in order to eliminate visible laps or other indications of repairs.

- H. Remove waste rags and coating debris on a daily basis. Keep storage spaces and work areas neat and clean.

3.07 DRY FILM THICKNESS

- A. Dry film thickness shall be measured in accordance with current SSPC PA2, "Procedure for Determining Conformance to Dry Coating Thickness Requirements".
- B. Measurements shall be made with a Type 1 magnetic gage, or Type 2 electronic gage.
- C. The number of areas to be selected and measured shall be as follows, or in accordance with latest SSPC PA2:
 - a. Less than 30 m² (~300 ft²): Measure each 10 m² (~100 ft²) area.
 - b. 30 m² (~300 ft²) to 100 m² (~1,000 ft²): Arbitrarily select and measure three 10 m² (~100 ft²) areas.
 - c. Exceeding 100 m² (~1,000 ft²): Arbitrarily select and measure the first 100 m² (~1,000 ft²) as stated in bullet 2. For each additional 100 m² (~1,000 ft²) coated area (or increment thereof), arbitrarily select and measure one additional 100 m² (~1,000 ft²) area.
- D. Dry film thickness shall be measured in the presence of Engineer or City Staff.

3.08 COLOR SELECTION

- A. The color of the finished painted surface shall be as chosen by Owner. Color selection chart to be provided for standard colors.
- B. Following are some of the colors need to be used:
 - 1. Painting of fall protection plate-Safety Yellow.
 - 2. Painting of exposed piping located above grade – Fairway Green.
 - 3. For any other items that colors are not provided in 3.08, contact Owner.

3.09 TESTING AND INSPECTION

- A. A final visual inspection shall be made by the Inspector and the manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.
- B. Visual inspection shall also be done by the Village (confined space entry) for all structures.

3.10 CLEAN-UP

- A. Clean spillage and soiling from adjacent surface using appropriate cleaning agents and procedures.

- B. Remove from the premises all rubbish and accumulated material and leave the work in clean orderly condition, acceptable to the Engineer.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item but shall be considered as included in the prices bid for the various pay items of work involved.

-- END OF SECTION ---

SECTION 26 05 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Submittals.
2. Substitutions.
3. Identification.
4. Testing.
5. Warranties.
6. Alterations.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Division 2 – Site Work
3. Division 3 – Concrete
4. Division 33 - Utilities

B. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.

1. Section 02 41 00 – Demolition

1.03 REFERENCES

- A. All work shall conform to Federal, State, and Local building code requirements as adopted by the County or municipality.**
- B. National Fire Protection Association.**
- C. National Electric Code.**
- D. Occupational Safety and Health Administration (OSHA).**
- E. Utility Standards.**

F. Underwriters Laboratories (UL).

G. American National Standard Institute (ANSI).

1.04 DESCRIPTION

- A. The following specifies the minimum requirements by which the Contractor shall furnish, deliver, erect, install, connect, and test electrical materials, equipment, and systems specified in Division 26, and as shown on the Drawings.
- B. The Drawings are conceptual and do not show all work required for a complete system. The Contractor shall provide all necessary components for a complete and operational electrical installation.
- C. Earth and rock excavation, backfill, concrete masonry, concrete reinforcement, and construction joints required for Electrical work shall be provided under other Divisions of Work specified under this contract.

1.05 SUBMITTALS:

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings and Data: Include manufacturer's drawings, bills of material, panel and equipment layouts, catalog data, schematics diagrams, interconnection diagrams, wiring diagrams and other documentary or descriptive information as required for each assembly submitted in one package insofar as possible.
 - 1. Bills of material: Include a numbered list of all components, with manufacturer's name, catalog number, rating, and other identification. Place item number or similar identification on all other drawings where item appears.
 - a. Where additions and modifications are made to existing equipment, provide drawings which include both retained existing equipment and new work.
 - b. Mark shop drawings and data submitted to indicate items applicable to this specific contract.
 - c. Include one-line diagrams, schematic diagrams, wiring diagrams, control sequence diagrams, relay diagrams, and metering. Submit only completed drawings showing all local and remote devices associated with each item. Submit one complete package of shop drawings. Partial submittals will be returned without action.

- d. For informational purposes only, submit equipment installation instructions in separate submittals from other shop drawings.
- e. Shop drawings for different systems and equipment shall be bound separately by specification section, and not by manufacturer.
- f. Submittals which contain different specification sections bound together shall not be reviewed and will be returned to the Contractor for re-submittal.
- g. Contractor shall examine shop drawings and equipment brochures prior to submission.
- h. Engineer's review of shop drawings shall not relieve Contractor of responsibility for deviations from requirements of drawings and specifications, unless prior written approval for such deviation has been granted.

2. The following shop drawings and data shall be submitted for review:

- a. Circuit Breakers
- b. Conduit and Fittings
- c. Wire and Cable
- d. Wiring Devices
- e. Portable Generator Receptacle or Receptacle Cabinet
- f. Explosion proof pull / terminal Box
- g. Handholes, and Associated Equipment and Devices
- h. Grounding Equipment and Devices
- i. Control Stations
- j. Enclosures
- k. Control Panels
- l. Double throw fused Safety Switch – service entrance rated

m. Field Acceptance Test Reports

n. Record Drawings

1.06 QUALITY ASSURANCE

- A. Provide in accordance with Section 01 43 00 – Quality Assurance and as specified.
- B. Install electrical work in conformance with latest versions of all codes, standards, and recommended practices of organizations.
- C. Install electrical components in accordance with manufacturer's written and supplier approved product installation requirements and procedures.
- D. Should manufacturer's instructions conflict with the contract drawings and specifications, Contractor shall request clarification from Engineer prior to proceeding.
- E. Provide equipment in compliance with Federal, State, and Local regulations established for noise control.
- F. Perform Work by persons qualified to produce workmanship of specified quality.

1.07 PRODUCT SUBSTITUTIONS

- A. Submittal shall be in accordance with Section 01 25 00 – Substitution Procedures.
- B. Substitutions will be considered when a product becomes unavailable through no fault of the Contractor.
- C. A request constitutes a representation that Contractor:
 - a. Has investigated and determined that proposed product meets or exceeds quality level of specified product.
 - b. Will provide same warranty for Substitution as for specified product.
 - c. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to the Owner.
 - d. Waives claims for additional costs or time extension that may subsequently become apparent.
 - e. Will reimburse Owner for review or re-design services associated with re-approval by authorities having jurisdiction.
- D. 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 Contract Documents.

- E. Contractor's submitting equipment for approval as an equal, shall include in their bid all incidental costs that may result from use of approved equipment.
- F. Such costs shall include, but are not limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of "equal" products.
- G. Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.
- H. When substitution is not accepted, provide specified product.

1.08 INTERFERENCE AND ERRONEOUS LOCATIONS

- A. Locations of electrical equipment, devices, outlets, and similar items, as indicated, are approximate only. Exact locations shall be determined during construction.
- B. Verify in field, all data and final locations of work installed under other sections of specifications, required for placing of electrical work.
- C. In case of interference with other work or erroneous locations with respect to equipment or structures, furnish all labor and materials to complete the work.
- D. Coordinate electrical work with all trades working on or near the project area.

1.09 APPROVAL AND MARKING EQUIPMENT

- A. Ensure that devices and materials are listed and/or labeled by Underwriters Laboratories, Inc., wherever standards have been established by that agency. Where Underwriters Laboratories listing is not available for equipment, submit certified test reports of Nationally Recognized Testing Laboratory, approved by the local inspecting authority, indicating that equipment is in conformance with local code requirements or any other applicable requirements. Tests and inspections for approval of equipment shall be performed at no additional cost to Owner.
- B. Clearly mark equipment, devices and material with name or trademark of manufacturer and rating in volts and amperes and other pertinent information on a nameplate.

1.10 EQUIPMENT SPECIFIED ELSEWHERE

- A. Certain items of control equipment and other equipment are indicated on electrical drawings for connection, but are specified in other sections pertaining to plumbing, mechanical process, instrumentation, etc. Such items are not furnished as part of electrical work.

1.11 TEST REPORTS

- A. Electrical equipment shall be provided with arc flash and personnel protection equipment (PPE) labels in accordance with NPFA 70E.
- B. Contractor shall submit a coordination study for proposed overprotection devices, where they are connected to existing service equipment, panelboards, motor control centers, and switchgears to ensure safety of maintenance personnel, equipment failure, or damage. Contractor shall be responsible for obtaining existing equipment make/model information, ratings, and wire sizes necessary to perform the coordination study.
- C. Final acceptance is to be made after Contractor has adjusted their equipment and demonstrated that it meets or exceeds requirements of Drawing and specifications.
- D. After work is completed and prior to acceptance, Contractor shall conduct following tests, tabulate data, date, sign and submit to Engineer for cables and grounding performed at the pump controller and on the load side of the electric service:
 - 1. Standard megger insulation test on each feeder.
 - 2. Ground resistance test.
 - 3. Record amperages on incoming phase conductors to main disconnect and on each feeder conductor with all equipment energized.
 - a. Load current shall not differ from average connected loads conductors by more than 7-1/2 percent.
 - b. If load current does differ by more than 7-1/2 percent, then the Contractor shall receive written direction from the Engineer whether the increase is acceptable.

1.12 ALTERATIONS

- A. All modifications or alteration to existing electrical facilities required shall be made to successfully install and integrate the new electrical equipment as shown. All modifications to existing equipment, panels or cabinets shall be made in a professional manner with all coatings repaired to match existing.
- B. Provide temporary wiring as needed for equipment intended to operate during alterations.
- C. Where existing equipment including wiring is in the way of new Work and is required to be relocated, disconnect electrical circuits, relocate equipment as directed, and reestablish circuits.

1.13 WARRANTY

- A. All equipment (electrical and/or mechanical) specified by these Specifications shall be warrantied and shall be provided with such warranties covering all parts and labor for a period of one (1) year from the date of Final Acceptance.
- B. Contractor shall obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers and manufacturers, within 10 days after completion of applicable item of work.
- C. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Standard Products

The equipment furnished shall be standard products in production by reputable companies regularly engaged in the manufacture of high-quality equipment of the type specified. Similar equipment shall have been in satisfactory and successful operation for a period of at least five years. All parts of the specified equipment shall be so designed as to be especially adapted for the service required and shall be proportioned, enclosed, or guarded as to have ample and liberal strength and stability to withstand, without damage, the stresses to which they may be subjected during erection or operation. The component parts of duplicate items shall be fabricated on a principle of interchangeability to facilitate ready replacement.

B. Materials

All material incorporated in the equipment shall be new and of first-class quality, free from injurious defects and imperfections, and of the classifications and grades designated. Materials not specifically designated herein shall be subject to the review of the Owner's Representative and shall be suitable for the purpose intended.

C. Identification Symbols and Nomenclature

Identification symbols and nomenclature where used throughout these Specifications are the same as those shown on the Drawings. Paragraphs of the Specifications describing the requirements of a single item of equipment shall apply equally to all identical items of equipment to be furnished.

2.02 RATINGS

- A. The sizes, ratings, capacities, and performance characteristics of various specified items of equipment and devices are based on currently available standard products, which are available through United States manufacturers. In no case shall the size, rating, capacity or performance characteristic be less than that specified unless approved in writing by the Owner's Representative. Ratings and performance characteristics, where applicable, of various devices and items of equipment are specified in respective Sections of these Specifications. All electrical equipment shall be UL rated.

2.03 DETAILS OF CONSTRUCTION

- A. Electrical work shall meet requirements of these Specification, product manufacturer's instructions, recommended tolerances and recommended procedures, and as indicated by final reviewed submittals for the Work.
- B. Materials shall be of size and thickness indicated. If not indicated, size and thickness shall be selected to provide strength and durability in finished Work for intended application. Work to dimensions indicated, using proven fabrication details.
- C. Product finishes, surfaces and edges shall be smooth and free of marks, burrs, seams, roughness and like defects or conditions.
- D. Other electrical-mechanical product construction details shall be in accordance with the best engineering practices, applicable code requirements and as specified in other Sections of these Specifications.

1.04 IDENTIFICATION

- A. Each panelboard and control center shall be equipped with a typewritten directory describing loads served. Directory shall be contained in steel frame mounted on inside face of enclosure door and shall be covered with sheet of clear plastic.
- B. Nameplates shall at a minimum consist of 1/8-inch thick, phenolic material, engraved with white lettering indicating plan designation, amperage, voltage, phase, originating panelboard/control center, or disconnecting means. Nameplates shall be fastened with escutcheon pins or other permanent means which do not damage the equipment.
- C. Install permanent nameplates on all devices or pieces of equipment such as starters, relays, contactors, pushbuttons, indicating lights, switches, RTU enclosure, control panel, pull/terminal boxes, and generator receptacle. Ensure position of nameplates readable after equipment installation.

- D. Wiring shall be color coded in accordance with NEC or as indicated on the Drawings.
- E. All wires shall be labeled with wire markers indicating the circuit ID. Labels shall be mechanically fastened white plastic type, similar to "PLM" series manufactured by Panduit, or equal.
- F. Where wires of different systems are located in a common box, each cable shall be grouped with its own system and labeled identifying power source and circuit.

1.05 EXTRA MATERIAL AND SPARE PARTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections, or as required by the manufacturer for the proposed installation.
- B. Deliver to location as directed by Owner.
- C. Provide accessories and appurtenances which the Engineer deems functionally necessary for a complete installation, whether or not explicitly indicated or described.

1.06 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Protect electrical equipment from the weather, especially from water dripping or splashing upon it, at all times during shipment, storage, and construction. Do not store equipment outdoors. Where equipment is installed or stored in moist areas, or unheated buildings, provide acceptable means to prevent moisture damage. Provide uniformly distributed source of heat in electrical equipment to prevent condensation and damage to electrical insulation systems.

1.07 DEFECTIVE OR DAMAGED EQUIPMENT

- A. Do not install equipment or material that was subjected to possible water damage.

1.08 RECORD DRAWINGS

- A. Maintain on site one (1) set of Drawings to record actual construction.
 - 1. Actual condition are to be put on the Drawings in red on a daily basis so the drawings will continuously show location and routing of conduits, pull boxes, circuit numbers, depths of conduits, and other information as required.
 - 2. At the completion of the project, provide two sets of drawings red-lined "Record" electrical drawings shall be carefully prepare, that show the as-installed equipment, devices, duct locations and wiring. These sets are to

be provided to the Owner. The markings on the drawings are to be neat, clean and legible.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Contract Drawings indicate the general details necessary for the complete electrical installation. It shall be the Contractor's responsibility to install all electrical work in a neat and workmanlike manner. The Contractor shall cooperate with others to permit the installation of all of the Work without interferences. If changes become necessary to avoid interference between the Work installed under various Sections, the Contractor shall submit to the Owner's Representative, for review, the proposed changes and upon review by the Owner's Representative, proceed with the installation of such changes without additional cost to the Owners.
- B. The Contractor shall maintain at the site a set of Drawings which shall be accurately shown the actual installation of all Work done under Division 16 and any variation from the Contract Drawings as reviewed by the Owner's Representative including changes in sizes, locations, and dimensions shall be indicated thereon. At the conclusion of the Work, the Contractor shall furnish record drawings in accordance with the General Conditions and as specified herein.

3.02 FACTORY TEST AND INSPECTION

- A. All equipment shall be shop-assembled and tested in the manufacturer's shop in accordance with recognized standard practices. Factory tests and inspections shall be conducted to verify that the equipment is operating satisfactorily and in compliance with the Specifications.

3.03 INSTALLATION AND TESTING

- A. General: Examine the areas and conditions under which electrical work is to be installed or performed and remedy any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.
- B. Existing Facilities: Verify existence, location, and operation of existing electrical facilities to be abandoned, removed, altered, modified and/or temporarily relocated to allow activities during construction of the Work.
- C. Install electrical work. Meet requirements of these Specifications, product manufacturer's instructions, recommended tolerances, and recommended procedures and as indicated by final reviewed submittals for the Work.

- D. Trenching and Backfilling. Unless otherwise specified, trenching and backfilling for conduit, cable, etc. shall be in accordance with IDOT Standard Specifications.
- E. Tests: Comply with the requirements of Section 26 05 00 as a minimum, and as specified in other Sections of these Specifications.

3.05 REMOVAL AND RELOCATION OF MATERIAL AND EQUIPMENT:

- A. Carefully dismantle and salvage electrical equipment, switches, fixtures, conduits, cables, wiring, junction/device boxes, as necessary for the proposed Work.
 - 1. The Owner shall mark any additional equipment that is to be salvaged, for delivery to location directed by Engineer.
- B. Remove from site and dispose of material and equipment not indicated for reuse.

3.07 DEMOLITION:

- A. Survey the existing electrical systems and equipment identified for removal with representative from the other trades prior to performing any demolition work. Identify all conduit and equipment to be removed with tags or paint. The Owner will indicate any equipment to be removed and given to the Owner.
- B. Where a piece of equipment is to be removed all associated ancillary components (e.g. solenoid valves, pressure switches, etc.) and associated wiring and conduit shall also be removed.
- C. Equipment, building or structures scheduled for complete demolition shall be made safe from electrical shock hazard prior to demolition. Disconnect all electrical power, communications, alarm and signal system.
- D. Equipment scheduled to be returned to the Owner shall be carefully disconnected, removed and delivered to the Owner where indicated. Provide labor, hoisting and transportation of the equipment. All other miscellaneous electrical materials, devices, etc., associated with the equipment being turned over shall be demolished and removed from the site.
- E. Unless otherwise specifically noted, remove unused exposed conduit and support systems back to point of concealment. Remove unused wiring back to source (or nearest point of usage).
- F. Disconnect and remove abandoned panelboards, disconnect switches, control stations, distribution equipment, etc.

- G. Disconnect and remove abandoned luminaries. Remove Unistrut, brackets, supports, hangers and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Coordinate electrical power outages to the electrical systems and equipment with the Owner. Where duration of proposed outage cannot be allowed by the Owner, phase the retrofit work to allow the system or equipment to be re-connected to the electrical power system within the time frame allowed by the Owner or provide temporary power connections as required to maintain service to the systems or equipment. The temporary power can be from a generator or another part of the facility not affected by the outage provided there is sufficient spare capacity.
- J. Continuous service is required on all circuits and outlets affected by these changes, except where the Owner will permit an outage for a specific time. Obtain Owner's consent before removing any circuit from continuous service.
- K. The electrical and process equipment to be removed or relocated under this contract has been identified on the Drawings. Survey the affected equipment and lift station areas before submitting bid proposal.
- L. Trace existing circuits that are to be relocated or removed and perform the relocation or removal work as required for a complete operating and safe system. Identify all equipment that is connected to the circuit and notify the Engineer of any equipment which was not identified on the Drawings.
- M. All equipment, materials, controls, motor starters, branch and feeder breakers, panelboards, transformers, wiring, raceways, etc. furnished and installed to provide temporarily electric service shall be removed when the permanent installation is fully operational.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Project Requirements.
2. 600-Volt.
3. Direct Burial.
4. Variable Frequency Drives.
5. Tracer Wire.
6. Connectors.
7. Wire Markers.
8. Color Coding.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. B3: Soft or Annealed Copper Wire.
2. B8: Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
3. B33: Tinned Soft or Annealed Copper Wire for Electrical Purposes.
4. B1010/B1010M – Standard Specification for Copper-Clad Steel Electrical Conductor for Tracer Wire Applications
5. B910/B910M – Standard Specification for Annealed Copper-Clad Steel Wire
6. B227 – Standard Specification for Hard-Drawn Copper-Clad Steel Wire
7. B170 – Standard Specification for Oxygen-Free Electrolytic Copper-Refinery Shapes
8. D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

B. National Fire Protection Association (NFPA) NFPA-70

C. National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

1. U.L. 44: Thermoset-Insulated Wires and Cables
2. U.L. 83: Thermoplastic-Insulated Wires and Cables
3. U.L. 854: Service Entrance Cables

E. Insulated Cables Engineers Association, Inc. (ICEA)/National Electrical Mfg's Association (NEMA):

1. ICEA S-61-4021/WC 5: Thermoplastic Insulated Wire & Cable.
2. ICEA S-66-524/NEMA WC7: Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable.
3. ICEA S-68-516/WC 8: Ethylene-Propylene-Rubber-Insulated Wire & Cable.
4. NEMA WD 1: General Requirements for Wiring Devices
5. NEMA WD 6: Wiring Devices-Dimensional Requirements.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 PROJECT REQUIREMENTS

A. Contractor shall furnish and install submersible the following low-voltage cables and accessories for, but not limited to:

1. Temporary Electric Service.
2. Proposed lift station.
3. As shown on Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wire and cable:

1. Okonite Company.
2. Southwire Company, LLC.
3. USA Wire & Cable, Inc.
4. Draka.
5. General Cable.

6. Belden.
7. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Trace cable:

1. Copperhead Industries.
2. No substitutions.

2.02 600-VOLT WIRE AND CABLE

A. Conductors: Copper.

B. Insulation: Rated for 600 volts.

1. Thermoplastic material rated not less than 194 degrees F (90 degrees C).
2. Use THHN/THWN in temperature controlled locations and within buildings.
3. Use XLP-Type USE for electrical services, outdoor, and unheated areas.

C. Stranding: Material and stranding of conductors to conform to ASTM B3, ASTM B33, and to ASTM B8, for the appropriate class.

D. Size: As shown on plans. For building and receptacle branch circuits a minimum of No. 12.

2.03 DIRECT BURIAL CABLE

A. Conductors: Copper.

B. Insulation:

1. 600 volts.
2. Rated for wet locations and direct burial use.

C. Temperature: 194 degrees F (90 degrees C).

2.04 VARIABLE FREQUENCY DRIVE (VFD)

A. Conductors: Tin copper and rated for VFD applications.

B. Insulation:

1. 600 volts.
2. Industrial-grade XLPE insulation.
3. Sunlight and oil resistant.
4. Rated for wet locations and direct burial use.

C. Temperature: 194 degrees F (90 degrees C).

- D. High stranded.
- E. Shielding: Two spiral copper tap shields to provide 100% ground symmetrical coverage.
- F. Suitable for Class I, II & III, Division 2 hazardous locations.

2.05 TRACER WIRE INSTALLED IN OPEN TRENCH

- A. Conductors: Copper clad with steel core conforming to ASTM B1010 and ASTM B910/B910M.
- B. Size: #12 AWG, minimum.
- C. Insulation:
 - 1. 600 volts.
 - 2. HDPE insulation.
 - 3. 30 mil thickness.
 - 4. Color: Color shall meet APWA color code standard for identification of buried utilities.
- D. Direct burial rated.
- E. Break Load: 450 lbs.

2.06 TRACER WIRE DIRECTIONAL DRILLING/BORING APPLICATIONS

- A. Conductors: Copper clad with steel core conforming to ASTM B1010 and ASTM B910/B910M.
- B. Size: #12 AWG, minimum.
- C. Insulation:
 - 1. 600 volts.
 - 2. HDPE insulation.
 - 3. 45 mil thickness.
 - 4. Color: Color shall meet APWA color code standard for identification of buried utilities.
- D. Direct burial rated.
- E. Break Load: 1,150 lbs.
- F. High strength, manufactured for directional drilling/boring applications.

2.07 TRACER WIRE CONNECTORS

- A. Rating: Direct bury rated.
- B. Fill Type: Dielectric silicone.
- C. Locking connectors, with a short jumper wire, shall be used at single and three-way connections.
- D. Non-locking, friction fit, or taped connectors shall be prohibited.

2.08 GROUNDING

- A. Ground Rod: Drive-in type, magnesium ground rod.
- B. Grounding Conductor: #12 AWG minimum.
 - 1. HDPE insulation.

2.09 JOINTS, TAPS, SPLICES, AND TERMINATIONS

- A. Twist type nuts
 - 1. No. 10 AWG conductors and smaller.
 - 2. Insulated.
 - 3. Solderless connectors.
- B. Compression connectors
 - 1. No. 8 AWG conductors and larger.
 - 2. Insulated.
 - 3. Solderless connectors.
 - 4. Type that will not loosen under vibration or normal strains.
- C. Crimp Type
 - 1. Insulated ring and spade terminal.
- D. Subject to moisture
 - 1. Watertight splice kits.

2.10 PERMANENT WIRE MARKERS

- A. Allowable types:
 - 1. Type-on, self-laminated vinyl
 - 2. Heat shrink polyolefin
 - 3. Plastic mechanically fastened
 - 4. Cloth tags are not acceptable
- B. Use fine-line, black, permanent ink pens

2.11 COLOR CODING

- A. Provide color coded wires in accordance with NEC, and as follows:

Conductor	120/208/240 Volt	277/480 Volt
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	White/Gray Striped
Ground	Green	Green

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform work in accordance with the National Electrical Code.
- B. Install in accordance with manufacturer's recommendations.

3.02 INSTALLATION OF WIRING

- A. Number and sizes of wires and conduits indicated are a guide only and are not necessarily correct for the actual equipment installed. Install as many wires and conduits as necessary for complete electrical system, and provide adequately for the equipment actually installed.
- B. Maintain barrier or conduit separation between power conductors and instrumentation conductors to avoid magnetic interaction where such conductors enter and pass through the same manhole, handhole, junction/device box, casing pipe, or enclosure.
- C. Install conductors continuous from outlet to outlet and make no splices except within outlet or junction boxes.
- D. Install cable in underground raceway system without splices. There shall be no splices between connection points unless otherwise indicated.
- E. Draw all conductors contained within a single conduit at the same time.
- F. Apply wire pulling compound to conductors being drawn through conduits. Use a pulling compound compatible with the conductors being installed.
- G. Allow slack so wires can expand and contract, and as required for future use if terminated or spliced.

- H. Provide service loop of wire in each junction or pull box for future use.
- I. Use no cable bend with radius of less than eight times its diameter.
- J. Install solid conductor for feeder and branch circuits 10 AWG and smaller.
- K. Wires and cables installed without prior submittal review are subject to removal at no additional expense.

3.03 DIRECT BURIAL CABLE

- A. Trench and backfill for direct burial cable installation shall be in accordance with Section 31 23 16 – Trench Excavation, Backfill, Compaction.
- B. Install warning tape along entire length of direct burial cable, within six (6) inches of grade.

3.04 TRACER WIRE

- A. Shall be installed in accordance with manufacturer's recommendations.
- B. Performed in such a manner that allows proper access to connection to the tracer wire and equipment.
- C. Locating without loss or deterioration of low frequency (512 Hz) signal and without distortion of signal caused by more than one wire being installed in close proximity.
- D. Installed as one single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
- E. Installed at the bottom of the pipe and secured at 5-foot intervals.
- F. Wire shall not be connected to existing conductive pipes.
- G. Service lateral tracer wire shall be a single wire, connected to the mainline tracer wire using a three-way mainline-to-service connector, installed without cutting/splicing the mainline tracer wire
- H. Tracer wire installed on service laterals/stubs shall terminate at an approved tracer wire access point located directly above the utility, at the edge of the road right-of-way, but out of the roadway.
- I. One foot of excess/slack wire shall be installed in all tracer wire access points after meeting final elevation.

- J. Ground with magnesium ground rod at all mainline dead-ends.
- K. When grounding the tracer wire at dead-ends/stubs, the Ground Rod shall be driven into virgin soil directly beneath and in line with the utility.
- L. Tracer wire shall be properly grounded as specified.

3.05 CONDUCTOR IDENTIFICATION

- A. Label each wire at both termination points. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identify each wire in junction boxes, cabinets, and terminal boxes where total number of control, indicating, and metering wires is three or more and no terminal board is provided, including all power wire. Where no termination is made use a plastic-coated, self-adhesive, wire marker and where termination is made use a, plastic, pre-printed sleeve wire marker.
- C. In cases similar to above where terminal boards are provided for the control, indicating, and metering wires, identify all wires including motor leads and other power wires too large for connection to terminal boards, by sleeve wire markers as specified above.
- D. In manholes and handholes, identify each power wire by laminated plastic tag located so it is easily seen. Control wires to be bundled and marked as listed in conduit and wire schedule.

3.06 CONNECTORS, TERMINAL LUGS AND BOARDS

- A. For wiring of circuits consisting of No. 10 or No. 12 AWG, such as for lighting branch circuits, use self-insulated pressure type connectors for all splices or joints.
- B. Terminate all wires connected to terminal boards, terminal blocks, or to other similar terminals by means of ring and tongue, nylon self-insulated, tin-plated copper pressure terminals.
- C. Wire connections for which terminals are not supplied, for example, at solenoids or motor terminal junction boxes:
 - 1. No. 10 AWG and smaller: Use self insulated pressure-type connectors.
 - 2. No. 8 AWG and larger: Use insulated, mechanical type with set screw or follower bearing directly on the wire. Split bolt connectors are not acceptable.

- D. Clearly and permanently mark terminal strips with ink or indelible pencil. Mark each wire consistently throughout entire system. Use the notation given on manufacturer's wiring diagrams wherever possible.

3.07 TESTING

- A. Perform tests of all cables prior to energizing in accordance with Section 01 43 00 – Quality Assurance.
- B. Submit results of all cable tests on forms indicating cable size, voltage, time, date, name of tester and witness.

3.08 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01 77 00 – Closeout Procedure.

3.09 TESTS AND CHECKOUTS

- A. Testing shall include:

1. Perform tests of all cables prior to energizing in accordance with Section 01 43 00 – Quality Assurance.
2. Submit results of all cable tests on forms indicating cable size, voltage, time, date, name of tester and witness.
3. Insulation Resistance Test in accordance with NFPA 99.
 - a. Connected loads over 20A - Insulation for new cables, shall not exceed 50 mΩ for phase to neutral conductors.
 - b. Connected loads over 20A or less - Insulation for new cables, shall not exceed 100 mΩ for phase to neutral conductors.
 - c. On tests of cables runs which include existing cables , the resistance shall be the same or better than the readings recorded at the maintenance transfer.
4. Ground Continuity testing in accordance with IEEE 142 and Standard Specifications for Road and Bridge Construction.
 - a. Resistance of the system ground as taken from the farthest extension of each circuit run from the controller. Readings shall not exceed 2.0 Ω, regardless of the length of the circuit.

- B. Testing shall not be performed within 48 hours of rainfall.

- C. Perform testing in the presence of the Engineer and furnish copies of test reports.

3.10 SAMPLE TEST FORM:

- A. A sample test form is provided for reference. See next page.

RESISTANCE TESTING
FOR SINGLE AND MULTIPLE CONDUCTORS, 600 VOLTS AND LESS

- Testing shall be performed before connecting the cable to the terminals at either end. Continuity of each conductor shall be checked at this time.
- Each conductor shall be checked with a 1000 volt megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable megger resistance shall be 250 megohms for each conductor to ground.

DATE: _____

PROJECT NAME: _____

LOCATION: _____

TEMPERATURE: _____

HUMIDITY: _____

UTILITY SERVICE INFORMATION

ELECTRIC METER
NO.: _____

TRANSFORMER
KVA RATING: _____

SERVICE CABLE
SIZE: _____
INSULATION

NO. OF
CONDUCTORS: _____

TYPE: _____

GROUND METHOD: _____

CONTROLLER INFORMATION

SERVICE LOAD
VOLTAGE: _____
AΦ-BΦ

SERVICE LOAD
AMPERAGE: _____
AΦ

AΦ-NΦ

BΦ

BΦ-NΦ

NΦ

MAIN BREAKER
RATING: _____

INTERRUPTING
RATING: _____

TESTING INFORMATION:

TESTING COMPANY: _____

REPRESENTATIVE: _____

MEGGER TYPE: _____

MAUFACTURER: _____

SERIAL _____

NUMBER: _____

REMARKS _____

CIRCUIT NAME:	RATING				MEASURED CABLE INSULATION		
					Min. Req.: $50\text{M}\Omega > 20\text{A}$ $100\text{M}\Omega \leq 20\text{A}$		
	AMPS	VOLTS	Ø	INTERRUPTING RATING	PHASE A	PHASE B	PHASE C

If applicable, all shields must be properly grounded prior to testing.

TEST PERFORMED BY:

Signature

Date

TEST WITNESSED BY:

Signature

Date

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 05 23

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Control-voltage wires, cables, and connectors.
2. Data cables.
3. Wire Markers.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

A. National Fire Protection Association (NFPA) NFPA-70.

B. National Electrical Code (NEC).

C. Underwriters Laboratories, Inc. (UL):

1. U.L. 44: Thermoset-Insulated Wires and Cables
2. U.L. 83: Thermoplastic-Insulated Wires and Cables
3. U.L. 854: Service Entrance Cables

D. Insulated Cables Engineers Association, Inc. (ICEA)/National Electrical Mfg's Association (NEMA):

1. ICEA S-61-4021/WC 5: Thermoplastic Insulated Wire & Cable.
2. ICEA S-66-524/NEMA WC7: Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable.
3. ICEA S-68-516/WC 8: Ethylene-Propylene-Rubber-Insulated Wire & Cable.
4. NEMA WD 1: General Requirements for Wiring Devices
5. NEMA WD 6: Wiring Devices-Dimensional Requirements.

1.04 SUBMITTALS:

- A. Submit in accordance with Section 01 33 00 – Submittals.
- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Control Cable:
 - 1. Belden.
 - 2. Anxiter.
 - 3. Southwire.
 - 4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 CONTROL-VOLTAGE WIRES AND CABLES

- A. Provide tinned copper wire only.
- B. Where cable is installed within a building, the cable shall be rated for indoor applications, tray cable, with a plenum fire resistance rating.
- C. For outdoor applications, cable insulation shall be sunlight resistant.
- D. Shielded instrumentation cable:
 - 1. Conductors: Stranded No. 16 AWG (min.).
 - 2. Insulation: Polyethylene or fluorinated ethylene propylene (FEP), color coded, rated for 300 volts.
 - 3. Jacket: Polyvinyl chloride or FEP.
 - 4. Shielding: Aluminum polyester, 100 percent coverage.
 - a. Includes stranded No. 20 AWG tinned copper drain wire.
 - 5. Instrumentation cable systems:
 - a. For 2-conductor requirements:
 - (1) Belden No. 8760 suitable for outdoor.

- (2) Belden No. 88760 suitable for outdoor & burial.
 - b. For 3-conductor requirements:
 - (1) Belden No. 8770 suitable for outdoor.
 - (2) Belden No. 88770 suitable for outdoor & burial.
 - c. For 2-twisted pair requirements: Belden No. 9552.
6. UL Listed for use.
7. Provide shielded instrumentation cable suitable for flooded burial and freeze/thaw conditions where installed in duct banks, underground conduits, or conduits in and on unheated structures.

C. Data Cables:

- 1. Verify unique cable requirements of individual data systems shown on Drawings with Systems Integrator.
- 2. Provide Belden, or equal, copper data cable systems:
 - a. DeviceNet Applications:
 - (1) No. 3083A CPE (Thick).
 - (2) No. 3085A CPE (Thin).
 - (3) No. 3082A PVC (Thick).
 - (4) No. 3084A PVC (Thin).
 - b. ControlNet Applications:
 - (1) No. 3092A RG-6 PVC Quad shield coax suitable for outdoor.
 - (2) No. 3093A RG-6 FEP Quad shield coax, plenum, suitable for outdoor & burial.
 - c. E/IP application:
 - (1) No. 7933A Cat 5e – 2 pair, bonded, shielded.
 - (2) No. 7929A Cat 5e – 4 pair, bonded, stranded, shielded.
 - (3) No. 7937A Cat 5e – 4 pair, bonded, shielded, burial.

- (4) No. 7932A Cat 5e – 4 pair, bonded, industrial grade with PVC jacket.

d. Profibus DP Applications:

- (1) No. 3079A 22AWG 300V Twinax.
- (2) No. 3079E 22AWG 300V Twinax, Flex Version.

e. Modbus application:

- (1) No. 8777 22 AWG, 3 pair modem drop cable.

3. Provide data cable suitable for flooded burial and freeze/thaw conditions where installed in duct banks, underground conduits, or conduits in and on unheated structures.

4. Provide data cables UL listed for intended use.

3.02 PERMANENT WIRE MARKERS

A. Allowable types:

- 1. Type-on, self-laminated vinyl
- 2. Heat shrink polyolefin
- 3. Plastic mechanically fastened
- 4. Cloth tags are not acceptable

B. Use fine-line, black, permanent ink pens

PART 3 - EXECUTION

3.01 GENERAL

A. Perform work in accordance with the National Electrical Code.

B. Install in accordance with manufacturer's recommendations.

3.02 INSTALLATION OF WIRING

A. Number and sizes of wires and conduits indicated are a guide only and are not necessarily correct for the actual equipment installed. Install as many wires and conduits as necessary for complete electrical system, and provide adequately for the equipment actually installed.

- B. Maintain barrier or conduit separation between power conductors and instrumentation conductors to avoid magnetic interaction where such conductors enter and pass through the same manhole, handhole, junction/device box, casing pipe, or enclosure.
- C. Install conductors continuously, with no splices.
- D. Install cable in underground raceway system without splices.
- E. Draw all conductors contained within a single conduit at the same time.
- F. Provide individual wiring compartment or barrier for separation between intrinsically safe and non-intrinsically safe conductors inside enclosure.
- G. Use a pulling compound compatible with the conductors being installed.
- H. Allow slack so wires can expand and contract, and as required for future use if terminated or spliced.
- I. Provide service loop of wire in each junction or pull box for future use.

3.03 DIRECT BURIAL CABLE

- A. Trench and backfill for direct burial cable installation shall be in accordance with Section 31 23 16 – Trench Excavation, Backfill, Compaction.
- B. Install warning tape along entire length of direct burial cable, within six (6) inches of grade.

3.04 CONDUCTOR IDENTIFICATION

- A. Label each wire at both termination points. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identify each wire in junction/device boxes, cabinets, and terminal boxes. Where no termination is made use a plastic-coated, self-adhesive, wire marker and where termination is made use a, plastic, pre-printed sleeve wire marker.
- C. In manholes and handholes, identify each control cable by laminated plastic tag located so it is easily seen. Control cables shall be bundled and marked as listed in conduit and wire schedule.

- D. Provide schedule identifying various control and instrumentation circuit conductors based on equipment tag numbers.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for CONTROL-VOLTAGE ELECTRICAL POWER CABLES.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Design requirements.
3. Ground Rods.
4. Grounding Conductors.
5. Access Wells.
6. Handholes.
7. Mechanical Connections.
8. Exothermic Connection.
9. Testing.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

A. American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):

1. ANSI-C2-/IEEE - National Electrical Safety Code.
2. IEEE 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.
3. IEEE 1100 – Recommended Practice for Powering and Grounding Electronic Equipment.

B. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electric Code.

C. International Electrical Testing Association (IETA):

1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. Local codes and ordinances.

E. Utility company.

1.04 SUBMITTALS:

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Metal underground water pipe.
2. Metal building frame.
3. Concrete-encase electrode.
4. Ground ring.
5. Metal underground gas piping system.
6. Rod electrode.
7. Plate electrode.

B. Grounding of electric equipment enclosures.

C. Grounding of water supply pipe and electrical services.

1.06 DESIGN REQUIREMENTS

A. Grounding System Resistance: Five (5) ohms maximum.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Ground Rods, exothermic welding, and hardware:

1. ERICO Products Inc.
2. Thomas and Betts.
3. Hubbell.
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Access wells and Handholes:

1. Hubbell.
2. Oldcastle Infrastructure.
3. Pentair.
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitutions.

2.02 GROUND RODS

A. Ground Rod:

1. Material: Copper clad steel.
2. Diameter: Minimum $\frac{3}{4}$ " diameter.
3. Length: Minimum 10 feet.

B. Connections: Exothermic welded connection or U-bolt clamp, as shown on Drawings.

2.03 GROUND CONDUCTORS

- A. Material: Copper.
- B. Insulation. Rated for 600 Volts.
- C. Grounding Electrode Conductor: Solid copper conductor.
- D. Bonding Conductor: Bare copper conductor.
- E. To Grounding Electrodes: Maximum No. 6 AWG.

2.04 ACCESS WELL COMPONENTS

- A. Well: Eight (8) inch NPS by 25 inch long cast iron pipe.
- B. Cover: Cast iron with "GROUND" embossed cover.

2.05 HANDHOLES

- A. Size: 12"x12"x12" deep polymer concrete handhole with Tier 15 rating, or as shown on the Drawings.
- B. Cover: Gasketed and engraved with "GROUND" logo.

2.06 MECHANICAL CONNECTORS

- A. Interlocking listed clamp fabricated from high strength corrosion-resistant bronze.
- B. U-bolt, nuts, and lock washers.
- C. Rated for grounding and bonding applications.

2.07 EXOTHERMIC CONNECTIONS

- A. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.
- B. Exothermic connections shall be provided where ground connections are installed below grade.

PART 3 - EXECUTION

3.01 EQUIPMENT GROUNDING

- A. Fastening to Steel and Concrete Substrate:
 - 1. Insert a non-conductive ¼-inch spacer between bus bar and building steel and concrete.
- B. Grounding Across Expansion Joints:
 - 1. Provide expansion connections.
- C. Connect power transformer cases and neutrals to grounding system. Connect neutral ground connection at transformer terminal. Provide two separate, independent, diagonally opposite, connections for power transformers so removal of one connection will not impair continuity of other.
- D. Connect a grounding conductor between panelboard and grounding system. Where a grounding bar is furnished with panelboard, connect grounding conductor to bar.
- E. Where conduits are not effectively grounded by firm contact with a grounded enclosure, apply grounding bushings on at least one end of conduit run.
- F. Ground wire fences when used to enclose electrical equipment or when overhead electrical lines cross fence. Unless otherwise indicated, provide grounding by buried outside peripheral ground loop; connections to each corner fence post and nearby ground rod; flexible connections to each gate; and at least two connections to grounding system from approximately opposite positions on fence.

3.02 GROUND RODS

- A. Drive rod down to permanent moisture level to ensure good grounding connection.
- B. Install ground rods near equipment as indicated on schematic. Install the top of the rod 12-in. below the ground surface.

- C. A minimum 8-feet shall be in contact with soil.
- D. Spacing: A minimum of 6-feet between multiple rods.
- E. Ensure that final resistance of interconnected ground system is 5 ohms, or less. Measure ground resistance in normally dry conditions, and not less than 48 hours after rainfall.

3.03 GROUNDING CONDUCTORS

- A. Install grounding conductors so that they will not be exposed to physical damage.
- B. Arrange conductors and connectors so no strain on connections.
- C. Connectors shall be sized to eliminate cutting of strands.
- D. Grounding conductors where not exposed to Class I, Division 1, locations shall be installed in PVC conduit.
- E. Install ground conductor in the same conduit as feeder/branch circuit wires.
- F. Ensure that severing of any single grounding conductor in this system does not remove grounding protection on any major item.
- G. Buried and concealed ground connections shall use exothermic welding.
- H. Connections shall be accessible.

3.04 EXOTHERMIC CONNECTIONS

- A. Exothermic connections shall be installed in accordance with the manufacturer's recommendations.
- B. Connections shall be made using the proper mold and powder charge.
- C. Connection shall be exothermic fusion type that will make a connection without corroding or loosening.
- D. The welding process shall join all strands and not cause the parts to be damaged or weakened.

3.05 TESTS AND CHECKOUTS:

A. Testing shall include:

1. Ground resistance testing in accordance with IEEE 142.

- a. Dry season resistance of each electrode(s) shall not exceed 5 ohms. If such resistance cannot be obtained with the system as installed, additional grounding rods shall be provided as required.

B. Testing shall not be performed within 48 hours of rainfall.

C. Perform testing in the presence of the Engineer and furnish copies of test reports.

3.06 SAMPLE TEST FORM:

A. A sample test form is provided for reference. See next page.

GROUND ROD RESISTANCE TO EARTH TEST RECORD

1. DATE _____
2. PROJECT NAME _____
3. LOCATION OF TEST _____
4. DRAWING NO. _____
5. GROUND ROD TYPE _____
DIAMETER _____
LENGTH _____
6. TEST METHOD _____
INSTRUMENT TYPE _____
SERIAL NO. _____
7. REQUIRED MAXIMUM RESISTANCE TO EARTH _____
8. MEASURED RESISTANCE TO EARTH ROD 1 _____
ROD 2 _____
ROD 3 _____

TEST PERFORMED BY: _____
Signature

TEST WITNESSED BY: _____
Signature

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for GROUNDING SYSTEM.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Conduit Supports.
3. Supporting Structures.
4. Anchoring and Fasteners.
5. Cord Grips.
6. Sleeves.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Division 3 - Concrete
3. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

A. ASTM International

B. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electric Code.

C. Factory Mutual (FM).

D. Underwriters Laboratories, Inc. (UL).

E. Manufacturers Standardization Society (ANSI/MSS).

F. Local codes and ordinances.

G. Utility company.

1.04 SUBMITTALS:

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

C. Shop Drawings shall include:

1. Support system load capacity.
2. Firestopping data, performance, limitations.
3. Structural calculations signed and sealed by an engineer or manufacturer.

1.05 SYSTEM DESCRIPTION

A. Design of support system shall be capable for supporting combined weight of support system and equipment/contents being supported.

B. Where installed within buildings. Support system shall confirm to applicable section of FM and UL for fire resistance ratings and surface burning characteristics.

1.06 QUALITY ASSURANCE

A. Welding: Where welding is required, this work shall be performed according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

1.07 COORDINATION

A. Coordinate size and locations of concrete bases, cast anchor-bolt inserts, reinforcement, and formwork.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Support Systems

1. Unistrut.
2. Allied Tube and Conduit.
3. Copper B-Line.
4. ERICO Products Inc.
5. Thomas and Betts.
6. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Fasteners

1. Hilti.
2. Copper B-Line.

3. ITW/Red Head.
4. MKT Fastening.
5. Eaton.
6. Empire Tool and Manufacturing Co.
7. Simpson Strong-Tie Co.
8. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

C. Cord Grips

1. Kellems, a Division of Hubbell.
2. Thomas and Betts.
3. Calbrite.
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 CONDUIT SUPPORTS

- A. Hanger Rods and Beam Clamps: Threaded high tensile strength galvanized carbon steel, cadmium plated steel, or malleable iron.
- B. Conduit Clamps for Trapeze Hangers: Galvanize steel, notched to fit trapeze with single bolt to tighten.
- C. Conduit Clamps:
 1. One-hole malleable iron for surface mounted conduits. Diameter: Minimum $\frac{3}{4}$ " diameter.
 2. Where mounted to steel beams, shall be clamp-on type. Welding or drilling of steel beams shall not be allowed.
- D. PVC Coated: PVC coated metal supports, clamps, and hardware shall be provided when PVC-coated, rigid galvanized steel conduits are used.
- E. Fiberglass: Fiberglass supports, clamps, and hardware shall be provided when fiberglass conduits are used, unless otherwise shown on the Drawings.

2.03 SUPPORTING STRUCTURES

- A. Material: Steel support channels with zinc coating, hot dipped galvanized per ASTM A123 or A153.
- B. Clips: Spring steel clips with screw closure.
- C. Supports, bases, accessories, and conduit clamps shall be from one manufacturer.

2.04 ANCHORING AND FASTENERS

A. Power Actuated Fasteners:

1. Threaded-steel stud, for use in concrete, steel, or wood.
2. Sized for tension, shear, and pullout loads required to support the support system loads.

B. Mechanical Expansion Anchors:

1. Wedge type for use in concrete.
2. Sized for tension, shear, and pullout loads required to support the support system loads.

C. Concrete Inserts:

1. Stainless steel, galvanized steel, carbon steel, or malleable iron.
2. Comply with ANSI/MSS SP-58 and SP-69.

D. Clamps:

1. Stainless steel, galvanized steel, carbon steel, or malleable iron.
2. Comply with ANSI/MSS SP-58.

E. Through Bolts:

1. Structural type, hex head, and high strength.
2. Comply with ASTM A325.

F. Toggle Bolts: All steel springhead type.

2.05 CORD GRIPS

- ### A. Cord grips shall be stainless steel, closed mesh, sized for the proposed cord diameter.

2.06 SLEEVES

- ### A. Sleeves Through Non-Fire Rated Floors: 18-gauge thick galvanized steel.
- ### B. Sleeves Through Non-Fire Rated Walls, Footings, and Wet Floors: Steel pipe or 18-gauge thick galvanized steel.
- ### C. Sleeves Through Fire Rated and Fire Resistive Floors and Walls: Prefabricated fire rated sleeves including seals, UL listed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install supporting devices in accordance with manufacturer's recommendations.
- B. Do not use perforated hanger iron.
- C. Supports shall be spaced in accordance with NFPA 70.
- D. Where anchors are drilled into concrete, Contractor shall use nondestructive methods to identify reinforcement locations and depths.

3.02 HANGER AND SUPPORTS INSTALLATION

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors, and preset inserts.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

C. Multiple Conduits:

1. Install multiple conduit runs on common hangers.
2. Supports shall be sized to accommodate a minimum of 25% in future load without exceeding specified design load limits.

3.03 EQUIPMENT BASES AND SUPPORTS

- A. Vertical support systems shall be provided with a concrete pad, a minimum of 3-1/2 inches thick and extends six (6) inches beyond supported equipment, reinforced with 6x6-W1.4/1.4 wire mesh.
- B. Use templates furnished with equipment, install anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members or formed steel channel as detailed on Drawings. Brace and fasten with flanges bolted to structure.

3.04 SLEEVE INSTALLATION

- A. Exterior Watertight Entries: Seal with adjustable interlocking rubber links.
- B. Conduit Penetrations Not Required to be Watertight or Through Existing Buildings: Sleeve and fill with silicon foam.
- C. Size sleeves in position in forms. Provide additional reinforcement around sleeves and box openings.
- D. Extend sleeves through floors one (1) inch above finished floor level. Caulk sleeves.
- E. Where conduit or raceways penetrates floor, ceiling, or wall, that is fire rated, the conduit or raceway shall be sealed with fire stopping insulation and caulked airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install stainless steel escutcheons at finished surfaces.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Project requirements.
3. Metal conduits.
4. PVC coated metal conduits.
5. Flexible metal conduits.
6. Liquidtight flexible metal conduits.
7. Nonmetallic conduits and tubing.
8. Reinforced thermosetting resin conduit (RTRC).
9. Sealing Compound.
10. Outlet, Pull, Device and Junction Boxes.
11. Handholes.
12. Underground Conduit Markers.
13. Spacers.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 05 29 – Hangers and Supports for Electrical Systems

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. American National Standard Institute (ANSI):

1. ANSI C80.1 – Specifications for Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 – Specifications for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing

C. National Electric Manufacturers Association (NEMA):

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA FB-1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 – Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.
8. NEMA TC14 – Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

D. National Fire Protection Association (NFPA)

E. National Electrical Code (NEC)

F. Underwriters Laboratories, Inc. (UL):

1. UL 514 – Outlet Boxes and Fittings.

G. Local codes and ordinances.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 SYSTEM DESCRIPTION

- A. This Section covers the general provision for furnishing and installing all conduits, related boxes and fittings, and associated accessories as required for the electrical power, control, annunciation, instrumentation, communication, and lighting systems as shown on the Drawings and as specified herein.
- B. All necessary hardware including, but not limited to screws, bolts, hangers, concrete inserts, clamps, locknuts, bushings, sealing bushings, couplings, pulling-in irons, identification tags, etc. shall be included.

1.06 PROJECT REQUIREMENTS

- A. Contractor shall furnish and install low-voltage cables and accessories for, but not limited to the following items:

1. Proposed lift station.
2. Generator.
3. As shown on Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Conduit:

1. Allied Tube & Conduit.
2. Western Tube & Conduit Corporation.
3. Wheatland Tube Company.
4. Carlon.
5. Cantex, Inc.
6. Arnco Corporation
7. Champion Fiberglass.
8. Calbond.
9. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Flexible Sealing Compound:

1. Panduit.
2. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

C. Outlet, Terminal, Pullboxes, And Device Boxes:

1. Hubbell.
2. Eaton.
3. Emerson/Appleton/O-Z.Gedney.
4. Hoffman.
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

D. Handhole

1. Hubbell.
2. Old Castle.
3. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 SIZE REQUIREMENTS

A. Size:

1. Minimum size shall be 3/4-inch in diameter.

2. Sized in accordance with NEC requirements.

2.03 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. Electrical Metallic Tubing (EMT): ANSI C80.3.
- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB-1.

2.04 PVC COATED METAL CONDUIT

- A. Rigid steel conduit with external PVC coating, 4-mil thick, NEMA RN-1.
- B. Fittings and Conduit Bodies: NEMA FB-1, steel fittings with external PVC coating to match conduit.

2.05 FLEXIBLE METAL CONDUIT

- A. Interlocked galvanized flexible steel core.
- B. A ground bonding conductor shall be included.
- C. Fittings and Conduit Bodies: NEMA FB-1.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Interlocked galvanized flexible steel core, with sunlight resistant jacket.
- B. A ground bonding conductor shall be included.
- C. Fittings and Conduit Bodies: NEMA FB-1.

2.07 NONMETALLIC CONDUIT

- A. Polyvinyl chloride (PVC), Schedule 40 or 80, NEMA TC2.
- B. Solvent shall meet requirements of ASTM D2564.
- C. Fittings and Conduit Bodies: NEMA TC3.

2.08 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Fiberglass conduit, NEC Article 355 – Reinforced Thermosetting Resin Conduit and NEMA TC14.
- B. Rated for above and below grade installation.
- C. Sunlight resistant.

D. Fittings and Conduit Bodies: NEMA TC14.

2.09 FLEXIBLE SEALING COMPOUND

A. Non-hardening sealant which adheres to metal, masonry, wood, and plastic. Sealing compound shall be oil-based.

B. Dielectric Strength: 200 V/Mil.

C. Operating Temperature: -34°F – 210°F (-30°C - 98°C).

2.10 OUTLET, TERMINAL, PULLBOXES, AND DEVICE BOXES

A. Sheet Metal: NEMA OS1, galvanized steel.

B. Aluminum and Stainless Steel: NEMA rating as shown on Drawings.

C. Nonmetallic: NEMA OS2.

D. Surface Mounted: Continuously hinged, gasketed, handle, and locking provisions.

E. Watertight Enclosures: Gasketed.

F. Device Boxes:

1. Aluminum or cast iron, NEMA FB1, Type FD.
2. Where installed in wet locations device boxes shall be provided with watertight covers, rated for in-use.

G. In-ground Boxes:

1. Flanged, recessed cover box.
2. Galvanized cast iron or stainless steel.
3. Cover. Nonskid cover with neoprene gasket.
4. Logo: "ELECTRIC".

2.11 HANDHOLES

A. Material: Molded, composite polymer concrete.

B. Construction: Modular with interlocking sections.

C. Size: As shown on the Drawings.

D. Cover: Nonskid cover with tamperproof, stainless steel, fasteners.

- E. Logo: As shown on the Drawings.
- F. Loading: ASTM C857, Class A-16, ANSI Tier 15 rated.
- G. Testing: In accordance with the latest edition of ANSI/SCTE 77 “specifications for Underground Enclosure Integrity” and provisions of paragraphs 5.2.3 and 5.2.4 for Western Underground Committee Guide 3.6.

2.12 UNDERGROUND CONDUIT MARKERS

- A. Underground Warning Tape: Four (4) inch wide plastic tape, detectable type, colored red for electrical and orange for communications with suitable warning legend describing buried conduits.
- B. Tracer Wire: Magnetic detectable conductors in accordance with Section 26 05 29 – Low-Voltage Electrical Power Conductors and Cable.

2.13 SPACERS

- A. Where multiple conduits are installed in a common trench, spacers sized accordingly for the quantity and size of conduits, shall be provided.
- B. Where boxes are mounted to concrete walls, spacers, offsets, or Unistrut shall be used to mount boxes to wall. Boxes shall not be directly mounted to concrete wall/structures.
- C. Wood spacers shall not be allowed.

2.14 METAL UNISTRUT

- A. Material: Hot dip galvanized, conforming to ASTM A1011 S, GR 33. Stainless steel Type 304 or 316, conforming to ASTM A240.
- B. Size: 1 5/8” square, 12 gauge minimum.
- C. Additional Features: 1/2" diameter round holes to minimize field drilling.
- D. Accessories: Channel nuts, pipe/conduit support, general fittings, braces, and post bases shall be provided by the same manufacturer.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Installed in accordance with manufacturer's recommendations, NEC, and local code/ordinances.

- B. Ground and bond in accordance with Section 26 05 26 – Grounding and bonding for Electrical Systems.
- C. Fasten raceway and boxes in accordance with Section 26 05 29 – Hangers and Supports for Electrical Systems.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.
- E. Install pull rose or tape in empty raceways.
- F. All conduits and boxes shall be installed as shown on the Drawings, with the exact location and routing to be determined in the field as required.
- G. Any and all excavation, trenching, coring, backfilling, incidental concreting (not part of a structure in which conduits are embedded) and/or concreting required for duct banks, etc. as required for the installation of Electrical Conduit shall be performed by the Contractor at the Contractor's expense. Installation of all raceway conduits and fittings shall be in accordance with these Specifications, manufacturers' recommendations, applicable standards, codes and regulations, and best engineering practices.
- H. All accessories and mounting devices shall be provided as required for each installation.

3.02 RACEWAY INSTALLATION

- A. Installation of all conduits, boxed fittings, and accessories shall conform to the requirements of the NEC.
- B. During installation, precaution shall be taken to protect the conduits and conduit threads from mechanical injury.
- C. The ends of conduits shall be sealed in an approved manner during installation whenever the work is interrupted. Runs shall be sealed upon completion by the use of caps and discs or plugs. The seals shall be maintained, except during inspection and tests, until the conductors are pulled in.
- D. Conduits shall be thoroughly cleaned of water and dirt by means of compressed air, swabs or other approved methods.
- E. Each run of conduit shall be continuous between panelboards, pull boxes, handholes, or light poles.
- F. Conduits shall be cut square, ends reamed and threads cut with approved dies.

- G. Exposed conduits inside building shall run supported on walls or on trapezes away from wall, unless otherwise shown on the Drawings.
- H. Conduit embedded in concrete shall be PVC, unless otherwise shown on the Drawings. Embedded conduits shall be sloped towards drain points and shall be rigidly supported and braced to avoid shifting during placement of concrete. Embedded conduit runs parallel to concrete surfaces shall be located behind the reinforcing steel except at terminal connections to outlets or junction boxes. Conduit extending out of concrete walls, floors, or beams shall be at right angles to the surface.
- I. Conduits shall have long-sweep field bends wherever possible, but shall in no case have smaller radii bends than are allowed by NEC or as recommended by the manufacturer whichever is the most stringent. All field bends shall be manufactured bends or made with a bending machine or other approved device. Field bends shall not reduce the internal diameter of the conduit or injure the protective coatings. The bend shall be free of kinks, indentations, or flattened surfaces. Heat shall not be applied. Standard bends shall be used where conduits turn out of the concrete, at the conduit terminations, and at electrical equipment. Where conduits enter switchgear cubicles or other enclosures, they shall be located by template.
- J. Where conduits cross expansion joints or contraction joints, they shall be installed perpendicular to the plane of the joint and shall have expansion fittings.
- K. Expansion fittings installed in concrete shall have concrete formed around the expansion fitting in a manner to permit their movement.
- L. Conduit Schedule:

TYPE	INSTALLATION LOCATION	SIZE LIMITS	INSTALLATION REQUIREMENTS
Reinforced Thermosetting Resin Conduit (RTRC)	1. Exposed or concealed 2. Direct burial	Min dia: ¾-Inch	1. Straight as possible. 2. No more than four 90° bends. 3. No running threads. 4. Drains to nearest pullbox. 5. Where conduit enters a

TYPE	INSTALLATION LOCATION	SIZE LIMITS	INSTALLATION REQUIREMENTS
Rigid Galvanized Steel: Hot- dipped process or by applying a metalized zinc coating	- Exposed or concealed - Concrete encasement as shown on Drawings - Direct burial	Min dia:3/4-Inch	new structure below grade: Cast entrance seal in concrete wall. - Where conduit enters existing concrete structures below grade: Install entrance seals on the outside and inside surfaces of walls. - Interior free from abrasions, projections, and debris. - Conduit Fittings: Cast metal with cast-metal gasketed covers, lock-nuts, metal bushings, and caps. - Bushings: Galvanized or plastic. - Couplings, elbows, nipples, and offsets for conduit: Same material and service in which they are installed.
Rigid Galvanized Steel with PVC Coating	Corrosive areas	Min dia: 3/4-inch	
Electrical Metallic Tubing	- Interior locations only, as shown on Drawings - Never encase in concrete	Min dia: 3/4-inch	
PVC	- Below grade only - Concrete encasement as shown on Drawings	Min dia: 3/4-inch	
Flexible	- For connections to motors and other devices where vibration is encountered; watertight - For connections to recessed lighting fixtures when concealed above ceiling.	Min dia: 3/4-inch Max length: 6 feet	

- Installed conduits a minimum of 30-inches below grade, unless otherwise approved by the Engineer.
- For connection to lighting fixture: 1/2-inch diameter minimum.

3.03 BOX INSTALLATION

- Boxes shall be sized in accordance with NEC based on the number of conduits connected and splices made in the box.
- All boxes shall be so located that covers and openings are easily accessible.

- C. Installed parallel with building lines, and where embedded shall be flush with the surface of the finished floor, wall, or ceiling.
- D. The Contractor shall remove and reset all boxes not properly installed or shifted out of line during concreting, whenever required or directed.
- E. Weathproof boxes shall be installed for areas exposed to the elements or wet locations.
- F. Flush-mounted boxes shall be provided with trims to allow for embedding in concrete and required to allow cutting masonry within brick areas.
- G. Do not fasten boxes to ceiling supports and conduit/piping systems. Boxes shall be supported independently of conduits.

3.04 HANDHOLE INSTALLATION

- A. Excavate and backfill for handhole installation in accordance with Section 31 23 16 – Trench Excavation, Backfill, Compaction.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Color coding.
2. Labeling and nameplates.
3. Wire markers.
4. Conduit and raceway markers.
5. Stencils.
6. Underground warning tape.
7. Lockout devices.
8. Electrical identification installation.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code (NEC).

B. Underwriters Laboratories (UL):

1. Underwriters Laboratories Standards.

C. American National Standards Institute (ANSI).

D. Institute of Electrical and Electronics Engineers (IEEE).

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1. Product Data:

- a. Submit manufacturer's catalog literature for each product required.
- b. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

2. Samples:

- a. Submit two samples of each type of identification products applicable to project.
- b. Submit two nameplates, 4-inch x 4-inch in size illustrating materials and engraving quality.

3. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.01 COLOR CODING

- A. Designate by color the wires for ground, main feeders, motor leads, control, and instrumentation in accordance with governing codes and industry standard.

2.02 LABELING AND NAMEPLATES

A. Circuit Breaker Panels:

1. Label all power and lighting circuits.
2. Provide a typed directory with protective cover inside door that identifies all circuits.
3. Nomenclature for circuits: As shown on the Drawings or specified by Engineer.

B. Boxes:

1. Identify with nameplate indicating contract number:
 - a. Inside of Box: Mount identification so it is easily visible when the

- cover is removed.
- b. Outside on Cover: Ground mounting screws or bolts of identification flush with inside of cover.

C. Conduit:

1. Above the conduit entrance, inside each box, identify the designated number of each installed conduit where shown on Drawings:
 - a. Stencil.
 - b. Permanent ink marker covered with a coat of lacquer.
2. Identify after conduit installation and before wires are pulled through.

D. Nameplates:

1. Affix to all Electrical Centers and Apparatus:
 - a. Motor control centers.
 - b. Power centers.
 - c. Substations.
 - d. Cabinet doors and panels.
 - e. Switchboard panels.
 - f. Apparatus cases.
 - g. Junction boxes 6-inch x 6-inch and over.
 - h. All electrical apparatus.
2. Affix to Control and Instrumentation Devices:
 - a. Flow meters.
 - b. Recording meters.
 - c. Probes.
 - d. Trip valves.
 - e. Vent valves.
 - f. Electrically operated valves.
 - g. Supervisory valves.
3. Affix to control switches.
4. Drill and fasten with rust-proof mounting bolts or screws.
5. Finish bolts or screws to match nameplate.
6. Fasten to explosion-proof equipment and enclosures with suitable adhesive rather than with bolts or screws.
7. Nameplate sizes:
 - a. Minimum thickness of plate: 3/32- inch.
 - b. Front edges of plate: 1/32-inch bevel.
 - c. Lettering: Minimum height of 1/26- inch.
8. Nameplate Fabrication:
 - a. Material: Laminated phenolic.
 - b. Inner layer: Black
 - c. Outer layer: White

- d. Polished surfaces on both sides.
 - e. Engraved inscription: Black on white background.
 - f. Lettering shall be 1/2 -inch high (min.)
9. Nameplate Inscription: Contractor shall provide all details, including size of letters, numerals, and punctuation, after station tests of all material and apparatus have been completed.
10. Arc flash hazard warning and personnel protective equipment (PPE) shall be determined by the Contractor and labeled in the field according to NEC Article 110.16.

2.03 WIRE MARKERS

- A. Provide materials in accordance with NEC Code.
- B. Description: Cloth tape, split sleeve, or tubing type wire markers.
- C. Attach to each end of cable and in pull boxes, where spliced.
- D. Submit schematics with the number of each wire, and label in the field.
- E. Verify designations with Engineer.
- F. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
 - 2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams and on shop drawings.

2.04 CONDUIT AND RACEWAY MARKERS

- A. Description:
 - 1. Nameplate fastened with straps.
 - 2. Nameplate fastened with adhesive.
 - 3. Labels fastened with adhesive.
 - 4. Stencils.
- B. Color:
 - 1. Medium Voltage System: Black lettering on white background.
 - 2. 480-Volt System: Black lettering on white background.
 - 3. 208-Volt System: Black lettering on white background.
- C. Legend:
 - 1. Medium Voltage System: HIGH VOLTAGE.
 - 2. 480 Volt System: 480 VOLTS.
 - 3. 208 Volt System: 208 VOLTS.

2.05 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to two (2) inches Outside Diameter of Raceway: 1/2-inch high letters.
 - 2. 2-1/2 to six (6) inches Outside Diameter of Raceway: 1-inch high letters.
- B. Stencil Paint: As specified in Section 09 90 00 – Paintings and Coatings, semi-gloss enamel, colors conforming to the following:
 - 1. Black lettering on white background.
 - 2. White lettering on gray background.
 - 3. Red lettering on white background.
 - 4. Blue lettering on white background.

2.06 UNDERGROUND WARNING TAPE

- A. Description: Four (4) inch wide plastic tape, detectable type, colored red for electrical and orange for communications, with suitable warning legend describing buried electrical lines.

2.07 LOCKOUT DEVICES

- A. Lockout Hasps:
 - 1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4-inches x three (3) inches.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 – Painting and Coatings for stencil painting.

3.02 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this Section.
- B. Install identification on unmarked existing equipment.
- C. Replace lost nameplates, labels, and markers.
- D. Re-stencil existing equipment.

3.03 ELECTRICAL IDENTIFICATION INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners or adhesive.
4. Secure nameplate to equipment front using screws, rivets or adhesive.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
6. Install nameplates for the following:
 - a. Switchboards.
 - b. Panelboards.
 - c. Transformers.
 - d. Service disconnects.
 - e. All mechanical equipment including roof top and AC units.
 - f. Provide panel schedules with breaker sizes and designations.

C. Label Installation:

1. Install label parallel to equipment lines.
2. Install label for identification of individual control device stations.
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along cable run.
3. Install labels at data outlets identifying patch panel and port designation as indicated on Drawings.

E. Conduit Raceway Marker Installation:

1. Install conduit and raceway marker for each conduit and raceway longer than six (6) feet.
2. Conduit and Raceway Marker Spacing: 20 feet on center.
3. Raceway Painting: Identify conduit using field painting in accordance with Section 09 9600 – Protective Coatings.
 - a. Paint colored band on each conduit longer than six (6) feet.
 - b. Paint bands 20 feet on center.
 - c. Color:
 - 1) 480-Volt System: Blue.
 - 2) 208-Volt System: Yellow.

F. Stencil Installation:

1. Apply stencil painting in accordance with Section 09 90 00 – Painting and Coatings.

G. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable six (6) inches to eight (8) inches below finished grade, buried directly above conduit, raceway, or cable.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item, but shall be considered as included in the prices bid for the various pay items of work involved.

--END OF SECTION--

SECTION 26 27 16
CABINET AND ENCLOSURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hinged Enclosures and Cabinets.
2. Terminal Blocks.
3. Vented Cable Junction Box.
4. Junction Boxes and Wireways.
5. Tracer Wire Access Boxes.
6. Plastic Wire Management.
7. Cabinet Lights.
8. Light Fixtures.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
4. Section 26 05 26 – Grounding and Bonding for Electrical Systems
5. Section 26 05 29 – Hangers and Supports for Electrical Systems
6. Section 26 29 20 – Pump Controller
7. Section 27 51 25 – SCADA System

1.03 REFERENCES

A. National Electric Manufacturers Association (NEMA)

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA ICS 4 – Industrial Control and Systems: Terminal Blocks.

B. National Fire Protection Association (NFPA)

C. National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

1. UL 50 – Enclosures for Electrical Equipment, Non-Environmental Considerations.

2. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
3. UL 508A – Standard for Industrial Control Panels.

E. Local codes and ordinances.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.
- C. Scaled drawings showing dimensions, front/side views, sections, and layout of equipment (to scale) inside the cabinet/enclosure.

1.05 EXTRA MATERIALS

- A. Provide spare parts and maintenance products.
- B. Provide a minimum of two (2) keys to each cabinet and enclosure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Enclosures and Cabinets:

1. Saginaw Control & Engineering.
2. Eaton.
3. Cooper B-Line.
4. APX Enclosures.
5. Southern Manufacturing.
6. Hoffman.
7. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Vented Cable Junction Boxes:

1. Excel.
2. J&A Sheet Metal.
3. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 HINGED ENCLOSURES AND CABINETS

A. Construction:

1. Located in exterior and wet locations: NEMA Type 3R aluminum or galvanized steel. NEMA Type 4X, 304L stainless steel, as shown on the Drawings.
2. Located within buildings and enclosures: NEMA Type 12 steel enclosure.

B. Covers: Continuously hinge, operable by handle or flush latch.

C. Size: As shown on the Drawings.

D. Back Panel: A white metal panel or phenolic material shall be used to mount terminal blocks and interior electrical components.

E. Cabinet sloped top to prevent water accumulation and ice formation on top surface.

F. Restraint mechanism on each door to prevent movement of open door in windy conditions.

G. Concrete Equipment Pad: Ground mounted cabinets shall be arranged for mounting on a reinforced concrete equipment pad. The overall dimensions of the equipment pad shall be as indicated on the Drawings.

H. Vent: Cabinets shall be equipped with a louvered vent designed to prevent the elements, dirt, and insects from entering the cabinet. Vents shall be provided with removable air filter held firmly in place with top/bottom brackets and spring-loaded clamps. Vents shall be designed to operate with exhaust fan to provide a minimum of 100 cubic feet of air per minute to the cabinet.

I. Cabinets shall be provided with three-point latching systems and nylon rollers.

J. Finish: Manufacturer's standard enamel in gray, unless otherwise shown on the Drawings.

2.03 TERMINAL BLOCKS

A. Terminal Blocks: NEMA ICS 4.

B. Power Terminal/Distribution Blocks:

1. Rating: 600 Volts.
2. Insulated.

3. Unit construction type with closed back/sides and pressure screw connectors.
 4. Sized as required.
- C. Control/Signal Terminal Blocks:
1. Rating: 300 Volts.
 2. Insulated.
 3. Unit construction type with closed back/sides and pressure screw connectors.
 4. Sized as required.
- D. Furnish ground terminal/power distribution block, bonded to enclosure/cabinet.

2.04 JUNCTION BOXES AND WIREWAYS

- A. Product Description: NEMA Type 3R aluminum or galvanized steel. NEMA Type 4X, 304L stainless steel, as shown on the Drawings.
- B. Covers:
1. Continuously hinged.
 2. Door handle with padlock provision.
 3. Keyed at locations shown on the Drawings.
- C. Size: 18 inches wide x 18 inches high x 16 inches deep, minimum.
- D. Finish:
1. Steel: Manufacturer's standard enamel in gray.
 2. Aluminum: Brushed satin finish.
 3. Stainless steel: Standard Finish.
 4. Unless otherwise shown on the Drawings.
- E. Vented Bottom Box: Where mounted to a vented bottom box, the vented box shall consist of 14-gauge, Type 304 flattened stainless steel, with a diamond pattern, formed to match depth of the top box.
1. Box shall be provided with a solid back plate and stiffeners welded to the top to increase rigidity.
 2. Box shall have reinforced double plates with provisions to be pad mounted.
 3. Cover shall be provided with door handle with padlock provisions.
- F. Three-point latching systems with nylon rollers.

2.05 TRACER WIRE ACCESS BOXES

- A. Rating: For roadway applications.
- B. Lid: Cast iron with ground switch, and encapsulated magnet.

C. Base: High-grade ABS rigid plastic (ASTM D1788, Type 1).

D. Hardware: Anodized aluminum.

2.06 PLASTIC WIRE MANGEMENT

A. Construction: Plastic channel with hinged or snap-on cover.

2.07 LIGHT FIXTURES

A. The LED light fixtures shall be provided in ground mounted cabinet, operated on door switch, to automatically turn on when the cabinet door is open.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install cabinets and enclosures in accordance with manufacturer's recommendations.

B. Cabinets and enclosures shall be installed to maintain required working spaces in accordance with NEC.

C. Caulk all field punched or drilled openings with silicone sealing compound to maintain leak-proof integrity of exterior surfaces.

D. Enclosures and cabinets shall be installed level and plumb.

E. Adjust doors and door hardware as required for correct alignment and ease of operation.

3.02 TRACER WIRE ACCESS BOXES

A. All tracer wire termination points must provide a direct connection point to the tracer wire by a utility locate transmitter (above ground or at grade) specifically manufactured for lite duty, concrete/driveway, or roadway applications.

B. At-grade access points shall be appropriately identified with "sewer" or "water" on the cap and be color coded per American Public Works (APWA) standards.

C. Two-terminal tracer wire access points shall include a manually interruptible conductive/connective link between the terminal for the tracer wire connection and the terminal for the ground rod wire connection.

- D. Two-terminal tracer wire access points shall have external direct connection points to both the tracer wire and ground rod wire from top of lid.
- E. At-grade access points shall include an encapsulated magnet molded into the top portion of the tube, to allow for detection by a ferrous metal detector.
- F. At-grade access points shall be supplied with anti-corrosion wax/gel to protect wires.
- G. Service laterals on public property shall have tracer wire terminate at an approved at-grade access point located at the edge of the road right-of-way, and out of the roadway. Approved at-grade access points shall have a two-terminal externally switchable lid, where there is a direct connection point for a locate transmitter and an external switch to turn "ground" on and off from the top of the lid.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement shall be made for each vented cable junction box installed.
- B. Measurement shall not be made for other enclosures, tracer access boxes, etc.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made for VENTED CABLE JUNCTION BOX.
- B. The pump controller enclosure shall be paid for separately.
- C. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- D. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 27 26

WIRING DEVICES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Receptacles.
2. Switches.
3. Light fixtures (non-hazardous locations).
4. Light fixtures (hazardous locations).
5. Accessories.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 26 – Electrical Requirements

1.03 REFERENCES

- A. ASTM International**
- B. The Underwriters' Laboratory (UL) listings or approvals**
- C. National Fire Protection Agency (NFPA)**
- D. National Electric Code (NEC)**
- E. American Society of Mechanical Engineers (ASME)**
- F. National Electric Manufacturer's Association (NEMA)**

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.**

1.05 WARRANTY

- A. All materials, installation, equipment, connections, and controls shall be warranted for a period of one year after date of final acceptance. Make any required repairs or replacements during that time period to the satisfaction of the Owner, at no cost.**

PART 2 – PRODUCTS

2.01 STRAIGHT BLADE RECEPTACLES

A. Manufacturers:

1. Cooper
2. Hubbell
3. Leviton
4. Appleton
5. Substitutions will be allowed in accordance with Section 01 25 00 - Substitutions.

B. Equipment Requirements:

1. Heavy duty, commercial grade.
2. Duplex, GFCI, with indicator light when the device is tripped.
3. In conformance with NEMA WD 1, NEMA WD 6, UL 498, and UL 943.
4. Configuration: 5-20R.
5. Amperage: 20A
6. Operating Voltage: 120V, 1-phase.

C. Housing:

1. Cast Aluminum device box.
2. Weatherproof cover rated for in-use when located in wet locations.
3. Class I Division I rated, in accordance with NEMA FB 11 and UL 1010, at locations indicated on the plans.

2.02 SWITCHES

A. Manufacturers:

1. Cooper
2. Hubbell
3. Leviton
4. Emerson/Appleton
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Equipment Requirements:

1. Heavy duty, commercial grade.
2. Single pole.
3. Amperage: 20A
4. Operating Voltage: 120V, 1-phase.

C. Housing:

1. Cast Aluminum device box.

2. Class I Division I rated, in accordance with NEMA FB 11 and UL 1010, at locations indicated on the plans.

2.03 LIGHT FIXTURES (NON-HAZARDOUS LOCATIONS)

A. Manufacturers:

1. Philips/Stonco
2. Lithonia
3. Cooper
4. Emerson/Appleton
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Equipment Requirements:

1. Heavy duty, commercial grade.
2. LED Lamp.
3. Vapor-proof fixture.
4. Globe: Clear glass with guard.
5. Wattage: 100W (maximum)
6. Operating Voltage: 120V, 1-phase.

C. Housing:

1. Die-cast aluminum.
2. Ceiling mounted.
3. A wall box shall be provided at locations indicated on the plans.
4. Class I Division I rated, in accordance with NEMA FB 11 and UL 1010, at locations indicated on the plans.

2.04 LIGHT FIXTURES (HAZARDOUS LOCATIONS)

A. Manufacturers:

1. Emerson/Appleton
2. Lithonia
3. Cooper
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Equipment Requirements:

1. Enclosed and gasketed.
2. LED Lamp.
3. Suitable for wet locations.
4. Globe: Clear glass with guard.
5. NEC Class I, Division 1 Rated.
6. Wattage: 100W (maximum)

7. Operating Voltage: 120V, 1-phase.

C. Housing:

1. Die-cast aluminum or malleable iron with zinc electroplating.
2. Ceiling mounted.
3. A wall box shall be provided at locations indicated on the plans.
4. Class I Division I rated.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions where equipment shall be installed. Do not proceed with work until unsatisfactory conditions have been correct in a manner acceptable to manufacturer installation requirements.

3.02 INSTALLATION

- A. Install all equipment in accordance with manufacturer requirements.
- B. Comply with NECA 1, including mounting heights, unless otherwise noted.

3.03 ADJUSTMENT AND CLEANING

- A. Clean unit exposed surfaces.
- B. Retouch any marred or scratched surfaces, using finish materials furnished by manufacturer.

3.04 TESTING

- A. Upon completion of installation, test fans to demonstrate operability and compliance with manufacturer requirements. Where possible, field correct malfunctioning units, then retest.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 26 29 20

PUMP CONTROLLER ENCLOSURE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. PLC.
2. Operator interface.
3. Power supply.
4. Power monitors.
5. Disconnects.
6. Circuit breakers.
7. Load centers.
8. Transformers.
9. Indicator and push button switches.
10. Hand-Off-Switches.
11. Warning lights.
12. Cabinet lights.
13. Cabinet heater.
14. Relays.
15. Level management.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
4. Section 26 05 26 – Grounding and Bonding for Electrical Systems
5. Section 26 27 16 – Cabinet and Enclosures
6. Section 27 51 25 - SCADA
7. Section 33 42 00 – Sewage Pumps and Accessories

1.03 REFERENCES

- A. National Electric Manufacturers Association (NEMA)
- B. National Fire Protection Association (NFPA)
- C. National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

1. UL 50 – Enclosures for Electrical Equipment, Non-Environmental Considerations.
2. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
3. UL 508A – Standard for Industrial Control Panels.

E. Institute of Electrical and Electronics Engineers (IEEE).

F. Local codes and ordinances.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

C. Scaled drawings showing dimensions, front/side views, sections, and layout of equipment (to scale) inside the cabinet/enclosure.

1.05 COORDINATION

A. Coordinate features of motors, load characteristics, installed units, and accessory devices compatible with the following:

1. Pump torque, speed, and horsepower requirements for the load.
2. Ratings and characteristics of supply circuit and required control sequences.
3. Ambient and environment conditions of installation location.

B. Coordinate equipment sizes with cabinet fabricator, existing and proposed building components, and equipment supports.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Cabinet Manufacturer's:

1. USEMCO.
2. Metropolitan.
3. Tri-R.
4. Wunderlich-Malec

5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 COMPONENTS

- A. PLC: See Section 27 51 25 - SCADA.
- B. Operator Interface Terminals:
 1. Allen Bradley Panel View 5000.
 2. 10.4" square color touch screen minimum.
- C. Power Monitor: Power quality meter with integral digital display. RS-485 Port compatible with MODBUS communication protocol, 20-60Vdc power supply.
- D. Power Supply: Puls, C Series. 120V input, 24vDC output, 5A, single phase input, sized as required.
- E. Main Disconnect Switch (if required) – Heavy-Duty, fusible, 3 Pole, 600 Volt, 22KAIC minimum short-circuit rating, in a NEMA 3R enclosure. Main disconnect shall be mounted to the exterior of the pump controller enclosure.
- F. Manual Transfer Switch:
 1. Fusible, double-throw manual transfer switch.
 2. Listed for use in accordance with Article 702 of the NEC, ANSI/NFPA 70. Switch.
 3. Sized as required.
 4. Voltage: 277/480V, 3-Phase, 3-Pole
 5. Padlockable in the "On" and "Off" positions.
 6. Accessories: Provided with all accessories to allow a portable generator to provide emergency power to the pump controller enclosure.
- G. Main Circuit Breaker – 3 Pole, 600 Volt, 22kAIC minimum short-circuit rating, molded case circuit breaker type, with flexible cable operating mechanism, as shown on Drawings.
- H. Branch Circuit Breaker: 3 Pole, 600 Volt, 22kAIC minimum short-circuit rating, molded case circuit breaker type.
 1. Circuit breakers shall be provided with extension handles as required to allow them to be accessed through the dead front panels.
- I. Surge Protection:
 1. ANSI/UL 1449.
 2. 200kAIC, 600V rated, minimum.

J. Load Center: 120/240V, 1 Phase, 12 space (minimum), with main circuit breaker sized as shown on the Drawings, in a NEMA 1 rated enclosure.

K. Cabinet Control Transformer: Sized as shown on the Drawings, or as required.

L. Power Distribution Blocks:

1. 1 Pole, 600 Volt, 100kA fault rating, insulated type
2. Number of lugs and sizes as required.

M. Terminal Blocks:

1. NEMA ICS 4.
2. Power: 1 Pole, 600 Volt.
3. Control: 1 Pole, 300 Volt, minimum.
4. Number of lugs and sizes as required.
5. Self-locking screw and insulated type.
6. DIN rail mounted.

N. Warning Light:

1. Compact LED, 120Volt, indoor/outdoor use, strobe light, ready mount to ½ inch NPT pipe.

O. Interior Cabinet Light:

1. LED type activated by door switch.

P. Enclosure Heater:

1. UL 508A component.
2. 120V rated.
3. Sized for the enclosure size and interior component(s) requirements.
4. Thermostatically controlled, fan-driven heater, in aluminum housing.

Q. Temperature Transmitter:

1. Rating: IP 20 (minimum), for exterior applications.
2. Mounting: Wall mounted.
3. Output Signal: 4 to 20 mA, or 0 to 10 VDC.
4. Weatherproof air transmitter in Nema 4X enclosure.

R. Pilot Devices, Nameplates, and Wiring: All pilot devices shall be labeled with engraved plastic laminated nameplates describing the service for which they are intended. All black panel mounted items shall also be labeled for ease of

identification during service. All wiring shall be numbered and provided with circuit or control id.

S. Push Button Devices:

1. NEMA, illuminated, push-to-test type, 120V, color as shown on Drawings.
2. NEMA, non-illuminated, momentary contactor push button.

T. Hand-Off-Auto (HOA) Selector Switch:

1. 30mm, 3-position, standard knob, and spring return.
2. A HOA shall be provided for each pump. When in "Auto" position the pump shall be controlled by the pump controller. When in "Off" position the pump shall be disconnected from the power source. When in the "Hand" position the pump shall be activated, bypassing normal control operations.

U. Relays:

1. 2-pole, double throw, 10A, 120V, with on/off indicator and push-to-test feature.
2. Miniature relay, square base with blade terminals.
3. Insulated.

V. Level Management:

1. Submersible Level Transducer (Primary):
 - a. Application: Suitable for wastewater locations, to translate sensed level to an electric signal.
 - b. Rating: Class I, Div I.
 - c. Intrinsically safe operation.
 - d. Accuracy: $\pm 0.25\%$ full scale
 - e. Temperature Rating: 23°F to 130°F (-5°C to 55°C), minimum.
 - f. Temperature Drift: $\pm 3\%$ maximum.
 - g. Construction: 316 stainless steel diaphragm and 316 stainless steel sealed housing.
 - h. Mounting: suspended from cable hook, Contractor shall provide cable hook and strain relief.
 - i. Cord Cable: Two-wire, 4-20 mA, 12-40V DC, shielded type with polyurethane jacket.
2. Floats (Secondary):
 - a. Mechanical type.
 - b. Non-mercury.
 - c. Application: Suitable for wastewater locations.
 - d. Rating: Class I, Div I.

- e. Mounting: suspended from cable hook, Contractor shall provide cable hook and strain relief.
- f. Cord Cable: Three-wire, 300V AC, SJOOW cable.
- g. Weight: Provided with stainless steel chain and 10 lb. weight as shown on Drawings.

3. Pipe Mounted Transducer (Valve Vault, if required):

- a. WIKA S-11 Series.
- b. Application: Suitable for wastewater locations, to translate sensed level to and electric signal.
- c. Rating: IP 67, minimum.
- d. Intrinsically safe operation.
- e. Accuracy: $\pm 0.25\%$ full scale
- f. Temperature Rating: -22°F to 212°F (15°C to 25°C), minimum.
- g. Temperature Drift: $\pm 3\%$ maximum.
- h. Construction: 316 stainless steel diaphragm and 316 stainless steel sealed housing.
- i. Mounting: Threaded connection, installed on discharge piping.
- j. Cord Cable: Two-wire, 4-20 mA, 12-30V DC, shielded type with polyurethane jacket.

W. Radio/Antennae:

- 1. Radio: Viper SC1000.
- 2. Frequency: 159.75 Hz.
- 3. Contractor shall coordinate work with Village's SCADA integrator.

X. Generator Receptacle (where Applicable):

- 1. Appleton Powertite.
- 2. 200A, 4-wire, 4-pole.
- 3. 600 Volt.
- 4. Pin and sleeve receptacle.
- 5. Reverse service type.
- 6. Mounting box with clamp cover.
- 7. Factory jumper shall not be included or removed in the field.

Y. Locks:

- 1. Anderson Lock.
- 2. Keyed Best F1 with interchangeable core lock.

2.05 PLASTIC WIRE MANGEMENT

- A. Construction: Plastic channel with hinged or snap-on cover.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Install components in accordance with manufacturer's recommendations.
- B. Cabinets and enclosures shall be installed to maintain required working spaces in accordance with NEC.
- C. Components shall be mounted to phenolic type board.
- D. Components shall be mounted within enclosure to provide minimum free air space requirements.
- E. Cabinet enclosures shall be cleaned of debris or foreign materials of any kind..

3.02 FACTORY TESTING AND INSPECTION

- A. Each item of equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Monitoring and control devices shall be functionally tested to verify correct operation and that all parts function properly.

3.03 INSTALLATION

- A. The Contractor shall install pump controller, as shown on the Drawings, and shall provide proper anchorage in accordance with the manufacturer's recommendations. Any equipment removed for shipment and shipped separately shall be installed and properly connected. The Contractor shall adjust and calibrate the systems after all connections are made.

3.04 TESTING

- A. All equipment and components shall be tested by operating them a reasonable number of times to demonstrate their proper and safe installation and operation. To determine what constitutes a safe and proper installation, these Specifications, manufacturer's recommendations, guidelines set by NEC, IEEE, ANSI, OSHA, et. al. shall be the norm.
- B. Operational test for all power, control and HMI equipment shall be performed to verify correctness of operation, connections, and interconnections with other equipment.
- C. All motor operated equipment shall be tested by applying rated voltage and operating the controlling equipment (HOA, HMI, level switches, etc.) to insure their proper interconnection and compliance with the requirements for the operation of the equipment. After this has been verified, motor starters shall be

operated manually to operate each motor at its rated load. Data to be taken for each motor shall include, but not limited to, terminal voltage (one per phase), and full load amperes.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for PUMP CONTROLLER ENCLOSURE.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 32 13
ENGINE GENERATOR

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Design requirements.
3. Ratings and Operation.
4. Details of Construction.
5. Operating Conditions.
6. Control and Monitoring.
7. Enclosure.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
4. Section 26 05 23 – Control-Voltage Electrical Power Cables
5. Section 26 05 26 – Grounding and Bonding Electrical Systems
6. Section 26 05 29 – Hangers and Supports for Electrical Systems
7. Section 26 36 00 – Automatic Transfer Switch
8. Section 26 60 20 – Electric Service

1.03 REFERENCES

A. National Fire Protection Association (NFPA)

1. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
2. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
3. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and

functional unit. Component level type tests will not substitute for this requirement.

B. National Electrical Code (NEC)

C. Institute of Electrical & Electronic Engineers (IEEE)

1. IEEE446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

D. Local codes and ordinances

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 QUALITY ASSURANCE

A. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

B. Qualifications

1. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

1.06 WARRANTIES

A. The engine generator shall be provided with a 5-year extended warranty which covers failures of the engine generator under normal use and service, which results from a defect in material or factory workmanship.

B. Warranty period shall commence upon the date of initial startup.

C. Provide in duplicate transferable warranty documents from subcontractors, suppliers, and manufacturers.

PART 2 - PRODUCT

2.01 MANUFACTURERS

- A. Cummins.
- B. Substitutions will be allowed in accordance with Section 01 25 00 – Substitutions.

2.02 ENGINE-GENERATOR SET

A. Ambient Conditions:

- 1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
 - a. Ambient Temperature: 77 °F
 - b. Altitude: 740 ft
 - c. Relative Humidity: 0-95%

B. Rating:

- 1. 35 kW.
- 2. 277/480V, 3-Phase, 4-Wire, 60 Hz.

C. Speed: 1800 rpm

D. Type: Standby.

E. Engine: Diesel, in-line, 4 cylinder, turbocharged.

F. Excitation: PMG.

G. Temperature Rise: 105°C, maximum.

H. Insulation: Class H.

I. Exhaust: Critical type muffler.

J. Starting Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

K. Voltage Drop: 20% maximum.

L. Harmonic Distortion: 20% maximum.

M. Exercise Schedule: 30 minutes once per week.

N. Controls: Control panel shall be mounted on generator unit and contain include the following:

1. Emergency stop button
2. Remote annunciator
3. Manual start-stop-run
4. Oil pressure gauge
5. Coolant temperature gauge
6. DC battery charger ammeter
7. Phase monitor
8. AC ammeter
9. AC voltage meter
10. Frequency meter
11. Indicating lights:
 - a. Low oil pressure indicator light
 - b. High coolant temperature
 - c. Low coolant temperature
 - d. Overcrank
 - e. Overspeed
12. Test and reset switch
13. Warning
 - a. over current
 - b. under voltage
 - c. under frequency
 - d. over excitation
 - e. over speed
 - f. low oil pressure
 - g. low coolant level

O. Related equipment to be supplied with the generator

1. Manufacturer regulator
2. Annunciator
3. Battery charger and rack

4. 80% rated circuit breaker
 5. Governor, adjustable isochronous, with speed sensing
 6. Coolant heater
 7. Cooling system
 8. Filters
 9. Lubricating system
 10. Critical exhaust silencer
 11. Muffler and exhaust piping
 12. All sensors and relays
 13. UL Listed fuel storage tank (diesel units only)
 14. Diesel Fuel (diesel units only)
 15. Anchor bolts
 16. Vibration isolators
- P. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.
- Q. Enclosure: Sound attenuated, Level 2, enclosure.
- R. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.

2.03 DIESEL FUEL TANK

- A. Fuel tank shall be dual walled, steel construction with the following components.
1. Emergency tank and rupture basin vents.
 2. Tank mounted fuel gauge.
 3. Fuel supply and return tubes.
 4. Leak detection flow switch.
 5. Low and high level fuel switches.
 6. UL 142 Listed.
 7. NPFA37 Compliant.
- B. Fuel tank shall be sized for hold a minimum 240-hour worth of diesel fuel to run the generator at full load.

2.04 OPERATING CONDITIONS

- A. Engine shall be designed to automatically start and continuously operate the connected loads as shown on the Drawings and specified herein.
- B. Load Starting Sequence: Loads shall be sequential started by means of a time delay relay furnished and installed in each of the motor starters or programmable logic in the PLC. The loads shall be started as follows:
 - 1. Connected loads shall be started after the automatic transfer switch transfers to emergency position.
 - 2. After several seconds have elapsed, the connected loads shall be sequentially started. Loads shall be sequentially started as follows:
 - a) Miscellaneous and restive loads
 - b) Submersible Pump #1
 - c) Submersible Pump #2 (if Pump #1 does not respond)

2.05 ENGINE

- A. Lubrication System: The following items are mounted on engine or skid:
 - 1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
 - 2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
 - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- B. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions.
- C. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.
- D. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.
 2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.
- E. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure, and the exhaust system shall be a critical type muffler.
- F. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.
- G. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.
1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Cycle: As required by NFPA 110 for level 1 systems.
 3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.
6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:
 - a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.
 - f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.06 CONTROL AND MONITORING

- A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.
- B. Controller shall be cable of accepting a plug-in device capable of plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine.
- C. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- D. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- E. Configuration: Operating and safety indications, protective devices, system controls, engine gauges and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.
- F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter (3-phase, line to line and line to neutral values).
 - 2. AC ammeter (3-phases).
 - 3. AC frequency meter.
 - 4. AC kVA output (total and for each phase). Display shall indicate power flow direction.

5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
6. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
7. Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.
8. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
9. DC voltmeter (alternator battery charging).
10. Engine-coolant temperature gage.
11. Engine lubricating-oil pressure gage.
12. Engine cooldown timer factory set at 5 minutes.
13. Running-time meter.
14. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
15. AC Protective Equipment: The control system shall include over/under voltage, over current, short circuit, loss of voltage reference, and over excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.
16. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
17. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.

18. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
19. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
- G. Three position (Automatic-Off-Test) selector switch. In the TEST position, the engine shall start and run regardless of the position of the remote starting contact. In the Automatic position, the engine shall start when contacts in the remote control circuit close and stop 5 minutes after those contacts open. In the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of any faults shall also be accomplished by putting the switch to the OFF position.
- H. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.
- I. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.
1. Overcrank shutdown.
 2. Coolant low-temperature alarm.
 3. Control switch not in auto position.
 4. Battery-charger malfunction alarm.
 5. Battery low-voltage alarm.
- J. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. The following information shall be annunciated on a remote control panel:
1. High jacket water temperature.
 2. Low cooling water level.
 3. Low oil pressure
 4. Low fuel.
 5. Overspeed.
 6. Overcranking cutout.
 7. Protect relay operation.

2.07 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H.
- D. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- E. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
- F. Voltage Regulator: SCR type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.
- G. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- H. Subtransient Reactance: 15 percent maximum, based on the rating of the engine generator set.

2.08 GENERATOR SET ENCLOSURE

- A. Description: Aluminum, weatherproof, level II sound attenuating enclosure. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Enclosure shall be tamperproof and protect against rodent entry. Instruments, control, and battery system shall be mounted within enclosure.
- B. Construction:
 - 1. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.
 - 2. Exhaust System: Muffler located within enclosure.
 - 3. Hardware: All hardware and hinges shall be stainless steel.

4. Mounting Base: Provide with integral vibrator insulation.
 5. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
 6. Withstand 180 MPH wind loads.
 7. In accordance with ASCE7-10 standards.
- C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.
1. Louvers: Fixed-engine, cooling-air inlet and discharge.
- D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75 dBA measured at any location 23 ft from the engine generator in a free field environment.
- E. Site Provisions:
1. Lifting: Complete assembly of engine generator, enclosure, and subbase fuel tank (when used) shall be designed to be lifted into place as a single unit, using spreader bars.

2.09 VIBRATION ISOLATION DEVICES

- A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator base, unless the engine manufacturer requires use of separate spring isolation.

2.10 FINISHES

- A. Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 INSTALLED ACCESSORIES

- A. The following accessories shall be provided for the generator unit:
1. Level II Sound Attenuated Enclosure
 2. Stainless Steel Tail Pipe and Rain Cap
 3. Stainless Steel Flexible Exhaust

4. UL 2200 Listing
5. Remote Annunciator Panel
6. Remote Emergency Stop
7. Input/Output Module (2 inputs, 5 outputs)
8. Run Relay
9. Block Heater, 120V
10. Oil Pan Heater, 120V
11. Common Failure Relay ("Not in Auto")
12. Battery Charger, 10A
13. Battery, 1/12V, Wet
14. Extended 5-Year Comprehensive Warranty

PART 3 - EXECUTION

3.01 FACTORY TEST AND INSPECTION

- A. Each item of equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Monitor and control devices shall be functionally tested to verify correct operation and that all parts function properly.

3.02 INSTALLATION AND TESTING

- A. The Contractor shall install the equipment as shown on the Drawings in accordance with the manufacturer's recommendations. The Contractor shall adjust and calibrate the equipment after all connections are made.
- B. Contractor shall be responsible for supplying cranes, equipment, transportation, and/or storage necessary to remove generator from deliver trucks, transport generator to site, and install the generator in the location shown on the plans, or as directed by the Engineer.
- C. All equipment and components shall be tested by operating them a reasonable number of times to demonstrate their proper and safe installation and operation. To determine what constitutes a safe and proper installation, these Specifications, manufacturer's recommendations, guidelines set by NEC, IEEE, ANSI, OSHA, etc. shall be the norm.

- D. Operational tests shall be performed to verify correctness of operation, connections, and interconnections with other equipment.
- E. After the equipment has been made ready for operation, the Contractor shall perform field test of the engine generator. The Contractor shall furnish the services of a factory representative who shall provide final checkout of the entire installation covered by these Contract Documents and supervise the initial start-up and test of the engine generator. The tests shall include load, phase sequence, and utility power tests. Field testing shall include a simulated power failure and load transfer.
- F. The loads shall be operated continuously for a period of not less than 30 minutes or as otherwise mutually agreed upon between Owner, Owner's Representative and Contractor.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for ENGINEER GENERATOR.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 36 00

AUTOMATIC TRANSFER SWITCH

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Design requirements.
3. Rating and operation.
4. Details of construction.
5. Accessories.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
4. Section 26 05 23 – Control-Voltage Electrical Power Cables
5. Section 26 05 26 – Grounding and Bonding Electrical Systems
6. Section 26 05 29 – Hangers and Supports for Electrical Systems
7. Section 26 32 13 – Engine Generators
8. Section 26 60 20 – Electric Service

1.03 REFERENCES

A. National Fire Protection Association (NFPA)

B. National Electrical Code (NEC)

C. Underwriters Laboratories, Inc. (UL)

1. UL 1008 – Transfer Switch Equipment.

D. Local codes and ordinances.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 SYSTEM DESCRIPTION

- A. This Section covers the automatic transfer switches (ATS) to be furnished, installed and tested as shown in the Drawings and as specified herein. All related accessories where required, but not specifically provided for in these Specifications, shall be included under this Section of Work.

1.06 WARRANTY

- A. This The manufacturer shall provide a **5 year Comprehensive Warranty** for the supplied generator and automatic transfer switch.
- B. In the event a component failure to perform as specified or is proven defective in service during the warranty period, excluding items of supply normally expended during operation, the manufacturer shall provide a replacement part without cost to the owner.
- C. This warranty shall be valid only if the product is installed, serviced, and operated under normal conditions, in accordance with the manufacturer instructions.

PART 2 - PRODUCT

2.01 MANUFACTURERS

- A. Cummins.
- B. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 GENERAL

- A. The automatic transfer switch shall be furnished complete with all necessary sensing relays for each phase of the normal power sources and the standby power source plus all necessary control relays and contacts to transfer the load from the normal power source to the emergency standby power source. Sensing and control logic shall be solid state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade plug in type with dust covers. The ATS shall be provided with normal and emergency switch position contacts for use in signaling "normal" or "emergency" status.

2.03 RATING AND OPERATION

A. Rating:

1. 100A.
2. 277/480V, 3-Phase, 4-Wire, 60 Hz.

B. Poles: 3-Pole, Solid Neutral.

C. Withstand Rating: 22,000 AIC.

D. UL 1008 Rated for Emergency System.

2.03 DETAILS OF CONSTRUCTION

A. Construction

Automatic transfer switch shall be 3-pole, 4-wire unit with overlapping neutral. Normal and emergency contacts shall be mechanically interlocked by the operating linkage when in the open or closed position. All parts of the mechanical driving system and mechanical interlocks shall be electrically isolated and at ground potential.

B. Load Transfer

There shall be three normal line voltage sensing relays and sequencing controls such that a loss of power in the normal incoming power line below 80% of rated voltage, loss of phase, or voltage imbalance condition of the normal feed will initiate change over to the alternative (secondary) power source, after an adjustable time delay to ignore momentary outages. Upon proper voltage level from the alternative (secondary) power source, the load shall be transferred to the secondary power source. Upon restoration of normal voltage on the utility incoming power line, the transfer panel, after an adjustable time delay, shall transfer load back to Normal Line.

Transfer switch shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via a permanently affixed manual operator shall provide the same contact-to-contact transfer time as provided under normal automatic operation to prevent flashovers from switching the main contacts slowly. In addition, provisions shall be made to allow disengagement of the electrical operator during manual operation.

C. Current Carrying Contacts, Coils and Relays

Current carrying contacts, coils and relays shall be readily accessible from the front for maintenance and inspection as individual units. Replacement of any part shall not require removal of the switch panel from the enclosure or disconnecting the operating linkage or power conductors.

D. Indicating Lights

Indicating lights shall be identified with nameplates mounted on the front of the cabinet door.

E. Test Switch

Test switch shall be provided to simulate normal power failure.

F. In phase Monitoring

Bidirectional In phase Transfer System to control transfer operation between live sources. Shall provide variable transfer initiation which limits motor inrush current to magnitude or normal starting current ignoring unequal source voltages and wave shape distortion from solid state controlled loads. Operation shall be over a frequency difference range of ± 2.0 Hz. If voltage of the source carrying load drops below 70%, the in phase function shall be automatically bypassed.

G. Accessories

Accessories shall be provided as follows:

1. Mounted green and red pilot lights for indicating switch in normal and emergency positions, including fuses and auxiliary contacts, rated 10 amps 250 VAC.
2. Individually mounted amber pilot lights for indicating when normal and emergency source voltages are available, including fuses and auxiliary contacts.
3. One normally open auxiliary contact which closes when an abnormal condition is detected on the normal source feed and/or the normal source is de-energized.
4. Ground Bus.
5. Two position test switch. Maintained contact for auto and momentary contact for test.
6. Adjustable close differential relays.

7. Adjustable time delay to emergency to delay transfer to emergency for 0-5 minutes.
8. Adjustable time delay on restoration to delay retransfer to normal for 0-30 minutes.
9. Adjustable time delay to override momentary normal source outages to delay all transfer switch signals for 0.5 to 10 seconds.
10. Normally open auxiliary contact for initiating change over to alternative (secondary) power source. Contact shall close upon loss of normal power. The contact shall remain closed until such time as normal power is restored and the automatic transfer switch has transferred back to the normal position.
11. Terminal boards for control wiring connection.
12. One contact to allow exercising the generator unit remotely through PLC signal.
13. Exercise timer with minimum 30 minutes (adjustable) once per week.

PART 3 - EXECUTION

3.01 FACTORY TEST AND INSPECTION

Each item of equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Monitor and control devices shall be functionally tested to verify correct operation and that all parts function properly.

3.02 INSTALLATION AND TESTING

- A. The Contractor shall install the equipment as shown on the Drawings in accordance with the manufacturer's recommendations. The Contractor shall adjust and calibrate the equipment after all connections are made.
- B. All equipment and components shall be tested by operating them a reasonable number of times to demonstrate their proper and safe installation and operation. To determine what constitutes a safe and proper installation, these Specifications, manufacturer's recommendations, guidelines set by NEC, IEEE, ANSI, OSHA, etc. shall be the norm.

- C. Operational tests shall be performed to verify correctness of operation, connections, and interconnections with other equipment.
- D. After the equipment has been made ready for operation, the Contractor shall perform field test on the automatic transfer switch. The Contractor shall furnish the services of a factory representative who shall provide final checkout of the entire installation covered by these Contract Documents and supervise the initial start-up and test of the automatic transfer switch. The tests shall include load, phase sequence, and utility power tests. Field testing shall include a simulated power failure and load transfer.
- E. The loads shall be operated continuously for a period of not less than 30 minutes or as otherwise mutually agreed upon between Owner, Engineer and Contractor.

3.03 PAINTING

- A. All equipment specified in this Section shall be shop-painted with the manufacturer's standard finish. All equipment specified in this Section shall be field-painted as directed by the Owner.
- B. The Contractor shall be responsible for coordination of the compatibility between the manufacturer's standard finish and the field-paint specified.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for AUTOMATIC TRANSFER SWITCH.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 42 00
CATHODIC PROTECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Anodes.
3. Wire and cable.
4. Test stations.
5. Control stations.
6. Sealing, potting, and dielectric compounds.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements

1.03 REFERENCES

- A. American Water Works Association (AWWA)
- B. National Association of Corrosion Engineering (NACE)
- C. National Fire Protection Association (NFPA)
- D. National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL)
- F. Local codes and ordinances.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

- C. Include calculations and details of anode designs.
- D. Equipment layout both below and above grade.
- E. Conduct and submit site test necessary for design, including soil resistivity, close-interval potential surveys, testing during construction, interference testing and training of Owner's personnel.
- F. Design and submittal shall be signed and sealed by qualified corrosion engineer responsible for their preparation.

1.05 SYSTEM DESCRIPTION

- A. This Section covers the cathodic protection system, related electrical panels and associated accessories including but not limited to power unit, conduit, wires and cables, junction boxes, anodes, and all other necessary appurtenances to be designed, furnished, installed, and tested on as shown on the Drawings and as specified herein.
- B. All necessary hardware including, but not limited to screws, bolts, hangers, concrete inserts, clamps, locknuts, bushings, sealing bushings, couplings, access boxes, identification tags, etc. shall be included.
- C. All miscellaneous electrical work required for installation and to electrically connect and provide for a complete and operational system shall be included under this Section.

1.06 QUALITY ASSURANCE

- A. The cathodic protection equipment supplier shall have personnel who have been engaged in the design and installation of impressed current corrosion control system for five (5) or more years.
- B. This work shall be performed under the direction of a licensed professional engineer or a person with NACE certification who has experience with wastewater steel structure protection design.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Corrpro Companies, Inc.
- B. USEMCO.
- C. Aegion Company.
- D. Borin Manufacturing, Inc.

- E. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 GENERAL

- A. All materials and equipment shall conform to the Specifications listed below and as required for cathodic protection of an existing wet well structure. All products shall have a minimum rating as specified herein. Identification symbols and nomenclature where used in this Section are the same as those shown on the Drawings.
- B. All materials shall be new and conform to the applicable portion of the Specifications. The materials to be furnished under these Specifications shall be a standard product of manufacturers regularly engaged in production of such equipment and shall be manufactured to the latest standard design.

2.03 HIGH POTENTIAL MAGNESIUM ANODES

- A. Comply with ASTM B843.
- B. Chemical composition
 - 1. Aluminum: 0.010 maximum.
 - 2. Manganese: 0.50 to 1.3.
 - 3. Zinc: 0.05 maximum.
 - 4. Silicon: 0.50 maximum.
 - 5. Copper: 0.02 maximum.
 - 6. Nickel: 0.001 maximum.
 - 7. Iron: 0.03 maximum.
 - 8. Other Impurities: 0.05 each, 0.30 maximum total.
 - 9. Magnesium: Remainder.
- C. Anode Wire
 - 1. Comply with ASTM D1248 and NEMA WC70/ICEA S-95-658.
 - 2. Factory cables.
 - 3. No less than a No. 10 AWG with PVC insulation and suitable for direct burial.
 - 4. Provided with sufficient cable to connect to controller without splicing.
- D. Anode Bags
 - 1. Anodes shall be factory installed in packaged backfill material.
 - 2. Size: 9lbs – 40lbs.
 - 3. Backfill material composition by weight:
 - a) Hydrated Gypsum: 75 percent.
 - b) Bentonite Clay: 20 percent.
 - c) Anhydrous Sodium Sulfate: 5 percent.

2.04 MAGNESIUM/MANGANESE ALLOY ANODES

A. Comply with ASTM B843.

B. Chemical composition

1. Aluminum: 0.010 maximum.
2. Manganese: 0.50 to 1.3.
3. Copper: 0.02 maximum.
4. Nickel: 0.001 maximum.
5. Iron: 0.03 maximum.
6. Other Impurities: 0.05 each, 0.30 maximum total.
7. Magnesium: Remainder.

C. Anode Core

1. Galvanized steel with anode wire silver-soldered to the core.
2. Connection shall be recessed and epoxy insulated for 600V rating.
3. Connection shall be covered with heat-shrinkable tubing and insulation shall be extended over connection.

D. Anode Wire

1. Comply with ASTM D1248 and NEMA WC70/ICEA S-95-658.
2. Factory cables.
3. No less than a No. 10 AWG with XLPE insulation and suitable for direct burial.
4. Provided with sufficient cable to connect to controller without splicing.

E. Anode Bags

4. Anodes shall be factory installed in packaged backfill material.
5. Size: 9lbs – 40lbs.
6. Backfill material composition by weight:
 - d) Hydrated Gypsum: 75 percent.
 - e) Bentonite Clay: 20 percent.
 - f) Anhydrous Sodium Sulfate: 5 percent.

2.05 IMPRESSED CURRENT ANODE

A. Anode: Tubular type.

B. Material: Titanium substrate with metal oxide (MMO) XL coating.

C. Rod Dimensions: 1/4" diameter by 4'-0" long, minimum.

D. Lead Wire: Manufacturer installed PE insulated lead wire.

E. Enclosure: Anode shall be installed in a canister.

1. Sized as required for the anode length.
2. Backfilled with coke breeze, sc-2.
3. Ends sealed with epoxy resin.
4. Supplied with waterproof connector.

2.06 REFERENCE ELECTRODE

- A. Comply with NACE/AMPP TM0113 and TM0211 Standards.
- B. Housing: High Impact ABS or ceramic case with Moisture Retention Membrane
- C. Material: Copper-copper sulfate electrode (Cu-Cu₅₀₄)
- D. Potential Range: 10 millivolts
- E. Temperature Range: 32°F - 135°F
- F. Lead Wire: Manufacturer installed PE insulated lead wire.

2.07 WIRE AND CABLE

- A. Comply with Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- B. Bonding conductors for continuity bonds: Not less than No. 8 AWG.

2.08 TESTING STATIONS (FOR GALVANIC SYSTEMS)

A. General

- 1. Station shall have required quantity of terminals for the total number of anodes to be connected.
- 2. Shunt switches connected in series with each anode circuit independently shall also be provided for current adjustment.

B. Post Mounted

- 1. A test station shall be provided as an access point to terminate, take electric measurements, and readings on cables connected to structure.
- 2. Station shall be provided with a manufactured, high impact UV stabilized polycarbonate enclosure to protect terminals.
- 3. Enclosure shall be equipment to mount to a high-density polyethylene conduit/support post.
- 4. A bonding strap shall be included.
- 5. Color shall be as selected by Owner.

C. Enclosure

- 1. Enclosure: Nema 4X enclosure.
- 2. Ammeter: 0 to 100 milliamps shall be provided to allow current readings to be taken of the current flow to each anode.

3. Adjustable shunt switches shall be connected in series with each anode and mounted to copper bus bar.
4. The control station shall be provided with terminals to connect a reference electrode.
5. Testing station shall be mounted in the pump controller, or as otherwise shown on Drawings.
6. Meyers Hub to allow all anode leads to be routed into the enclosure.

2.09 CONTROL STATION (FOR IMPRESSED CURRENT SYSTEMS)

- A. Input Rating 120V, 1-Phase, 60Hz.
- B. Output Rating: DC.
- C. Enclosure: Heavy duty aluminum.
- D. Approximate dimensions: 13" high x 7.5" wide x 5.5" deep
- E. Ammeter: 0 to 10 milliamps shall be provided to allow current readings to be taken of the current flow to each anode.
- F. Voltmeter: 6V-40V and 18-Step voltage control taps.
- G. Adjustable resistors shall be connected in series with each anode circuit independently.
- H. AC breaker and input terminal block.
- I. The control station shall be provided with terminals to connect a reference electrode.
- J. Testing station shall be mounted in the pump controller, or as otherwise shown on Drawings.
- K. All conduit and cable connections shall be watertight.
- L. Controls accessible from the front of the panel.

M. Control circuits: Unit shall be designed to continuously monitor the potential of the structure and automatically regulate the protective current as required to maintain the potential at the preselected level.

N. Monitoring: The cathodic protection shall be integrated into the SCADA system. Components shall be provided to allow for integration.

2.10 SEALING, POTTING, AND DIELECTRIC COMPOUNDS

A. Comply with NACE PR0188.

B. Sealing and Dielectric Insulation Compound: Consist of black, rubber based, soft, permanently pliable, tacky, moldable, and unbacked.

C. Potting compound: Cast-epoxy, two-packaged type, covered with heat-shrinkable tape.

D. Inline Splice Kit:

1. UL listed for direct burial and submerged applications.
2. 600 volts.
3. 90°C continuous operation.
4. Sized for splice or multiple conductors.

E. Vinyl-Plastic Electrical Tape:

1. Comply with UL 510.
2. 90°C continuous operation.
3. High thermal conductivity.
4. Weather and moisture resistant.

2.11 EXOTHERMIC WELD GROUNDING CONNECTION

A. An exothermic welded connection shall be used to connect magnesium anode lead wire to a direct buried valve.

B. Exothermic welded connection shall consist of Cadweld connection for a cable to horizontal steel pipe.

C. The exothermic welded connection shall be covered with a prefabricated corrosion protection adhesive for metal pipes. The assembly shall consist of protective adhesive with integrated primer, elastomeric adhesive, corrosion resistant compound, and protective plastic dome.

D. Thickness: 10 mils, minimum.

E. Dimensions: 4"x4", or as required.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Equipment shall be installed and tested in accordance with the manufacturer's recommendations.
- B. All accessories and mounting devices shall be provided as required for each installation.
- C. All conduit and wiring shall be in accordance with NEC, local codes, and ordinances.

3.02 INSTALLATION

- A. Anodes shall be installed in locations that are clear from obstructions, at least 36 inches and no more than 10 feet from the underground structure to be protected.
- B. Install anodes in dry condition. Contractor shall not use anode-connecting wires to lower anode into holes.
- C. Magnesium anodes shall be placed vertically in the ground at 90 degrees intervals around the centerline of the steel structure. The anodes shall be located approximately in native soil, a maximum of 5-feet from the structure, vertically.
- D. Backfill annular space around anode with fine earth in 6 inch layers; compact each layer using hand tools. After backfilling and compacting to within 6 inches of finished grade, Contractor shall pour approximately 5 gallons of water into each filled hole. After water has been absorbed by earth, complete backfilling to finish layer.
- E. Impressed current anodes shall be installed horizontally as close to the structure(s) as possible. The anode including enclosure shall be installed with a trench, with a minimum of 9" coke backfill (type SWK, with a density of 70lb/ft³) installed around the enclosure.
- F. Impressed current anode lead shall be installed in trench, the Contractor shall install sand bed where the cable runs over aggregate.

G. Reference electrode should be wet with approximately 2 gallons of water prior to backfilling.

H. Test Stations. Install test stations as follows:

1. At 1000-foot intervals.
2. At insulating joints.
3. At both ends of casing when casing material is included in the cathodic protection system.
4. Where pipe crosses other metal pipes.
5. Where pipe connects to existing piping/structure systems.
6. Where pipe connects to dissimilar metal pipe.
7. At each structure.
8. Within pump controller enclosure.

I. Field Supervisory Personnel. The equipment manufacturer shall provide the services of factory trained field supervisory personnel who shall perform all necessary checkouts and energize and adjust the system to operate within the specified criteria. The factory trained field supervisory personnel shall be responsible for adjusting the system to perform in accordance with specified design criteria as well as conducting potential profile measurements.

J. Performance. All work shall be in accordance with the following requirements:

1. Components of the cathodic protection system shall be installed in the manner and at the locations as shown on the design drawings prepared by the cathodic equipment manufacturer.
2. Pressure entrance fitting shall be installed in accordance with AWWA D100-96, Section 3.13.
3. Welding, cutting and coating shall be in accordance with AWWA Standards D100, D102 and D105.
4. Electrical continuity of all section of bolted or welded structures and piping shall be furnished by the Contractor.
5. Materials and equipment shall be inspected prior to installation. Any defective component shall be repaired or replaced.
6. Electrical work shall be in accordance with the National Electrical Code.
7. Lead wires shall be installed to prevent damage from abrasion.
8. Electrical connections shall be sealed to prevent water migration.
9. The rectifier shall be mounted within proposed pump controller cabinet and the Contractor shall coordinate work with pump controller manufacturer.

10.AC power to the rectifier shall be provided as shown on the Drawings.

3.03 HANDHOLE INSTALLATION

A. Tests and Inspections:

1. Static Pull Test: Choose, at random, one completed anode of each type for this destructive test. Demonstrate that anode wire connections have enough strength to withstand a minimum tensile load of 300 lb. If test fails, replace all anodes and repeat test at another randomly selected anode.
2. Insulation Testing: Before anode system is connected to pipe and/or underground structure, test insulation at each insulating joint and fitting. Demonstrate that no metallic contact or short circuit exists between the two insulated sections of pipe and/or underground structure. Replace defective joints or fittings.
3. Bonding Tests: Test for electrical continuity across all bonded joints. Repair or add additional bonds until electrical continuity is achieved.
4. Baseline Potentials: After backfilling of pipe and/or underground structure anodes is completed, but before anodes are connected to pipe and/or underground structure, measure the static potential of pipe and/or underground structure to soil. Record initial measurements.
5. Anode Output: Measure electrical current as anodes or groups of anodes are connected to pipe and/or underground structure. Use a low-resistance ammeter. Record current date, time and location of each measurement.
6. Pipe and/or Underground Structure to Reference Electrode Potential Measurements: On completion of installation of entire cathodic protection system, make electrode potential measurements according to NACE RP0169, using a copper/copper-sulfate reference electrode and a potentiometer-voltmeter, or a dc voltmeter with an internal resistance (sensitivity) of not less than 100,000 ohms per volt and a full scale of 1 or 2 V. Make measurements at same locations as those used for baseline potentials. Record voltage, date, time and location of each measurement, using one of the following two methods:
7. 0.85 V Negative Voltage: With cathodic system in operation, measure a negative voltage of at least minus 0.85 V between pipe and/or underground structure and a saturated copper/copper-sulfate reference electrode contacting the earth directly over pipe and/or underground structure.
8. 100-mV Polarization Voltage: Determine polarization voltage shift by interrupting protective current and measuring polarization decay. An immediate voltage shift will occur if protective current is interrupted. Use voltage reading, after immediate shift, as base reading from which to measure polarization decay. Measure at least a minimum polarization voltage shift of 100 mV between pipe and/or underground structure and a saturated copper/copper-sulfate reference electrode contacting the earth directly over pipe and/or underground structure.

- B. Location of Measurements for Piping or Valve: For coated piping, conduit, or valves, measure from reference electrode in contact with the earth directly over pipe. Measure at intervals not exceeding 400 feet. Make additional measurements at each distribution service riser, with reference electrode placed directly over service line.
- C. Location of Measurements for Structures: For underground structures, a minimum of five (5) locations shall be measured. Measure from reference electrode located as follows:
1. Directly over center of underground structure.
 2. At a point directly over underground structure and midway between each pair of anodes.
 3. At each end of underground structure.
- D. Interference Testing: Test interference with cathodic protection from any foreign pipe and/or underground structure in cooperation with Owner of foreign pipe and/or underground structure. Report results and recommendations.
- E. Stray Current Measurements: Perform at each test station. Mitigate stray currents due to lightning or overhead ac power transmission lines as provided for in NACE standards.
- F. Inspect Coatings: Comply with NACE RP0188. Repair imperfections of factory-applied coatings as specified in "Coatings" Article.
1. Use electronic holiday detectors to detect coating imperfections.
 2. All damage to the protective coating during transit and handling shall be repaired before installation.
 3. Repair factory-applied coatings to have equal or better corrosion resistance than the factory-applied coating system. Field repair material shall be of the type approved by and shall be applied as recommended by manufacturer of the coating material.
- G. Monitoring During Guarantee Period. The cathodic protection equipment manufacturer shall furnish self-addressed report cards to be completed by the Owner. Report cards received by the cathodic protection equipment manufacturer during the one-year guarantee and service period shall be evaluated for system performance.

3.04 ADJUSTING

- A. System shall be adjusted as necessary as directed by the corrosion engineer or fabricator.
- B. Approximately twelve (12) months after Substantial completion, test, inspect, and adjust cathodic protection system to ensure its continued compliance with specified requirements.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for CATHODIC PROTECTION.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 26 60 20
ELECTRIC SERVICE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Project Requirements.
2. Electric Utility Service.
3. Electric Utility Equipment.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 03 00 00 – Cast-in-Place Concrete
3. Section 03 40 00 – Precast Concrete Structures
4. Section 26 05 00 – General Electrical Requirements
5. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
6. Section 26 05 26 – Grounding and Bonding for Electrical Systems
7. Section 26 05 29 – Hangers and Supports for Electrical Systems
8. Section 26 28 16 – Enclosed Switches and Circuit Breakers

1.03 REFERENCES

A. Utility Company Requirements.

1. For Com Ed Service Areas (CECHA listing).

B. National Fire Protection Association (NFPA).

C. National Electrical Code (NEC).

D. Underwriters Laboratories, Inc. (UL).

E. Local codes and ordinances.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.

1.05 PROJECT REQUIREMENTS

- A. Proposed electric service for the new lift station.
- B. The existing service shall remain in place for the station to operate during construction.
- C. Contractor shall coordinate the following work with Com Ed:
 - 1. Connecting the proposed electric service.
 - 2. Disconnecting the existing electric service, only once the new station is operational.
 - 3. Elimination of existing wood poles as shown on the Drawings.
 - 4. Raise overhead electric lines over existing residential property.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Meter:
 - 1. Milbank.
 - 2. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.
- B. CT Cabinet (if Required):
 - 1. Erickson.
 - 2. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 ELECTRICAL SERVICE

- A. Voltage: 277/480V, 3-Phase, 4-Wire, 60 Hertz.
- B. Amperage: As shown on the Drawings.
- C. Location: As shown on the Drawings.
- D. Contractor Responsibility:
 - 1. Conduit: Conduit between meter or CT cabinet and electric service location, as shown on the Drawings. Long sweep 90 degree elbows are included.

2. Secondary Cables: Service cables between meter and electric service location. Contractor shall provide enough slack cable to connect to overhead service wires and/or ground mounted transformer stabs.
 3. Service Grounding.
 4. Concrete transformer pad (where required).
 5. Meter fitting.
 6. CT cabinet (where required).
 7. Splice pits.
 8. Service Disconnect.
 9. Step down transformers (where required).
- E. Utility Provider Responsibility:
1. Connections to overhead wires or pad mounted transformers.
 2. Utility meter.
 3. Transformers.
 4. Switchgears.
 5. Primary cables.

PART 3 - EXECUTION

3.01 GENERAL

- A. Contractor shall be responsible for coordinating all work with utility company.
- B. Project Contact is:
Mr. James Bartholomew
(224) 257-1456
- C. Project Service Request Number: 06691365
- D. Contractor shall be responsible for obtaining Utility Company's Service Agreement for electrical service.

3.01 INSTALLATION

- A. Contractor shall furnish and install equipment and materials as described in related Sections of the specifications, and as shown on the Drawings.
- B. Equipment shall be installed in accordance with Com Ed standard procedures and the manufacturer's recommendations.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for ELECTRIC SERVICE INSTALLATION.
- B. Payment for coordination of the Work and any associated utility fees as required for the proposed electrical service will be made under an Allowance for ELECTRIC SERVICE UTILITY FEE.
- C. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; for all labor, equipment, tools, and incidentals necessary to complete the items; and, for all coordination with the utility company and the Owner.
- D. Conduit and cables shall be paid for separately and will not be included in the payment for the work specified in this section.
- E. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 27 51 25

SCADA SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. SCADA panel.
2. Programmable Logic Controller (PLC).
3. System integration.
4. On-site training.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 26 05 00 – General Electrical Requirements
3. Section 26 27 16 – Cabinet and Enclosures
4. Section 26 29 20 – Pump Controller

1.03 REFERENCES

- A. Instrument Society of America (ISA)**
- B. American National Standards Institute (ANSI)**
- C. Electrical Industries Association (EIA)**
- D. National Electrical Manufacturers Association (NEMA)**
- E. National Electrical Code (NEC)**
- F. Institute of Electrical & Electronic Engineers (IEEE)**
- G. Local codes and ordinances**

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.**

- B. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00 – General Electrical Work.
- C. Shop drawings shall include ladder diagrams, control schematic diagrams, internal wiring diagrams, interconnecting wiring diagrams, sample screen displays, cabinet and component dimensions.

1.05 CLOSEOUT SUBMITTAL

- A. Submit in accordance with Section 01 77 00 – Closeout Procedures.
- B. Ladder diagrams, control schemes, and station operation.
- C. Maintenance Data
 - 1. Furnish one complete set of electrical and electronic schematics.
 - 2. Identify systems maintenance requirements and spare parts.
- D. Instruction Manuals
 - 1. Complete descriptive literature for each piece of equipment, including a list and description of all parts of each piece of equipment.

1.06 QUALITY ASSURANCE

- A. The entire system shall be designed, coordinate, and supplied by a qualified system integrator supplier who is regularly engaged in the business of designing and building instrument and control systems for water works related projects.
- B. Instrumentation supplier and system integrator shall meet the following qualifications:
 - 1. Have and maintain qualified technical staff and design office. The qualifications and experience of key personnel shall be acceptable to the Owner.
 - 2. Have and maintain competent service personnel to service the equipment furnished. The system integrator shall provide 24-hour service for the complete system.
 - 3. Successfully provided similar work for at least ten (10) years.
 - 4. Assume responsibility for the complete SCADA system package.
 - 5. Supply all controls and appurtenances required for a fully functional system, compatible with the existing SCADA system.

1.07 COORDINATION

- A. Contractor shall coordinate system requirements with Owner to ensure proper integration into existing SCADA system.

PART 2 - PRODUCT

2.01 SYSTEM INTEGRATOR

- A. The Contractor shall use Concentric Integration to provide all necessary programming and integration for the station.
 - 1. Mr. Jim Gramhofer
(815) 444-4447
jgramhofer@goconentric.com
- B. The Contractor shall supply all SCADA equipment for Concentric to program.
- C. The Contractor shall provide Concentric with Pump Controller Builder contact information during construction. It shall be the Contractor's responsibility to coordinate all work between both parties as necessary for a complete installation.
- D. All work shall be coordinated with the Village.

2.02 SCADA CONTROL PANEL

- A. The SCADA control panel shall be a complete automatic monitoring package consisting of the following:
 - 1. Enclosure with a minimum of a NEMA 12 rating.
 - 2. Components installed within the pump controller enclosure.
 - 3. Primary and Backup Programmable Logic Controller.
 - 4. UPS.
 - 5. Independent cooling system.
- B. Rating:
 - 1. 120V, 1-Phase, 3-Wire, 60 Hz.
- C. The SCADA control panel shall be completely prewired and tested prior to installation in the pump controller.
- D. All terminals shall be numbered and labeled for ease of troubleshooting.

2.04 PROGRAMMABLE LOGIC CONTROLLER

- A. Manufacturer's
 - 1. Rockwell Automation CompactLogix 5300 series, with I/O Expansions Power Supplies and Modules.

- B. The PLC shall provide all functions and features for the pumping activity, power monitoring, pump, controller, and station status. Hardware and program shall include the following features as a minimum:
 - 1. Inputs for pump set-points
 - 2. Inputs for drives status, availability, and faults
 - 3. Inputs for level monitoring
 - 4. Outputs for system alarms
 - 5. Display messages for all system conditions, set-points, and alarms
 - 6. Program language for input and display of operator set-points
 - 7. Program language for recognition of signal transmitter failure
 - 8. Program language for interlocking and coordinating all output functions
- E. Operating Temperature: -40°F to 185°F (-40°C to 85°C)
- F. Relative Humidity: up to 95%.
- G. Communication Ports: RS-232, 9-pin ports; and RS-485.
- H. Built-in LCD display.
- I. Built-in PID capabilities, with a minimum of up to 16 PID loops capable of executing at the same time.
- J. Unit shall be finger safe.
- K. All inputs and outputs shall survive ANSI/IEEE C37.90 surge withstand capability tests without damage.
- L. The central processing unit (CPU) shall be microprocessor based with real-time multi-tasking executive operating system stored in EPROM. The CPU shall provide a minimum of 8 MB of RAM for user programs and data, real time clock/calendar, timer, and data logging. The memory shall be protected by on-board lithium battery. The processor shall be a minimum of 32-bit processor.
- M. Expansion modules as necessary for the number of digital inputs, analog inputs, digital outputs as shown on the Drawings, and required for a complete SCADA

system. Inputs shall be independent without a common ground and outputs individually isolated without a common ground.

N. Provide prewired terminal blocks for the following inputs and outputs at a minimum:

SCADA DATA POINT LIST								
IO TYPE	IO NO.	SLOT	DESCRIPTION	PROC VAR	STATE CODE 0	STATE CODE 1	RESET	NOTES
GENERAL STATION								
AI			ENCLOSURE TEMPERATURE	TEMPERATURE	-	-	-	-
DI			ENCLOSURE LOW TEMPERATURE	TEMPERATURE	NORMAL	LOW	-	
AI			OUTSIDE TEMPERATURE	TEMPERATURE	LEVEL	-	-	-
DI			WET WELL INTRUSION ALARM	STATUS	NORMAL	ALARM	-	-
DI			VALVE VAULT INTRUSION ALARM	STATUS	NORMAL	ALARM	-	-
AI			TRANSDUCER	ELEVATION	LEVEL		-	-
DI			WET WELL HI WATER LEVEL FLOAT	ELEVATION	HI	NORMAL	MANUAL	START LEAD AND LAG PUMPS
DI			WET WELL LOW WATER LEVEL FLOAT	ELEVATION	LOW	NORMAL	MANUAL	STOP PUMPS UPON SENSING LOW WATER LEVEL
DI			VALVE VAULT HI WATER LEVEL FLOAT	ELEVATION	HI	NORMAL	MANUAL	ALARM ONLY
DI			SCADA POWER FAIL	STATUS	NORMAL	ALARM	-	-
DI			SCADA LOW UPS BATTERY	STATUS	NORMAL	-	-	-
DI			SCADA UPS FAIL	STATUS	NORMAL	ALARM	-	-
DI			RTU SURGE FAIL	STATUS	NORMAL	ALARM	-	-
DI			RTU POWER FAIL	STATUS	NORMAL	ALARM	-	-
DI			PHASE MONITOR	STATUS	NORMAL	FAILURE	-	-
DI			UTILITY POWER	STATUS	NORMAL	FAILURE	-	-
DI			ENCLOSURE OPERATIONAL LIGHT	STATUS	NORMAL	ALARM	-	-
DO			LAG SELECTION	SELECTION	1-2	-	-	REMOTE SELECTION OF LAG PUMP
DO			FLOAT MODE RESET	SELECTION	TRANSDUCER	FLOAT	RESET	REMOTE FLOAT MODE RESET
DI			SPARE	STATUS	NORMAL	ALARM	-	-
DI			SPARE	STATUS	NORMAL	ALARM	-	-
DI			SPARE	STATUS	NORMAL	ALARM	-	-
DI			SPARE	STATUS	NORMAL	ALARM	-	-
PUMP NO. 1 (P-1)								

SCADA DATA POINT LIST								
IO TYPE	IO NO.	SLOT	DESCRIPTION	PROC VAR	STATE CODE 0	STATE CODE 1	RESET	NOTES
DI			PUMP RUNNING	STATUS	RUNNING	-	-	-
DI			PUMP AUTO	STATUS	NOT RUNNING	-	-	-
DI			PUMP FAIL	STATUS	NORMAL	ALARM	-	-
DO			HOA SELECTOR SWITCH "HAND"	STATUS	HAND	-	-	REMOTE OPERATION OF PUMPS
DO			HOA SELECTOR SWITCH "OFF"	STATUS	OFF	-	-	REMOTE OPERATION OF PUMPS
DO			HOA SELECTOR SWITCH "AUTO"	STATUS	ON	-	-	REMOTE OPERATION OF PUMPS
DI			PUMP SEAL FAIL ALARM	STATUS	NORMAL	ALARM	MANUAL	REQUIRE MANUAL RESET OF PUMPS (TO BE COORDINDATED)
DI			PUMP THERMAL FAULT	STATUS	NORMAL	ALARM	MANUAL	REQUIRE MANUAL RESET OF PUMPS (TO BE COORDINDATED)
DI			PUMP HIGH AMPERAGE	STATUS	NORMAL	HIGH	-	PUMP MANUFACTURER TO PROVIDE VALUE
DI			SPARE	STATUS	NORMAL	ALARM	-	-
PUMP NO. 2 (P-2)								
DI			PUMP RUNNING	STATUS	RUNNING	-	-	-
DI			PUMP AUTO	STATUS	NOT RUNNING	-	-	-
DI			PUMP FAIL	STATUS	NORMAL	ALARM	-	-
DO			HOA SELECTOR SWITCH "HAND"	STATUS	HAND	-	-	REMOTE OPERATION OF PUMPS
DO			HOA SELECTOR SWITCH "OFF"	STATUS	OFF	-	-	REMOTE OPERATION OF PUMPS

SCADA DATA POINT LIST								
IO TYPE	IO NO.	SLOT	DESCRIPTION	PROC VAR	STATE CODE 0	STATE CODE 1	RESET	NOTES
DO			HOA SELECTOR SWITCH "AUTO"	STATUS	ON	-	-	REMOTE OPERATION OF PUMPS
DI			PUMP SEAL FAIL ALARM	STATUS	NORMAL	ALARM	MANUAL	REQUIRE MANUAL RESET OF PUMPS (TO BE COORDINDATED)
DI			PUMP THERMAL FAULT	STATUS	NORMAL	ALARM	MANUAL	REQUIRE MANUAL RESET OF PUMPS (TO BE COORDINDATED)
DI			PUMP HIGH AMPERAGE	STATUS	NORMAL	HIGH	-	PUMP MANUFACTURER TO PROVIDE VALUE
DI			SPARE	STATUS	NORMAL	ALARM	-	-
GENERATOR								
DI			ATS FAULT	STATUS	NORMAL	ALARM	-	-
DI			ATS ON STANDBY	STATUS	NORMAL	ON	-	-
DI			ATS ON UTILITY	STATUS	NORMAL	ON	-	-
DO			GENERATOR FAULT	STATUS	NORMAL	FAILURE	-	-
DO			GENERATOR RUNNING	STATUS	RUNNING	ALARM	-	-
DO			GENERATOR EXERCISE	STATUS	RUNNING	ALARM	-	-

2.05 DISPLAY SCREENS

- A. The system integrator shall provide programming and graphical screen development services required for the proper integration into the Owner's SCADA system.
- B. The following information shall be displayed at a minimum:
 1. Water level sensors
 2. Pump Status

3. System alarms
 4. Power Status
 5. Pump alarms
 6. Pump runtimes
 7. Utility status
 8. Generator operation
 9. Generator exercise program
 10. Historical station data including pump run times, water levels, flows, and alarm conditions
 11. Graphical reporting
 12. Operator Input and modification of the following
 - a. Pump hand/off/auto section
 - b. Level management set points
 - c. Alarm set points
 - d. Alarm acknowledgment
 13. Site/station information
- C. Display screen shall be a minimum of 9" square, with LED backlight, 800x480 pixels, 24-bit color graphics, and touchscreen type.

2.06 COMMUNICATION

- A. The SCADA control panel shall communicate to the Owner via a proposed radio.
- B. Components that shall be supplied with the radio shall be as follows, and as required for a complete system:
 1. Ethernet Switch
 2. UPS
 3. Antenna

4. Mounting brackets and pipes for Antenna

2.07 ENCLOSURE

- A. Description: SCADA control components shall be located within the proposed pump enclosure. Contractor shall be responsible for coordinating all work with the system integrator and cabinet manufacturer.
- B. Additional components that will be required for the SCADA system are as follows:
 1. A display screen shall be installed through the pump controller dead front panel, along with all station indicators.
 2. Separate environmental controls.
 3. Receptacle for UPS.
 4. Branch circuit breaker(s).
 5. 24VDC power supply
 6. Terminal blocks.
 7. Surge suppression.
 8. Control relays.
 9. RF connector.

PART 3 - EXECUTION

3.01 GENERAL

- A. The equipment shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations. All necessary fittings, connectors, supports, anchors, and other items required for the installation and testing shall be furnished.
- B. All equipment shall be operated, adjusted, and tested for proper performance in accordance with the manufacturer's recommendations.

3.02 RADIO STUDY (IF REQUIRED)

- A. Prior to beginning any work, the Contractor shall perform a radio study for the site. This will be to establish the required mounting height of the antenna for the proposed station.

- B. It is anticipated that the radio will be mounted to the building, however if it is determined that a higher mounting height is required, then the antenna shall be mounted to an aluminum pole. This work shall be coordinated during construction. The Contractor shall notify the Engineer immediately of the Radio Study results.

3.02 INSTALLATION AND TESTING

- A. The instrumentation equipment shall be provided and installed by the Contractor and/or subcontractor. The services of the system integrator technical representative shall be provided as necessary to program, calibrate, test, and oversee the installation, adjustment, and operation of the SCADA equipment, devices, and components.
- B. The system integrator technical representative shall be present during startup, and provide necessary coordination to check-out, start-up, and place into operation the SCADA system.
- C. All equipment shall be installed and mounted so that they are readily accessible for operation and maintenance.
- D. The radio and cable shall be installed so that they are located a minimum of 5'-0" above grade. Cable shall not be installed on or below grade.
- E. A technical representative of the system integrator shall calibrate each instrument and provide a written calibration report for each instrument/component. Calibration shall be performed prior to startup and closeout procedures. Field calibration shall include all necessary software modifications required.
- F. During startup if station components such as valve actuators, level sensor/floats, and/or motor controls cannot perform properly when placed into service, the system integrator technical representative shall use suitable test equipment and procedures to simulate a signal to verify or measure signals from those devices and locate source of trouble or malfunction. A written report shall be prepared with the results of such tests and submitted to the Owner upon request, to address responsibility for corrective measures.
- G. The system integrator shall provide a technical representative at the job site to train the Owner's personnel in operating and maintaining the equipment. The representative shall be a skilled, factory-trained technician capable of providing service to supervise, inspect, perform start-up procedures, and train personnel for the proposed installation. The training session shall include a technical explanation

of the equipment and hands-on demonstration. The training session shall consist of one full 8-hour working day, scheduled and coordinated with the Owner.

- H. Start-up and testing is the Contractor's responsibility and shall include pump supplier, electrical subcontractor and system integrator.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be paid for under an Allowance for SCADA SYSTEM.
- B. These prices shall be full compensation for furnishing all materials; for all preparation, installation, programming and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 31 11 00

SITE CLEARING AND GRUBBING

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section Includes:
 - 1. Protection of existing utilities, landscaping, roadway, and related site items.
 - 2. Tree protection.
 - 3. Tree removal.
 - 4. Grubbing and stripping.
 - 5. Disposal of surplus and waste.

1.02 REFERENCES

- A. State of Illinois Department of Transportation
- B. Illinois Urban Manual
- C. National Resources Conservation Service
- D. Village of Hoffman Estates

1.03 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Documentation of existing trees and plantings, adjoining construction, and site improvements that established preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use detailed photographs and videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.04 QUALITY ASSURANCE

- A. Referenced Standards: Work shall be performed in accordance with the latest editions of the following standards. In case of conflict between the requirements of this Section and those of the listed standards, the most stringent shall prevail.
 - 1. State of Illinois Department of Transportation
 - 2. Illinois Urban Manual
 - 3. National Resources Conservation Service
 - 4. Local Ordinances and Standards

PART 2 – PRODUCTS

As specified in applicable sections of the Contract Documents.

PART 3 – EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES, LANDSCAPING, ROADWAYS AND RELATED SITE ITEMS

- A. Protect utilities to remain in place from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Keep entrances and exits, and adjacent roadways affected, free of debris from clearing operations.
- D. Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared as indicated, without Engineer's permission.
- E. Accept responsibility for damages outside these lines.
- F. Remove trees within right-of-way, permanent, and temporary easement as indicated by Engineer.
- G. All damage to existing hardscape from tracked equipment shall be replaced at the Contractor's expense. It is recommended rubber tired, or rubber tracked equipment is used. Any unwarranted disturbance to the existing hardscape to remain will warrant repairs made joint to joint and in conformance with the bid documents. All work shall be done to the satisfaction of the Engineer. The Engineer shall determine with the Village limits of removals and replacements due to the Contractor's negligence.
- H. Protect and maintain benchmarks and survey control points from disturbance during construction.

3.02 SITE CLEARING

- A. Cut or remove trees, brush, and other vegetative matter such as snags, bark and refuse, from areas to be cleared. Clear ground to width of permanent easement unless otherwise directed.
- B. Cut trees, stumps, and stubs to be cleared, except where clearing done by machinery, as close to ground surface as practicable, but no more than 6 in. above ground surface for small trees and 12 in. for larger trees.

3.03 TREE PROTECTION

- A. Contractor shall protect trees to remain in place and take necessary precautions to avoid damaging them during construction.
- B. Protection shall be as shown on the Drawings and local standards.

3.04 TREE REMOVAL

- A. Tree removal shall be performed in accordance with applicable requirements of Section 201 of the Standard Specifications.

3.05 GRUBBING AND STRIPPING

- A. Clear and grub area required for access to site and execution of Work.
- B. Clear undergrowth and deadwood, without disturbing subsoil.
- C. Remove stumps and roots larger than 3 in. in diameter to a depth of 12 in., and roots larger than ½ in. in diameter to a depth of 6 in. Measure depths to cut from existing ground surface or proposed finished grade, whichever is lower.
- D. Strip stumps, roots, foreign matter, topsoil and unsuitable earth from ground surface. Utilize topsoil insofar as possible for finished surfacing.

3.06 DISPOSAL OF SURPLUS AND WASTE

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash, and debris.
- B. Promptly dispose of site material from clearing and grubbing not reused or stockpiled.
- C. Observe all applicable laws, ordinances, rules and regulations. Do not consider work completed until final cleaning, unless otherwise directed.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Work under this Section shall be measured as follows:
 - a. Unit diameter for tree removal. One unit is equal to 1 inch, with the tree's diameter measured at a point 4.5 feet above the highest ground level at

the base of the tree. Multiple stem tree branches, greater than 6 inches in diameter, will be measured for payment as individual trees.

- b. Lump sum for site clearing and tree protection.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the contract unit price for the below listed items:

- 1. SITE CLEARING
- 2. TREE REMOVAL (OVER 15 UNITS DIA.)
- 3. TREE TRUNCK PROTECTION

- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.

- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 31 20 00
EARTH EXCAVATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Design Requirements.
2. Excavating for building foundations.
3. Excavating for slabs-on-grade.
4. Excavating for underground structures.
5. Excavating for above ground structures.
6. Excavating for landscaping.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 01 57 00 – Erosion and Sediment Control
3. Section 02 21 00 – Site Preparation
4. Section 31 23 16 – Trench Excavation, Backfill, and Compaction
5. Section 31 23 19 - Dewatering
6. Section 31 41 00 – Earth Retention System
7. Section 31 25 13 – Erosion Controls
8. Geotechnical Report (if applicable)

1.03 REFERENCES

- A. ASTM International, (ASTM)
- B. Illinois Department of Transportation (IDOT) – Standard Specification for Road and Bridge Construction (SSRBC)
- C. Local codes and ordinances

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Maintenance of Traffic Plan – Contractor shall submit a complete Maintenance of Traffic Plan approved by the Owner for the hauling of excavated material to be disposed of off-site.

- C. Material Disposal Plan – Describe overall material disposal, including proposed disposal site demonstrating compliance with applicable local, state, and federal laws.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with IDOT and local standards and requirements.
- B. Contractor shall confirm that all erosion and sediment control measures are in place and working correctly prior to commencement of any excavation work.
- C. Contractor shall comply with all local, state, and federal regulations applicable to Work of this Section.
- D. Contractor shall comply with and be solely responsible for compliance with U.S. Department of Labor OSHA Part 1926 Safety and Health Regulations for Construction for this Work.
- E. Contractor performing Work of this Section shall be solely responsible for identifying, furnishing, installing, and maintaining equipment and materials required by state and federal regulations to establish safe working conditions during Work of this Section.

1.06 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Professional Structural Engineer experienced in design of this Work and licensed in State of Illinois.

1.07 DESIGN REQUIREMENTS

- A. Provide labor, material, tools and equipment to prepare site as indicated and specified.
- B. This work shall consist of all excavation necessary to complete the work to the line and grade shown on the plans. At the Contractors option, with the review of the Engineer, suitable excavated material may be utilized as fill material in non-structural areas. Excavation and Disposal of material shall be in accordance with Section 202 of the Special Provisions.
- C. Earth Excavation will include all materials encountered including but not limited to the following:
 - 1. Clay
 - 2. Sand

3. Bituminous Surface Removal
 4. Sanitary and Storm Sewer Structures
 5. Lift Station Structures
 6. Pump Controller
 7. Generator
 8. Sidewalk
 9. HMA Driveway Pavement
- D. Excavation for storm sewer items, sanitary items, electrical items including foundations shall be included in the cost of the various items and paid for separately under those items. No undercuts shall be performed without specific direction by the Engineer.
- E. Contractor shall review Geotechnical Engineering Services Report included under Appendix B.

1.08 SITE CONDITIONS

- A. Site Conditions - The Contractor shall be held to having visited the site before bidding and is to examine to his satisfaction the soil, its condition and characteristics, traffic and means of access and any other features which may affect or influence the cost of the work.
- B. Soil Borings – Additional site investigations may be made by the Contractor at his own expense.
- C. Field Screening – Contractor shall be responsible for field screening any soils and/or materials removed from the site. Field screening shall be performed in accordance with Section 669.
- a. If regulated substances are encountered the Contractor shall be responsible for:
 - i. Submitting a “Regulated Substances Pre-Construction Plan(RSPCP)” to the Engineer for review using form BDE 2730. The form shall be signed and sealed by a Professional Engineer, registered in Illinois.
 - ii. Contractor shall also perform regulated substances monitoring. This work shall be performed in accordance with Section 669 of the Standard Specifications, Federal, State, or Local regulatory requirements, and using form BDE 2730.
 - iii. Contractor shall also perform field screening and document the management and disposal of soil and/or groundwater containing regulated substances.
 - iv. No later than 90 days after completing the work, the Contractor shall submit a “Regulated Substances Final Construction Report

(RSFCR)” to the Engineer for review using form BDE 2733. The form shall be signed and sealed by a Professional Engineer, registered in Illinois.

- D. Benchmarks - The Contractor shall use established benchmarks and other reference points. Verify that survey benchmark and intended elevations for the Work are as indicated.
- E. Utilities - The Contractor shall make all necessary arrangements and provide all services required to protect, relocate or terminate and abandon any above or below ground utilities, in the way of new work and all other items of this character. Contractor is responsible for coordinating his work with the utility involved. The Contractor shall consult all public and utility company records, to fully inform himself of the location and extent of all utilities, and existing foundation walls and basements and/or adjacent buildings.
- F. Railroads – Contractor is responsible for coordinating with railroads (as required).

1.09 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining.
- B. Protect benchmarks and existing structures.
- C. Protect above or below grade utilities which are to remain.
- D. Protect existing pavement and curbs.
- E. Protect existing railroads.
- F. Repair damage and restore adjacent areas disturbed by construction.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect benchmarks, survey control points. Contractor is responsible for replacement of same if they are destroyed or disturbed in any manner due to his operations.
- C. Protect existing structures, fences, sidewalks, paving, and curbs that are to remain from damage throughout construction. Contractor is responsible for

replacement of same if they are destroyed or damaged in any manner due to his operations.

- D. Contractor is responsible for field locating utilities before excavating begins.
 - a. Contractor is responsible for coordinating with JULIE (800-892-0123) prior to performing Work. Request underground utilities to be located and marked within and surrounding construction areas.
- E. Contractor is responsible for coordinating with railroad that may be impacted by work prior to performing Work.
- F. Maintain and protect existing and proposed utilities throughout construction. Coordinate work with utilities and local municipality for relocation or termination if required.
- G. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- H. Maintain and protect existing drainage on adjacent roads throughout construction.
- I. Locations selected for collection of debris and/or storage of equipment or material must be subject to approval of the Engineer.
- J. Verify that survey benchmark and intended elevations for Work are as indicated on Drawings.

3.02 GENERAL

- A. Operations shall be done in such manner as to avoid hazards to persons and property and interference with the use of adjacent areas or interruption of free passage to and from such areas.
- B. Protect structures, utilities, roadways, railroads and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.
- C. Care shall be taken to prevent the spread of dust and flying particles.
- D. Excavation and removal work shall be executed in a careful and orderly manner.
- E. After work is started it shall be continued to completion at a rate that will allow the balance of the work to be completed within the time specified. If extra shifts are necessary beyond regular working hours the work must proceed with a minimum of nuisance to surrounding properties.

- F. Legally dispose of all excess excavated material and unacceptable backfill material off site. Also, remove and dispose of all wood and organic fill exposed at required excavation elevations.
- G. Plug any abandoned soil boring or monitoring wells encountered during excavation with bentonite grout in accordance with State standards.
- H. Install geotechnical instrumentation prior to excavation.

3.03 GENERAL EXCAVATION

- A. Perform work in accordance with applicable sections of the Standard Specifications.
- B. Earth excavation shall also include structure excavation, topsoil stripping and stockpiling, furnished excavation, embankment, and removal and disposal of unsuitable material, and shall include all labor, materials, equipment, tipping fees, soil testing for CCDD requirements, and all incidental construction required.
 - 1. The station excavation shall be considered structure excavation and shall be excavated in accordance with Section 502 of the Standard Specifications.
 - 2. Earth retention systems shall be erected for the proposed underground structures, station, and various other subsurface operations. Earth retention method and system design shall be signed and sealed by an Illinois Registered Structural Engineer. Earth retention system shall be temporary sheeting, soldier pile and lagging or other method as selected by Contractor.
 - 3. Furnished excavation shall be placed in accordance with Section 204 of the Standard Specifications to the lines and grades as shown on the Drawings to fill the area around the pump station, fill to subgrade for construction of the pavement and generator pads, and fill to the pump station finished grade. Furnished excavation shall be paid for under Earth Excavation lump sum pay item.
 - 4. Topsoil shall be stripped and stockpiled on site in accordance with Section 211 of the Standard Specifications. Topsoil stockpile may be left on site for use in topsoil placement.
 - 5. Removal and disposal of unsuitable material due to undercuts shall be in accordance with Section 202 of the Special Provisions and Standard Specifications. Unsuitable material shall be excess excavated material due to undercuts not used in furnished excavation or embankment fill

operations. Contractor shall dispose of unsuitable material and excess earth excavation off site. Soil testing and certification by an IL Professional Engineer to meet the requirements of CCDD and shall be included in the Contractor's scope of work and shall be included in the cost of Earth Excavation. Earth Excavation not meeting the CCDD requirements shall be hauled off site and disposed of and paid for as Non-Special Waste Disposal.

6. Demolition of existing structures and station shall include removal of existing structures, pumping units, equipment, piping, steel beams and grating, fencing, concrete or asphalt pavement, removal of existing electrical cabinets, and disposal of all materials offsite.
- C. Excavate to the elevations indicated on the Drawings.
 - D. Haul and place clay and unclassified material on-site as shown on the Drawings.
 - E. Remove unsuitable excavated material as directed by the Engineer and dispose of off-site.
 - F. Remove loose materials from excavations.
 - G. Compaction of the existing subgrade shall be to a minimum of 95 percent of maximum dry density as determined by the Modified Proctor Test – ASTM D 1557.
 - H. After site preparation is complete, strip areas covered with topsoil and remove from the site.

3.04 STRUCTURE EXCAVATION

- A. Notify Engineer of unexpected subsurface conditions.
- B. The assumed design net soil bearing pressures shown on the Drawings shall be verified in the field by an independent Geotechnical Engineer employed by the Contractor. All results shall be submitted to the Engineer.
- C. Underpin adjacent structures that may be damaged by excavating work.
- D. Excavate subsoil to accommodate building foundations, pump stations, slabs-on-grade, spillways, paving and site structures.
- E. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity.
- F. Slope banks with machine to angle of repose or less until shored.

- G. Do not interfere with 45 degree bearing splay of foundations.
- H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- I. Trim excavation. Remove loose matter.
- J. Remove lumped subsoil, boulders, and rock.
- K. The bottom of all excavations shall be properly leveled. All loose materials shall be removed from excavations. All wood, timber and organic materials, that are exposed at the bottoms of all excavations shall be removed and the local depression backfilled approved fill per Standard Specifications and compacted to a minimum of 95% of the maximum dry density in accordance with ASTM D1557.
- L. Any excess or unauthorized excavations shall be backfilled and compacted with crushed stone, per Standard Specifications and compacted to a minimum of 95% of the maximum dry density in accordance with ASTM D1557 at no additional cost to the Owner.
- M. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for EARTH EXCAVATION.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 31 23 16

TRENCH EXCAVATION, BACKFILL, AND COMPACTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System description.
2. Design requirements.
3. Aggregate.
4. Excavation.
5. Trench.
6. Material placement.
7. Compaction.
8. Allowance for shrinkage.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 01 57 00 – Erosion and Sediment Control
3. Section 02 21 00 – Site Preparation
4. Section 03 30 00 – Cast-in-Place Concrete
5. Section 03 40 00 – Precast Concrete Structures

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. C33: Specification for Concrete Aggregates.
2. C136: Sieve Analysis of Fine and Coarse Aggregates.
3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
4. D422: Test Method for Particle-Size Analysis of Soils.
5. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 Fm) Sieve.
6. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (600 kN-m/m³)).

8. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.)).
 9. D2922: Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods. (Shallow Depth).
 10. D3017: Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 11. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 12. D4718: Practice for Correction of Unit Weight and Water Content for Soils Containing Oversized Particles.
 13. D4944: Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Pressure Tester Method.
 14. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.
 15. Test Method for Rapid Determination of Percent Compaction.
- B. Illinois Department of Transportation – Standard Specification for Road and Bridge Construction (SSRBC)
- C. Standard Specification for Water and Sewer Construction in Illinois
- D. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.

1.04 SYSTEM DESCRIPTION

- A. Perform the following earth excavation, backfill, fill and grading as shown on the Drawings, or specified herein:
1. Make excavations to accommodate piping, conduits, foundations and other structures.
 2. Provide materials for backfilling excavations and constructing embankments and fills as indicated and specified.
 3. Construct embankments of compacted materials.
 4. Grade surfaces to meet finished grades indicated.
 5. Immediately notify the Engineer if suspected hazardous materials are encountered and cease operations in that part of work.
 6. Remove boulders within the excavation limits.

1.05 DEFINITIONS

- A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.
- B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller cannot be used.
- E. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.
- F. Unacceptable Materials: Materials does not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

1.06 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures:
 - 1. Qualifications of the Contractor's Independent Testing Laboratory four (4) weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.
 - 2. Submit an excavation, backfilling, and filling plan at least two weeks prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:
 - a. Detailed sequence of work.
 - b. General description of construction methods.
 - c. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.
 - d. Details of dust control measures.
 - e. Proposed locations of stockpiled excavation and/or backfill materials.

- f. Proposed surplus excavated material off-site disposal areas and required permits.
 - g. Details of erosion and sedimentation control measures which will prevent erosion and sedimentation during the earth moving activities.
- 3. Laboratory testing results of gradation and moisture-density relationship. Submittal shall include specific location of the source and the date when sample was taken.
- 4. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.

1.07 QUALITY ASSURANCE AND CONTROL

- A. Provide in accordance with Section 01 43 00 – Quality Assurance.
- B. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- C. Do not excavate, construct embankments, or fill until all the required submittals have been reviewed by the Engineer.
- D. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.
- E. Field Testing and Inspections:
 - 1. By Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense.
 - 2. Location of tests mutually acceptable to testing laboratory and the Engineer or as directed by the Engineer.
 - 3. In the event compacted material does not meet specified in-place density, re-compact material and retest this area until specified results are obtained at no additional to the Owner.
 - 4. Contractor's testing laboratory to perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.

5. Owner will retain the services of an independent testing laboratory to conduct confirmatory testing and inspection.

F. Methods of Field Testing:

1. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922.
2. In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959.

G. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill, grading and embankment.

1. Field In-Place Density and Moisture Content - Aggregate shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per:
 - a. Trenches under structures foundation preparation or roadways subbase: Every 1000 lin. ft. per lift.
 - b. Trenches in areas without structures or roadways: Every 1000 lin. ft. per alternate lift.
 - c. Paved Roadways: Every 200 lin. ft. per lift.
 - d. Paved Areas: 3,500 sq. ft. per lift.
 - e. Under Structure: 1,000 sq. ft. per lift.
 - f. Around Structures: 1,500 sq. ft. per lift.
 - h. Embankment Fills: 10,000 sq. ft. per lift.
2. Moisture Density - One per source, except for aggregate. Repeat the moisture density test for every 5,000 cubic yard of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.
3. Gradation Analysis - A minimum of one per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.
4. Owner's testing laboratory to conduct confirmatory testing at a minimum frequency of 25% of the specified frequencies in paragraph 1.06.H, or as directed by Owner's Engineer.

H. Construction Tolerances:

1. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
 2. Grade cut and fill areas to plus or minus 0.20 foot of the grades indicated.
 3. Complete embankment edges to plus or minus 6 inches of the slope lines indicated.
 4. Provide the Engineer with adequate survey information to verify compliance with above tolerances.
- I. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.
- J. Pipes, drains, and other utilities may exist in certain locations not indicated on drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed.
- K. Dig test pits considered as incidental to the normal excavation as indicated and specified in this Section, at no additional compensation.
- L. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbs, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.
- M. Whenever certain existing structures, as described below, are encountered, and the Engineer so directs, change the location, remove and later restore, or replace such structures, or assist the Owner in doing so.
- N. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the Engineer.
- O. The preceding two paragraphs apply to pipes, wires, and other structures which meet the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

- P. Restore existing property or structures as promptly as practicable.
- Q. If material unacceptable for foundation (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, remove such material to the required width and depth as directed by the Engineer and replace it with aggregate, select borrow, or concrete.
- R. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.
- S. Haul away and dispose of surplus excavated materials at locations directed by the Engineer at no additional cost to the Owner.
- T. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust. Furnish and spread calcium chloride if the Engineer decides that it is necessary for more effective dust control.
- U. Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Use only acceptable materials from excavations or borrows.
- B. Provide 1,500 psi concrete.
- C. Aggregate Base Course: CA-6 per SSRBC, Section 1004 (unless otherwise specified).
- D. Bridging Base Course: CA-1 per SSRBC Section 1001 (unless otherwise specified).
- E. Geotextile Fabric: Woven or nonwoven filaments of polypropylene, polyester, or polyethylene per SSRBC Section 1080.02.
- F. Any additional requirements as indicated in the Geotechnical Engineering Services Report, under Appendix B.

2.02 EQUIPMENT

- A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:
 - 1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.
 - 2. Vibratory steel drum or rubber tire roller weighing at least 12,000 pounds.

PART 3 – EXECUTION

3.01 SITE MAINTENANCE

- A. Site Leveling: Grade site as to maintain it in a level unrutted condition and to eliminate puddling of surface and subsurface water.

3.02 EXCAVATION

- A. Execution of any earth excavation shall not commence until the related excavation support systems and backfill and fill materials submittals are reviewed by the Engineer and all Engineer's comments satisfactorily addressed.
- B. Carry out program of excavation, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- C. Excavate to widths that give suitable room for building structures or laying and jointing piping.
- D. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.
- E. Excavate to lines and grades indicated in an orderly and continuous program.
- F. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.
- G. Excavate to elevations indicated, or deeper, as directed by the Engineer, to remove unacceptable bottom material.
- H. Exercise care to preserve material below and beyond the lines of excavations.

- I. Place excavated material at the approved stockpile locations and in no case closer than 3 feet from edge of excavations to prevent cave-ins of bank slides.
- J. Regard small, less than one cubic yard, boulders, rock fragments, and concrete encountered during excavation as a normal part of in-place soils and not included for payment as rock.

3.03 SEPARATION OF EXCAVATED MATERIALS FOR REUSE:

- A. Remove only existing pavement that is necessary for prosecution of work.
- B. Carefully remove loam and topsoil from excavated areas. Store separately for further use or furnish equivalent loam and topsoil as directed.
- C. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

3.04 TRENCH EXCAVATION

- A. When pipe is to be laid in gravel bedding or concrete cradle, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.
- B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated just before placing of pipe by use of hand tools. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

3.05 DEPTH OF TRENCH

- A. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.

3.06 WIDTH OF TRENCH

- A. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- B. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. above top of pipe.

3.07 TRENCH EXCAVATION IN FILL

- A. Place and compact material to top of fill or to a minimum height of 1 ft. above top of pipe, whichever is less, when pipe is to be laid in embankment or other recently filled material. Take particular care to ensure maximum consolidation of material under pipe location. Excavate pipe trench as though in undisturbed material.

3.08 EXCAVATION NEAR EXISTING STRUCTURES

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.
- B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

3.09 REMOVAL OF SUBSURFACE OBSTRUCTIONS

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.
- B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

3.10 UNAUTHORIZED EXCAVATION

- A. When the bottom of any excavation for structures is taken out beyond limits indicated or specified, backfill, with Aggregate Base Course compacted to 95% maximum dry density.

3.11 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS

- A. Reuse surplus acceptable excavated materials for backfill; deposit neatly and grade so as to make or widen fills, flatten side slopes, or fill depressions; or legally dispose off-site; all as directed or permitted and without additional compensation.

3.12 SUBGRADE PREPARATION AND PROTECTION

- A. Remove loam and topsoil, loose vegetative matter, stumps and large roots from areas upon which embankments will be built or material will be placed for grading. Shape subgrade as indicated on drawings, and prepare by forking,

furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.

- B. As directed by the Engineer, overexcavate unacceptable materials below the foundation subgrade. Backfill the overexcavation with compacted Aggregate Base Course.
- C. Proof roll the foundation subgrade prior to backfilling and filling operation, or placing foundation concrete.
- D. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.
- E. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench foundation subgrade to avoid disturbance of the bearing surface. Tamp the exposed subgrade with the excavating bucket prior to backfilling and filling operation or placing soil-supported pipeline.

3.13 CARE AND RESTORATION OF PROPERTY

- A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
- B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.
- C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.
- D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.
- E. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

3.14 BACKFILLING - GENERAL

- A. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.
- B. Do not use water jetting or flooding as a means of compaction.

3.15 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

A. Select Borrow, and Fine Aggregate:

- 1. Dump and spread in layers not to exceed 8-in. uncompacted thickness.
- 2. Compact, fill and backfill under structure and bedding for pipes (from below pipe to spring line) as indicated but to not less than 95 percent. Compact to not less than 90 percent in other areas unless otherwise indicated.

B. Aggregate Base Course:

- 1. Dump and spread in layers not to exceed 8-in. uncompacted thickness.
- 2. Compact using self propelled vibratory steel drum or rubber tire rollers with a minimum of 4 passes in directions perpendicular to one another in open areas. In small areas, use manually operated vibratory plate compactors with a minimum of 4 passes.
- 3. Compact to 95% maximum dry density.

C. Bank-run Gravel and Acceptable materials for use as non-structural fill:

- 1. Dump and spread in layers not to exceed 12-in. uncompacted thickness.
- 2. Compact to not less than 90 percent unless otherwise indicated.

D. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the Engineer that adequate densities are obtained.

3.16 STRUCTURAL FILL AND BACKFILL UNDER STRUCTURES

- A. Compact fill and backfill under structures and pavements with Aggregate Base Course.

3.17 NON-STRUCTURAL BACKFILL AROUND STRUCTURES

- A. Use acceptable materials for non-structural backfill around structures and compacted as specified and indicated.
- B. Conduct hydraulic testing as soon as practicable after structures are constructed and other necessary work has been done. Start backfilling promptly after completion of tests.
- C. Deposit material evenly around structure to avoid unequal soil pressure.
- D. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage.

3.18 BACKFILLING PIPE TRENCHES

A. General:

- 1. Begin backfilling and proceed until completed after: the pipes and conduits have been laid, joints have acquired maximum degree of hardness, pipelines and conduits have successfully passed tests and inspections as required in the Specifications, and concrete or masonry structures within the trench have reached their design strength to support all loads.
- 2. Backfill and compact indicated material under, around, and above pipes, conduits, and other structures to the indicated or specified compaction density requirement. Utilize compaction devices which will not damage the pipe, conduit, or structure within the trench.
- 3. Do not drop backfill material into trench from a height of more than 5 ft., or in a manner which will damage the pipe, conduit, or other structure within trench.

B. Pipe Trenches:

1. Materials:

- a. From below pipe to 1 ft. above top of pipe: Use screened gravel, or crushed stone, unless otherwise indicated.
- b. One foot above top of pipe to finished grade or to pavement subbase: Use bank-run gravel or acceptable materials, unless otherwise indicated.

2. Compacting Around Pipes: Compact material around circumference of pipe and the area between the trench wall and the pipe by hand tamping in 6 inches layers.
3. Compacting Above Pipe: Compact material by hand tamping. If trench width is wide enough to accommodate power tools and the compacted material over the pipe will support the load of the power tools without damage to the pipe, use rollers or other powered compaction equipment able to more readily achieve compaction requirements.

3.19 MATERIAL FOR FILLING AND EMBANKMENTS

- A. Use acceptable materials for filling and building embankments unless otherwise indicated.

3.20 PLACING AND COMPACTING EMBANKMENT MATERIAL

- A. Compact fill material as specified and indicated.
- B. Perform fill operation in an orderly and systematic manner using equipment in proper sequence to meet the specified compaction requirements.
- C. Place fill on surfaces which are free of unacceptable materials.
- D. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal but provide with sufficient longitudinal and transverse slope to allow for runoff of surface water from every point.
- E. Conduct filling so that no obstruction to drainage from other sections of fill area is created at any time.
- F. Reduce moisture content of fill material, if necessary, in source area by working it over under warm and dry atmospheric conditions. A large disc harrow with two to three foot diameter disks may be required for working soil in a drying operation.
- G. Compact uniformly throughout. Keep surfaces of fill reasonably smooth and free from humps and hollows which would prevent proper and uniform compaction. Do not permit hauling equipment to follow a single track on the same layer but direct equipment to spread out to prevent overcompaction in localized areas. Take care in obtaining thorough compaction at edges of fill.
- H. Slightly slope surface of fill to ensure drainage during periods of wet weather. Do not place fill while rain is falling or after a rain-storm until the Engineer considers conditions satisfactory. During such periods and upon suspension of filling operations for any period in excess of 12 hours, roll smooth the surface of fill using a smooth wheel static roller to prevent excessive absorption of rainfall and

surface moisture. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material, as determined by the Engineer.

- I. When fill is placed against an earlier fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction between two sections of fill, 1 vertical to 1.5 horizontal. Bench edge of existing fill 24- in. [60 cm] to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.
- J. When fill is placed directly upon another older fill, clean surface thoroughly of debris and remove any loose material. Then proof roll the entire old surface.
- K. After spreading each loose lift to the required thickness and adjusting its moisture content as necessary, roll with sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Do not make additional passes until previous pass has been completed.
- L. In case material of any fill sinks and weaves under roller or under hauling units and other equipment, required degree of compaction is not being obtained. Reduce the moisture content. If such sinking and weaving produces surface cracks, suspend operations on that part of the embankment until it becomes sufficiently stabilized. Ideal condition in fill is that attained when the entire fill below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as roller passes. Spread out rolling operations over the maximum practicable area to minimize condition of sinking and weaving.
- M. If because of defective workmanship, compaction obtained over any area is less than that required, remedy condition at no cost to Owner. If additional rolling or other means fail to produce satisfactory results, remove material in that area down to a level of satisfactory density. Perform removal, replacement, and rerolling without additional compensation.

3.21 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT

- A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified or if not specified, at a level slightly lower than optimum.
- B. The soil testing laboratory shall provide inspection during filling or backfilling operations to ensure compaction of aggregate and record compaction equipment in use.

- C. Moisture control may be required either at the stockpile area, pits, or on embankment or backfill. Increase moisture content when material is too dry by sprinkling or other means of wetting uniformly. Reduce moisture content when material is too wet by using ditches, pumps, drainage wells, or other devices and by exposing the greatest possible area to sun and air in conjunction with harrowing, plowing, spreading of material or any other effective methods.

3.22 ALLOWANCE FOR SHRINKAGE

- A. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
- B. Supply specified materials and build up low places as directed, without additional cost if embankment or backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

PART 4 – MEASUREMENT AND PAYMENT

Work specified in this Section will not be measured or paid for as a separate item but shall be considered as included in the prices bid for the various pay items of work involved.

--- END OF SECTION ---

SECTION 31 23 19

DEWATERING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System Description.
2. Groundwater control system.
3. Surface water control system.
4. System operation and maintenance.
5. Water disposal.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 31 20 00 – Earth Excavation
3. Section 31 25 13 – Erosion Controls
4. Section 31 41 00 – Shoring, Sheet piling, and Bracing

1.03 REFERENCES

A. ASTM International

B. Illinois Administrative Code (IAC) – Department of Public Health

1. 11 IAC 920 – Illinois Water Well Construction Code.

C. Illinois Environmental Protection Agency (IEPA)

1. General Storm Water NPDES Permit for Construction Activities.

D. Metropolitan Water Reclamation District of Greater Chicago

E. Illinois Department of Transportation – Standard Specifications for Road and Bridge Construction

1.04 SYSTEM DESCRIPTION

- A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.**

- B. Provide monitoring wells and monitoring equipment to obtain meaningful observations of conditions affecting excavation, adjacent structures, and adjacent water wells.
- C. Furnish standby equipment stored at site and ready for immediate use upon failure of dewatering equipment.
- D. Install level monitoring equipment with alarms and radio or cellular system to notify the Contractor and Village Staff if water levels exceed alarm levels.

1.05 PERFORMANCE REQUIREMENTS

- A. Remove water which accumulates in excavations during the progress of work so that all work can be done in the dry, unless otherwise approved by the Engineer. Keep excavated areas free from water while underground utilities or structures are constructed, while concrete is setting and until backfill or elements of the structure have been placed to a sufficient height to anchor the work against possible leakage or buoyant uplift forces. A height to anchor the work against buoyant uplift forces shall be considered sufficient when the dead load weight of the backfill or elements of the structure exceeds the uplift forces by a minimum factor-of-safety of 1.5.
- B. In addition to the other requirements specified herein, design the dewatering systems to perform as follows:
 - 1. Prevent damage to adjacent properties, buildings, structures, utilities, and other work as a result of settlement or other groundwater-related effects.
 - 2. At all times, maintain groundwater levels over the entire excavation a minimum of 2 feet below the excavation grade.
- C. At all times, have on the work site sufficient pumping equipment for immediate use, including standby pumps for use in case other pumps become inoperable. Dispose of water in accordance with the detailed requirements specified herein and so as to cause no injury to personnel or the public, damage to public or private property, nor menace to public health.
- D. Design dewatering system to prevent pumping fines from below grade or disturbing materials exposed at the excavation bottom. Wells shall be cased, and filter(s) shall be provided to prevent such pumping of fines.
- E. Provide a sufficient number of monitoring wells to confirm the following:

1. The dewatering system is performing as intended and is achieving the specified reduction in groundwater levels.
 2. Construction site groundwater levels inside and outside dewatered excavations to determine the acceptability of removing the dewatering system from operation.
- F. Furnish container for construction dewatering complete with baffles for the purpose of filtering silt prior to discharge of water. Size container or containers to suit dewatering and storage demands. Alternatively, provide filter bags of sufficient size for dewatering.
- G. If the approved methods include displacing groundwater as concrete or other work is placed in excavations, the dewatering system shall capture groundwater as it is displaced and follow the procedures herein for its containment, analysis, and discharge.
- H. Obtain jurisdictional authority's specific discharge requirements prior to commencement of dewatering.
- I. Contractor shall review Geotechnical Engineering Services Report included under the Appendix.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit dewatering plan including shop drawings and design data including the following elements:
1. The proposed type of dewatering system.
 2. Arrangement, location, and depths of system components.
 3. Complete description of equipment and instrumentation to be used, with installation, operation and maintenance procedures.
 4. Types and sizes of filters.
 5. Design calculations demonstrating adequacy of the proposed system and equipment.
 6. Methods of disposal of pumped water.
 7. Method of water quality monitoring.

8. Type of filtration and chemical treatment of contaminated water, as applicable.
 9. Location of discharge.
 10. Well point system design, if proposed: Submit design complete with calculations and shop drawings.
 11. Method for establishing and monitoring construction site groundwater levels.
 12. Description of emergency procedures, including notifications, in the event of dewatering system failure.
 13. Design shall be signed and sealed by a qualified engineer.
 14. Criteria for determining the acceptability of removing the dewatering system from operation.
- C. Prior to removing the dewatering system from operation, submit documentation and all design calculations verifying that the approved criteria for determining the acceptability of removing the system from operation have been met.
- D. Calculations shall be signed and sealed by a Licensed Professional Engineer in the State of Illinois, with at least 5 years of design experience in construction dewatering.

1.07 DELIVERABLES

- A. Submit copies of permits required for work of this Section.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Preinstallation Conference: Conduct conference at project site with Engineer and Owner's Representative.
1. Review methods and procedures related to dewatering including, but not limited to, the following:

- a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
 - b. Geotechnical report.
 - c. Proposed site clearing and excavations.
 - d. Existing utilities and subsurface conditions.
 - e. Coordination for interruption, shutoff, capping and continuation of utility services.
 - f. Construction schedule. Verify availability of installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - g. Testing and monitoring of dewatering system.
- D. Comply with all local, state, and federal regulations pertaining to water discharge and disposal from dewatering operations.
- E. Well point design, if applicable, shall be prepared, signed, and sealed by a geotechnical engineer registered by the State of Illinois and qualified and experienced to perform such design.

1.09 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum ten (10) years documented experience and responsible for design, operation, and maintenance of dewatering system.
 - 1. Assume sole responsibility for dewatering and surface water control systems and for loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations.
- B. Design, install, and monitor operation of dewatering under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Illinois.

PART 2 – PRODUCTS

2.01 DEWATERING EQUIPMENT

- A. Select dewatering equipment to meet specified performance requirements.

2.02 MONITORING EQUIPMENT

- A. Provide piezometer complete with signal cable and data logger.
- B. Flow Measurement: Provide devices as follows:

1. Pitometer installed on discharge of pipe of from each well.
2. Pitometer installed to measure flow from entire dewatering system.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Contractor shall call JULIE at least 48 hours prior to commencement of land-disturbing activities to schedule a utility locate. All underground utilities shall be located and marked within the project limits. It is Contractor's responsibility to verify the location of all existing utilities and to report any discrepancies or omissions with the existing utilities shown on the plans to Engineer immediately.
- B. Contractor shall carefully review the Geotechnical Reports prior to commencing dewatering operations.

3.02 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by dewatering operations.
 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, sidewalks, walkways, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.

3.03 INSTALLATION

- A. Install dewatering system utilizing wells, well points or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground water level, place system into operation to lower water to specified levels. Operate system continuously until drains water from excavation, underground piping/conduit and structures have been constructed, and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water bearing strata above and below bottom of foundations, drains, pipes/conduits and other excavations.
1. Do not permit open sump pumping that leads to loss of fines, soil piping, subgrade softening and slope instability.
- D. Reduce hydrostatic head in water bearing strata below subgrade elevations of foundations, drains, sewers or other excavations.
1. Maintain piezometric water level a minimum of 1 feet below surface of excavation.
- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on a continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
1. Remove dewatering system from project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.04 DEWATERING PROCEDURES

- A. Except as otherwise indicated in the Contract Documents, perform dewatering to accomplish a lowering of measured static ground water level to an elevation which is suitable for the construction of structures below grade.
- B. When pumping is required to reduce groundwater levels, accomplish pumping in a manner that will not disrupt the surrounding environment.
- C. The Contractor may, during the daylight hours of 8:30 AM to 4:30 PM, use generators to operate the dewatering pumps. During all other hours, power to run the pumps shall be electric and obtained from the electric power utility in accordance with Section 01 50 00 - Construction Facilities, unless otherwise authorized by the Engineer and jurisdictional authorities.
- D. If any dewatering well pumps fines, terminate pumping and construct new well at a different location with a revised design which eliminates the pumping of fines.
- E. Provide temporary surface casing when required to stabilize soil while advancing well.
- F. Install pump in accordance with manufacturer's recommendations.
- G. Do not turn off the dewatering system in a manner that the upsurge in water weakens the subgrade for completed excavation and structure foundation work.
- H. Remove storage containers, including those cleaned, and other dewatering facilities from the site at the completion of dewatering operations.

3.05 DEWATERING SYSTEM OPERATION AND MAINTENANCE

- A. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.
- B. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.
- C. Fill fuel tanks before tanks reach 25 percent capacity.
- D. Start emergency generators at least twice each week to verify operating condition.
- E. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.

1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
 2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.
- F. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.
- G. Correct unanticipated pressure conditions affecting dewatering system performance.
- H. Do not discontinue dewatering operations without the Engineer's approval.

3.06 MONITORING WELLS

- A. Install monitoring wells at locations indicated on Shop Drawings as specified for dewatering wells.
- B. Test each monitoring well point to verify installation is performing properly.
- C. Install piezometers, calibrate, and test for proper operation.
- D. Protect monitoring well standpipes from damage by construction operations.
- E. Maintain accessibility to monitoring wells continuously during construction operations.
- F. Maintain monitoring wells until groundwater is allowed to return to normal level.
- G. Water pumped or drained from the site shall be disposed of in a suitable manner without damage to adjacent properties, other Work under construction, street pavement, parks, and walkways.
- H. All damage caused by dewatering the site shall be the responsibility of the Contractor and shall be promptly repaired at the Contractor's expense.
- I. Contractor shall make provisions for removing and resetting individual well points without taking any part of the dewatering systems out of service.

3.07 CONTAINMENT, ANALYSIS, AND DISCHARGE OF GROUNDWATER EXTRACTED

- A. Containment: Upon extraction, store groundwater extracted in the process of construction dewatering in containers prior to discharge or disposal of water, as applicable. Keep containers locked to prevent accidental or purposeful discharge

of the water. Contain and store the water on-site and in such a manner that it will not interfere with the Contractor's existing or continued construction operations.

- B. Analysis: Collect and analyze water samples taken directly from each storage container to verify that the extracted groundwater meets applicable discharge requirements. Number of samples taken per container shall be at the sole discretion of the Engineer.
- C. Discharge Requirements: Discharge no water which exceeds regulatory requirements or the jurisdictional authority's discharge requirements.
- D. Use: Extracted groundwater of sufficient quality as shown by test data may be used on site with Engineer's written approval for those purposes approved by the Engineer.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for DEWATERING.
- B. These prices shall be full compensation for furnishing all materials; for all preparation, installing, and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 31 25 13
EROSION CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. System Description.
2. Performance Requirements.
3. Sediment Traps.
4. Erosion Control Fence.
5. Erosion Control Blanket.
6. Stabilized Construction Entrance.
7. Temporary Rock Check Dam.
8. Concrete Washout.
9. Temporary Seeding.
10. Diversion Channels.
11. Rock Energy Dissipator.
12. Site Stabilization.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Section 01 35 43 – Environmental Protection and Procedures.
2. Section 03 30 00 – Cast-in-Place Concrete.
3. Section 31 20 05 – Site Clearing and Grubbing.
4. Section 31 23 16 – Trench Excavation, Backfill, and Compaction.
5. Standard Specification Section 202 – Earth and Rock Excavation.
6. Standard Specification Section 250 – Seeding.
7. Standard Specification Section 251 – Mulch.
8. Standard Specification Section 252 – Sodding.
9. Standard Specification Section 253 – Planting Wood Plants.
10. Standard Specification Section 254 – Planting Perennial Plants.
11. Standard Specification Section 280 – Temporary Erosion and Sediment Control

- B. In the event of conflict between any of the above and this section, the most stringent shall prevail.

1.03 REFERENCES

A. ASTM International

- B. American Association of State Highway and transportation Officials (AASHTO)
- C. Illinois Urban Manual
- D. IDOT Standard Specifications for Road and Bridge Construction (referred to as the Standard Specifications)
- E. Illinois Environmental Protection Agency (IEPA)
 - 1. General Storm Water NPDES Permit for Construction Activities.
- F. Metropolitan Water Reclamation District of Greater Chicago
- G. American Concrete Institute (ACI)

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings: Submit data on all materials related to the proposed following:
 - 1. Erosion control elements
 - 2. Stabilized Construction Entrances
 - 3. Inlet Protections
 - 4. Silt Fences
 - 5. Culvert Inlet Protections
 - 6. Temporary Concrete Washout Facilities
 - 7. Tree Protections
 - 8. Rock Outlet Protections.
 - 9. Related to aggregates, fencing materials, posts, blanket and curtain materials, filter fabrics, riprap materials, and geotextile materials. hp
- C. Samples:
 - 1. Submit two samples of rock, minimum 5 tons each or one half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide other sample at quarry. Construction site sample may be incorporated into the Work. Samples will be used as reference for judging size, and gradation of rock supplied and placed.
- D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

- F. All materials used for these erosion control elements shall be in accordance with the applicable sections of the Illinois Urban Manual Standards.

1.05 SYSTEM DESCRIPTION

- A. Provide erosion control measures which include, but are not limited to, erosion control fences, filter baskets in structures, sod swales, sediment basins, diversion channels, stone haul roads, and any other measure necessary for soil erosion and sediment control practices.
- B. Erosion control fence shall be installed prior to initiation of construction activities.
- C. Erosion control shall be inspected weekly by the Engineer, and after every rainfall to determine potential damage, and if replacement is needed. The Contractor shall be responsible to make sure that these inspections are completed.
- D. At the completion of the project, all utility structures shall be inspected by the Engineer to determine the amount of cleaning and/or flushing of trapped sediment required.

1.06 PERFORMANCE REQUIREMENTS

- A. Work shall be in accordance with techniques and details as found in the most recent edition of the "Illinois Urban Manual" and as directed by the Engineer.

1.07 DEFINITIONS

- A. Best Management Practices (BMP):
 - 1. Is a practice or combination of practices by the State or Authority Having Jurisdiction, to be the most effective means (including technological, economic, and institutional considerations) of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with the water quality goals.
 - 2. BMP's include planning, selection, design, implementing, and maintenance, evaluation, and monitoring of soil erosion and sediment, stormwater management, and special area protection.

1.08 QUALITY ASSURANCE

- A. Perform work in accordance with the IEPA and MWRDGC requirements.
- B. Maintain one copy of erosion control procedures on site at all times.

PART 2 – PRODUCTS

2.01 ROCK AND GEOTEXTILE MATERIALS

- A. Furnish materials in accordance with the Standards of the Metropolitan Water Reclamation District of Greater Chicago.
- B. Rock gradations shall be as specified in Section 281 of the Standard Specifications.
- C. Geotextile fabric shall be as specified in Section 282 of the Standard Specifications.

2.02 AGGREGATE AND SOIL MATERIALS

- A. Precast Solid Concrete Block: Furnish in accordance with the Standards of the Metropolitan Water Reclamation District of Greater Chicago.
- B. Coarse Aggregate shall be in accordance with the Standard Specifications and as shown on the Drawings.
- C. Soil Backfill: Soil Type as specified in Section 31 20 00 – Earth Excavation.
 - 1. Subsoil shall not contain any rocks over 6 inches in diameter, frozen earth, or foreign matter.

2.03 PLANTING MATERIALS

- A. Seeding shall be in accordance with Section 250 of the Standard Specifications.
- B. Mulch shall be in accordance with Section 251 of the Standard Specifications.

2.04 SOURCE QUALITY CONTROLS AND TESTS

- A. Section 01 43 00 – Quality Assurance.
- B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
- C. Test samples in accordance with ACI 301.
- D. Make rock available for inspection at producer's quarry prior to shipment. Notify Engineer at least seven days before inspection is allowed.
- E. Allow witnessing of inspections and test at manufacturer's test facility. Notify Engineer and at least seven days before inspections and tests are scheduled.

2.05 TEMPORARY EROSION AND SEDIMENT CONTROL

- A. All temporary erosion and sediment control materials shall be in accordance with Section 280 of the Standard Specifications and as shown on the Drawings. This includes:
 - a. Erosion Control Fencing
 - b. Rolled Excelsior
 - c. Temporary Seeding
 - d. Erosion Control Blanket
 - e. Temporary Erosion Control Blanket
 - f. Inlet Filters

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Contractor shall examine existing conditions prior to start of construction.
- B. Verify compacted subgrade, granular base, and stabilized soil is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

3.02 GENERAL

- A. All construction activities that involves earthwork shall meet the National Pollutant Discharge Elimination System Phase II requirements:
 - 1. Submittal of a Notice of Intent (NOI) to Illinois Environmental Protection Agency (IEPA) shall be completed by the Contractor prior to the initiation of work.
 - 2. Possession of a completed and signed Stormwater Pollution Prevention Plan (SWPPP) and a graphic Erosion and Sediment Control (ESC) plan.
 - 3. Implementation of the SWPPP.
 - 4. Submittal of an Incidence of Noncompliance (ION) if an event occurs.
 - 5. Weekly reports after ½" rainfall or 5" snowfall.
 - 6. Documentation of changes to ESC plan.
 - 7. Submittal of a Notice of Termination (NOT) when final stabilization is achieved.
- B. The Contractor shall install all erosion control items prior to commencement of any work.
- C. In order to protect and ensure against flooding, all top of foundations shall be set a minimum of one (1) foot above the high water level of adjacent stormwater

management facilities such as retention/detention ponds. Unless otherwise noted on the plans or directed by the Engineer in writing.

- D. The Contractor shall maintain existing positive drainage from off-site at all times during construction.
- E. Within the limits of proposed grading the soil shall be compacted to not less than the following percentages of modified proctor dry density in accordance with ASTM D 1557-78:
 - 1. Under structures. Building slabs, steps and pavements. Compact six (6) inch maximum lifts of sub-grade. Backfill or fill material at 95% modified proctor dry density.
 - 2. Under walkways. Compact six (6) inch maximum lifts of dry sub-grade, backfill, or fill material at 95% modified proctor dry density.
 - 3. Under lawn or unpaved areas. Compact six (6) inch maximum lifts of sub-grade, backfill, or fill material at 85% modified proctor dry density.
- F. All erosion control work shall comply with "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control."
- G. Stripping of vegetation, grading or other soil disturbance, especially in designated wetland areas, shall be done in a manner which will minimize soil erosion, and shall be in accordance with the approved drawings, mitigation and permit requirements.
- H. The contractor shall take precautionary measures to minimize earthwork in areas where trees are to be saved as shown on the plans or determined in the field.
- I. The extent of the area which is exposed and free of vegetation and the duration of its exposure shall be kept within practical limits as directed by the Engineer.
- J. Sedimentation shall be retained on site. Sediment fence shall be installed along the perimeter of all re-graded areas or as required to prevent sediment from entering and/or leaving the site.
- K. Dust produced from the site shall be kept to a minimum during dry periods by spraying water as required to the Engineer's satisfaction and is to be considered incidental.
- L. All mud shall be removed from all tires before leaving the site and the roads shall be kept clean and clear of mud and debris at all times.
- M. Culverts and drainage ditches shall be kept clean and clear of obstructions during the construction period.

- N. Silt fences shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and integrity.
- O. Water courses and drainage swales adjacent to construction activities shall be monitored as necessary, for evidence of silt intrusion and other adverse environmental impacts. Any problems or deficiencies shall be corrected immediately upon their discovery.
- P. Sod or seed unpaved areas of parkways and right-of-ways.
- Q. The Contractor shall install temporary orange fence around all trees to remain as well as wetland areas that are to be mitigated.
- R. Straw and/or hay bales are not allowed for use as method for erosion or sediment control.
- S. Install the following in accordance with the details shown on the Drawings:
 - 1. Stabilized Construction Entrance.
 - 2. Concrete Washout.
 - 3. Dewatering Filter Pad.

3.03 DIVERSION CHANNELS

- A. Windrow excavated material on low side of channel.
- B. Compact to 95 percent maximum density.
- C. On entire channel area, apply soil supplements and sow seed.
- D. Mulch seeded areas with hay as specified in Section 251 of the Standard Specifications.

3.04 ROCK ENERGY DISSIPATOR

- A. Excavate to indicated depth of rock lining or nominal placement thickness per Section 281 of the Standard Specifications. Remove loose unsuitable material below bottom of rock lining then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

NCSA Class	Nominal Placement Thickness
R8	48 inch (1220 mm)
R7	36 inch (915 mm)
R6	30 inch (760 mm)
R5	24 inch (610 mm)
R4	18 inch (460 mm)

- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 ft. Offset adjacent roll ends a minimum of 5 ft. when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.
- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.
 - 1. Saturate rock with water. Fill voids between pieces with grout, for at least top 6 inch. Sweep surface with stiff broom to remove excess grout.
 - 2. Moist cure grouted rock for at least 3 days after grouting, using water saturated burlap in accordance with Section 03 30 00-Cast-in-Place Concrete.

3.05 SITE STABILIZATION

- A. Incorporate erosion control devices as shown on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 ft. Slope stockpile sides at 2:1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Sections 253 and 254 of the Standard Specifications at 100 percent of permanent application rate with no topsoil.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Sections 253 and 254 of the Standard Specifications and permanent seeding.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

- F. Any disturbed areas that are unvegetated and are schedule or likely to be left inactive for fifteen (15) days or more shall be temporarily or permanently stabilized with measures appropriate for the season as shown on the Drawings.
- G. Remove temporary erosion control measures only after approval of the established vegetation by the Owner or Engineer. Temporary erosion control measures shall remain in place at least until land-disturbing activities are complete and a uniform perennial vegetative cover with a density of 70% (by area) has been established.

3.06 EROSION CONTROL BLANKET

- A. Place at locations shown on the Drawings and where seeding is placed.
- B. Install and maintain in accordance with Section 251.04 of the Standard Specifications and recommended by the manufacturer.
- C. Erosion control blanket shall be organic or synthetic mulch incorporated with a biodegradable photodegradable, or permanent polypropylene or natural fiber netting in accordance with Section 1080.10 of the Standard Specifications.

3.07 TEMPORARY EROSION AND SEDIMENT CONTROL

- A. Install and maintain in accordance with Section 280 of the Standard Specifications, and as directed by the Engineer.

3.08 CLEANING

- A. Section 01 70 00 - Closeout Procedures.
- B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.09 PROTECTION

- A. Section 01 70 00 - Closeout Procedures.

- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit construction traffic over paving for 7 days minimum after finishing and until 75 percent design strength of concrete has been achieved.
- D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement for the items specified in this section shall be made as follows:
 - 1. Per foot for erosion control fence.
 - 2. Per each for inlet protection.
 - 3. Lump sum for dewatering filter bag.
 - 4. Lump sum for BMP maintenance.
 - 5. Lump sum for concrete washout.
 - 6. Lump sum for stabilized construction entrance.
 - 7. Per pound for temporary erosion control seeding.
 - 8. Per square yard for temporary erosion control blanket.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made for the following:
 - 1. EROSION CONTROL FENCE
 - 2. INLET PROTECTION
 - 3. DEWATERING FILTER PAD
 - 4. BMP MAINTENANCE
 - 5. CONCRETE WASHOUT
 - 6. TEMPORARY EROSION CONTROL SEEDING
 - 7. TEMPORARY EROSION CONTROL BLANKET
- B. These prices shall be full compensation for furnishing all materials; for all preparation, installing, and placing of the materials; for all labor, equipment, tools, and incidentals necessary to complete the items, and maintenance of erosion control measures.
- C. Seeding, erosion control blanket, and dewatering shall be paid for separately.

- D. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 31 41 00
SHORING, SHEETING, AND BRACING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Catenary Support Systems
2. Shoring.
3. Sheeting.
4. Bracing.
5. Vibration Monitoring.
6. Earth Retention Systems.

1.02 REFERENCES

A. National Bureau of Standards Building Science:

1. Series 127 “Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations.”

B. Federal, State and local laws and regulations applying to the design and construction of shoring, sheeting and bracing.

C. Occupational Safety and Health Administration (OSHA).

D. American Society of Civil Engineers (ASCE 37) “Design Loads on Structures During Construction.”

E. American Institute of Steel Construction (AISC) Design Guide 10 Erection of Bracing of Low-Rise Structural Steel Buildings.

F. Standard Specifications for Road and Bridge Construction in Illinois (referred to as the Standard Specifications).

G. Geotechnical Report

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Contractor's Submittals: Submit a Certificate only, signed and sealed by a Licensed Structural Engineer registered in the State of Illinois, that certifies that the Licensed Structural Engineer has evaluated and approved the Contractor's excavation plan and has prepared complete design calculations and working drawings for the shoring, sheeting and bracing, not specifically shown on the Contract Drawings, which will be used for excavation support.

C. The following items shall be included in the submittal:

1. Boring logs and associated field/lab test data.
2. A Geotechnical Report, if not already included.
3. List of all design assumptions used in the calculations.
4. Provide copies of relevant pages of references used in the calculations. These include all graphs, charts, or tables used in the analysis or design.
5. Provide copies of catalog cuts, tables of material properties use in the calculations.
6. Include sketches and/or listing of soil layering, soil parameters, and design water level assumed in the calculations. Specific borings which were used in establishing the design conditions should be identified by boring numbers as given on the logs.
7. Calculations should show cross-sections giving design elevations for:
 - a. Top and toe of shoring, sheeting, bracing, and/or walls.
 - b. Existing surrounding grades.
 - c. Bottom of excavation.
 - d. Roadway, existing structures, foundations, and utilities located within the zone of influence.
 - e. Cut slopes and set-backs.
 - f. Ground water elevation.
 - g. Penetrations.
8. All formulas.
9. Include all calculation steps that are a normal part of an actual hand calculation, whether or not a computer-assisted analysis/design was used. Do not submit re-copied computer output as hand calculations.
10. Drawings shall include plan views and cross-sections which are consistent with the final design option. Sufficient cross-sections shall be provided to show top of grade, cutback slopes, foundations, adjacent structures, sidewalks, roadways, as well as utilities within the zone of influence (within 2.5 times the excavation depth from grade).
11. A groundwater control plan and dewatering calculations must be signed and sealed by an Illinois registered Professional Engineer. Calculations shall be submitted for review in all cases where well/well points and/or dewatering are necessary to maintain a dry, stable excavation.

D. The Engineer's review of the shoring, sheeting, and bracing system in no way relieves the Contractor for the actual performance of the installed system. It will

be the Contractor's responsibility that any facilities or roadways adjacent to, and/or protected by this system, will not be damaged as a result of the inadequate performance of the system. Any damage to adjacent facilities and roadways shall be repaired or replaced at the Contractor's expense.

1.04 DESIGN REQUIREMENTS

A. General:

1. Design drawings and calculations must be prepared by the Contractor's Engineer based on the minimum requirements listed in this Section, and as required based on the Geotechnical Report.
2. The design and details shall be prepared in accordance with the Contractor's staging for construction.
3. The design shall ensure the stability and integrity of the structure during construction and/or demolition and removal.
4. The shoring system shall be able to maintain lateral stability under any jacking operation, where applicable.
5. The design shall not damage or otherwise lessen the quality or life of any portion of the structure(s) that is to remain, or adjacent roadways.
6. The design shall consider potential risks to the proposed shoring system including, but not limited to, underground utilities, adjacent structures, roadways, walkways, traffic, construction equipment impacts, etc.
7. The Contractor's Engineer shall determine the adequacy of existing structure at time of shoring installation to resist the concentrated force imposed through jacking device, as applicable. The design must include details to distribute concentrated forces.

B. Catenary Support Structures

1. For temporary shoring used during construction or demolition of existing and proposed catenary support structures, design methodologies and design loads in the Contract Documents shall be used for the shoring structure design. Minimum construction clearance envelopes shall apply when shoring systems are built adjacent to roadways.

C. Design Drawings:

1. The suggested shoring/earth retention scheme, if outline on the Contract Drawings, are conceptual and provide minimum criteria and/or limits. The Contractor's Engineer shall prepare all design drawings. The drawings shall incorporate the Contractor's phasing/staging and procedures for execution of the system. Diagrams from product data are not an acceptable alternative to engineered drawings.
 - a. Provide a layout showing locations for all shoring as required by the demolition and new construction work for the project.
 - b. Provide a layout for all phases.

- c. All layout drawings shall include locations of underground utilities. Concurrence on design must be received from agencies representing underground utilities prior to final design.
- d. All layout drawings to include locations of excavations. Concurrence on design must be received from the Contractor's Engineer in responsible charge for stability of the excavation, prior to final design.
- e. Indicate all field-verified dimensions and conditions that affect the shoring operations.
- f. The Design shall show plans, elevations, and details, including connections, with adequate clarity to demonstrate how the design will adequately resist and transfer all loads into the ground.
- g. All points of jacking must be detailed.
- h. Detailed plan on how the structure is jacked and how the jacks are not used to support live load of trains.

D. Monitoring:

- 1. The Contractor shall submit a vibration monitoring plan.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

- A. Use manufacturers and materials for shoring, sheet and bracing as recommended by the Contractor's Licensed Structural Engineer who designed the shoring, sheeting, and bracing. Products shall be subject to the review of the Engineer and Owner.
- B. Fabrication of sheeting / shoring / bracing shall be in accordance with applicable requirements of Standard Specification Article 505.04.

PART 3 – EXECUTION

3.01 SHORING, SHEETING AND BRACING INSTALLATION

- A. General: Provide safe working conditions, prevent shifting of material, prevent damage to structures or other work, and avoid delay to the work, all in accordance with applicable laws and regulations. Properly shore, sheet, and brace all excavations that are not cut back to the proper slope, as determined by the Contractor's Licensed Professional Engineer.
 - 1. Take sole responsibility for the design and adequacy of shoring, sheeting, and bracing not shown on the Contract Drawings.

2. Take sole responsibility for the methods of installation of the shoring, sheeting, and bracing.
- B. Arrange shoring, sheeting, and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- C. If the Contractor or its Licensed Structural Engineer is of the opinion that at any time the Contractor's excavation plan, shoring, sheeting, or bracing is inadequate or unsuited for the purpose, take immediate and appropriate action. Provide a new Certificate if the Contractor's excavation plans, shoring, sheeting, or bracing require modifications.
- D. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting, shoring, and bracing. Lateral and vertical readings shall be taken at the top of the sheeting, shoring, and bracing system, and at the bottom of the excavation. These readings shall be dated, recorded, and reported to the Engineer. The frequency of the readings will be dictated by the phase of the construction and shall be sufficient to detect series movements so that corrective measures can be initiated immediately. Readings shall be made once per day until settlement is less than 0.125 inches after which the frequency shall be once per week.
- E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.
- F. Remove shoring, sheeting, and bracing as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures or pipe bedding.
 1. Carefully fill voids left by the withdrawal of the shore, sheeting, and bracing. No separate payment will be made for the filling of such voids.
 2. If pipe bedding is disturbed, re-compact it to meet specified density requirements.
- G. Permission for Removal: Obtain permission from the Contractor's Licensed Structural Engineer before the removal of any shoring, sheeting or bracing. Retain the responsibility for injury to structures or to other property or persons for failure to leave such shoring, sheeting, and bracing in place even though permission for removal has been obtained.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for EARTH RETENTION SYSTEM.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 33 11 00

UTILITY PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ductile iron pipe.
2. Mechanical joint fittings.
3. Flange piping and joints.
4. Bolts, studs, tie rods, nuts, and washers.
5. Gaskets.
6. Restrained joints.
7. Coatings and liners.
8. Couplings.
9. Plastic Pipe.
10. Steel Pipe.
11. Pipe sleeves.
12. Pipe supports.
13. Flexible connector.
14. Casing pipe.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Section 09 90 00 – Painting and Coatings
2. Section 33 12 16 – Utility Piping Valves
3. Section 33 42 00 – Sewage Pumps and Accessories

1.03 REFERENCES

A. American Welding Society:

1. AWS B3.0 – Welding Procedure and Performance Qualification

B. Manufacturer's Standardization Society:

1. MSS SP-69 – Pipe Hangers and Supports

C. American Society for Testing and Materials:

1. ASTM A216: Standard Specification for Steel Castings, Carbon,

- Suitable for Fusion Welding, for High Temperature Service.
2. ASTM A307: Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
 3. ASTM D1330: Standard Specification for Rubber-Sheet Gaskets.

D. American National Standards Institute:

1. ANSI B16.1: AN Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

E. Fluid Sealing Association - Technical Handbook.

F. Standard Specifications for Water and Sewer Main Construction in Illinois

G. American Water Work Association (AWWA)

H. ASTM International (ASTM)

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop drawings shall include:

1. Manufacturer's certificates of conformance.
2. Certified copies of test reports.
3. Piping layouts in full detail.
4. Location of pipe hangers and supports.
5. Location and type of backup block or device to prevent joint separation.
6. Large scale details of wall penetrations and fabricated fittings.
7. Schedules of all pipe, fittings, special castings, flexible connectors, adapters, couplings, expansion joints, and other appurtenances.
8. Reports as required for welding certifications per ANSI B31.1 Paragraph 127.6.
9. Catalog cuts of joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories.
10. Brochures and technical data on coatings and linings and proposed method for application and repair.
11. Manufacturer's descriptive literature and technical data on insulation and proposed method of installation.
12. Accessory items.
13. Manufacturer's literature as needed to supplement certified data.
14. Special tools.
15. Shop and field testing procedures and equipment to be used.
16. The most recent ISO 9000 series certification or quality system plan.
17. Material Certification:

- a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and as indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified. And indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Authority.
- b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.

1.05 SYSTEM DESCRIPTION

- A. Provide all discharge piping, fittings, and appurtenances as shown on the Drawings, between the pumps and the forcemain.
- B. Provide piping, fitting, and appurtenances along the forcemain, as shown on the Drawings.
- C. The forcemain shall be defined as buried main commencing after the valve vault structure.

1.06 QUALITY ASSURANCE:

- A. In accordance with Section 01 43 00 – Quality Assurance.
- B. Replace all materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner, and acid solder at no additional cost to the Owner.
- C. Coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in piping systems. Bolt holes in flanges to straddle vertical centerline.
- D. Qualification for Pipe Support Structural Attachment Welders: Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If recertification of welders is required, retesting is the Contractor's responsibility at no additional cost to the Owner.
- E. Protect piping from dirt, dust, oil, grease, and other foreign matter during installation to prevent debris from being left in piping.

1.07 DELIVERY, STORAGE AND HANDLING:

- A. In accordance with Section 01 60 00 – Materials and Equipment.
- B. Shipping:
 - 1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
 - 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 - 3. The Contractor shall obtain spare parts from the manufacturer at the same time as pertaining equipment. The Contractor shall maintain possession of spare parts until Substantial Completion at which time, all spare parts shall be turned over to the Owner.
- C. Receiving:
 - 1. Inspect and inventory items upon delivery to site.
 - 2. Store and safeguard equipment, material and spare parts in accordance with manufacturer's written recommendations and instructions.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

- A. Minimum wall thickness for ductile iron pipe shall not be less than Class 52, unless otherwise shown on the Drawings.
- B. Ductile Iron Pipe (DIP) - shall be centrifugally cast in metal or sandlined molds and shall conform to ANSI A21.51/AWWA C 151. Pipe joints shall be push-on type and conform to ANSI A21.11/AWWA C 111 unless otherwise shown or noted on the Drawings. Each length of pipe shall be marked to show manufacturer's name or trademark, pipe class, year of manufacture conforming to ANSI A 21.51/AWWA C 151.
- C. Mechanical Joint Fittings - shall be mechanical joint and iron or ductile iron conforming to ANSI A 21.53/AWWA C153 and ANSI A21.4/AWWA C104. Restrained joints may be used instead of mechanical joints. Thrust blocking shall be provided for all fittings. Fittings not covered under AWWA C153 shall comply with AWWA C110. Fittings shall have the same linings and coatings as the pipe.

- D. Flanged Piping and Joints - Flanged piping and joints where required on the Drawings shall comply with AWWA C115 and AWWA C110, respectively. Flanges shall conform to ANSI B16.1. Flange gaskets shall be full face type, rubber composition. Gasket thickness shall be 1/16-inch for pipe 10 inches and less and 1/8-inch for larger pipe. Flange assembly bolts shall be standard hexagonal head carbon steel machine bolts with heavy, hot pressed, hexagon nuts, ANSI B18.2. Threads shall conform to ANSI B1.1, coarse thread series, Class 2 fit. Bolt length shall be such that after joints are made up the bolts shall protrude through the nut, but not more than 2-inch. Bolts for use in submerged/wetted service shall be stainless steel.
- E. Bolts, Studs, Tie Rods, Nuts and Washers - All bolts, studs, tie rods and nuts for all pipe, valves and accessories shall be low carbon steel and have American National form right-hand machine cut threads which shall conform with ANSI B1.1, "Screw Threads", Coarse Thread Series, Class 2 Fit, unless otherwise specified.
1. Bolt heads and nuts shall be semifinished and shall conform with ANSI B18.2, "Wrench-Head Bolts and Nuts and Wrench Openings", Heavy Series, unless otherwise specified. All nuts shall be hexagonal in shape.
 2. All low carbon steel bolts for flange joints and bolts for restrained joints shall conform with ASTM A307, Grade B or approved equal.
 3. The Contractor shall provide bolts conforming to AWWA C111 for all flanged and mechanical joints for compact fittings. The bolt threads shall be lengthened according to AWWA C153 to allow for proper nut installation.
- F. Gaskets - for mechanical joints and push-on joints shall conform to ANSI A 21.11/AWWA C 111.
- G. Coatings & Linings:
1. Interior coating: Cement mortar lining, standard thickness, in conformance with ANSI A 21.4/AWWA C 104.
 2. Exterior coating: Factory applied asphaltic coating, minimum of one (1) mil thick, in accordance with ANSI A 21.51/AWWA C 151, unless otherwise indicated on the Drawings.
 - a. All ductile iron pipe shall be encased in polyethylene film polyethylene encasement in accordance with ANSI/AWWA C105/A21.5-05.
 4. Field Applied Coatings: Shall be in accordance with Section 09 90 00 – Painting and Coatings.

2.02 PLASTIC PIPE

A. Polypropylene Pipe:

1. Pipe: ASTM F2764.
2. Joints: Flexible elastomeric seals in accordance with ASTM D3212 and F477.

B. PVC Pipe:

1. PVC Pipe:
 - a. Minimum SDR/DR shall be 35.
 - b. Pressure rated: ASTM D 2241, SDR 26.
 - c. Gravity rated: ASTM F679.
2. Fittings:
 - a. Screw Joint Fittings: ASTM D2464, Schedule 80.
 - b. Push-On Joint Fittings: ASTM D3139, with ASTM F477 gaskets.
 - c. Solvent Cement: ASTM D2564.
 - d. Solvent Cemented Joint Fittings: ASTM D2672.
 - e. Couplings for use with plain end pipe shall have centering rings or stops to ensure coupling is centered on joint.

C. High Density Polyethylene (HDPE)

1. Pipe:
 - a. Premium, highly engineered PE4710 resin, conforming ASTM D3350, with cell classification of 445574C/E
 - b. Listed with Plastic Pipe Institute's (PPI) TR4
 - c. Formulated with ultraviolet stabilizer for protection against UV rays.
2. Fittings: ASTM D3261.
3. Joints:
 - a. Heat fusion joints in accordance with ASTM F2620/F3190.
 - b. Electrofused in accordance with ASTM F1055
 - c. Flexible elastomeric seals in accordance with ASTM D3212 and F477.

D. All pipe shall be manufactured from 100 percent virgin resin.

2.03 STEEL PIPE

A. Pipe:

1. Steel Pipe 6-Inches in Diameter and Larger: AWWA C200.
2. Steel Pipe Less Than 6-Inches in Diameter: ASTM A53, standard weight, threaded end, galvanized.
3. Fittings 6-Inches in Diameter and Larger: AWWA C200, fabricated in compliance with AWWA C208.
4. Fittings Less Than 6 inches in Diameter: ASME B16.3, galvanized.

B. Joints:

1. Push-On Joints: AWWA C200.
2. Mechanical Joints: AWWA C200.
3. Flanged Joints: AWWA C207.

2.04 RESTRAINED JOINTS

A. Manufacturers:

1. Megalug.
2. Substitutions will be allowed in accordance with Section 01 25 00 - Substitutions.

B. Restraint devise for nominal pipe sizes 3 inch through 54 inch shall consist of multiple gripping wedges incorporated into a follower gland.

C. In accordance with applicable requirements of ANSI/AWWA C110/A21.10.

D. The devices shall have a working pressure rating of 350 psi for 3-16 inch, 250 psi for 18-48 inch, and 200 psi for the 54 inch size. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

E. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

F. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

2.05 PIPE SUPPORTS

A. Saddle Stands: Used adjustable saddle stands.

1. Provide each stand with a length of steel pipe fitted at the base with standard threaded cast-iron flange or steel base plat and at the top with an adjustable saddle or roll. Bolt the base flange or plate to the floor, foundation or concrete base.
2. Use stanchions of construction similar to the saddle stand, except fit them at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

2.06 PIPE SLEEVES

A. Steel fabricated type with integral water stop.

B. Plastic when used within concrete form work.

2.07 WALL SLEEVES

- A. Wall sleeves installed on round structures
 - 1. Flexible boots
 - a) In accordance with ASTM C923 Clamp-On Type or "A-Lock" Type
 - b) Clamp to pipe using minimum of 2 stainless steel clamps.
- B. Wall sleeves installed on square structures
 - 1. Modular, elastomer sealing system
 - a) sized for the pipe diameter and material type.
 - b) Pressure resistant to 20 psi
 - c) EDPM rubber
- C. Hardware: Type 316 stainless steel.

2.08 STEEL CASING PIPE

- A. Yield strength: 35,000 psi minimum.
- B. Steel Casing Pipe:
 - a. Installation: By boring/augering or jacking into place at the locations shown on the Drawings.
 - b. Wall thickness: Minimum wall thickness as required by permit requirements of the Agency Having Jurisdiction, and as shown on the Drawings.
 - c. Material: Billet steel, cylindrical, with smooth bituminous coated walls inside and outside.
 - d. Design Requirements: Conform to ASTM A53 Grade B, ASTM A139 Grade B, or pipe fabricated in accordance with AWWA C200 using ASTM A36 steel.
- C. Casing Spacers:
 - a. Material:
 - i. The shell shall be made of two sections of heavy T304 stainless steel.
 - ii. The shell shall be lined with a PVC liner 0.090-inch thick with 85-90 durometer.
 - iii. Connecting flanges of shell shall be ribbed.
 - b. Type: Bolt-on, spider style and shall be provided with the casing pipe to

facilitate position of the carrier pipe within the casing pipe.

c. Accessories:

- i. Nuts and bolts shall be 18-8 stainless steel.
- ii. Runners shall be made of ultra-high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction.
- iii. Runners shall be supported by shell risers made of heavy T304 stainless steel.
- iv. The height of the supports and runners combined shall be sufficient to approximately center the carrier pipe inside the casing pipe.

d. Manufacturers:

- i. Cascade Waterworks Mfg. Co.
- ii. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.09 COUPLINGS-SLEEVE TYPE

A. Manufacturers:

1. Romac
2. Smith Blair
3. Viking Johnson
4. Dresser
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. In accordance with AWWA C219.

C. Couplings 12-in and smaller:

1. End rings and center rings: ASTM A536 ductile iron, fusion bonded epoxy coated.
2. Gaskets: Buna-N, NSF 61 approved.
3. Hardware: Type 316 stainless steel.

D. Bridles and tierods: Minimum $\frac{3}{4}$ -in diameter, except where tierods replace flange bolts of smaller size, in which case fit with nut on each side of pair of flanges.

1. Provide as indicated.

2.10 EXPANSION JOINTS-STAINLESS STEEL

A. Manufacturers:

1. Pathway
2. Flexonic
3. Adsko
4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Design Criteria:

1. Minimum Pressure Rating: 150 psi minimum or as indicated in the Process Piping Schedule.
2. Minimum Lateral Movement: 0.125-inch.
3. Minimum Axial Movement: 0.4-inch
4. For expansion joints used on pump discharge nozzles the Contractor shall coordinate the rod size and movement allowable with the pump manufacturer and provide a statement from the pump manufacturer that the expansion joint and rod size is acceptable for the pump provided.

C. Products:

1. Provide bellows of two-ply construction formed from concentric tubes having only longitudinal seams.
2. For two-ply construction, each ply shall be capable of retaining the rated pressure at the specified temperature independently.
3. For two-ply construction, seal weld both plies so that no gas or liquid leaks out at the ends.
4. For two-ply construction, provide a pressure monitoring connection with pressure gauge and pressure switch as specified herein for the annular space.
5. Provide control rods for test pressure.
6. Provide minimum two lifting lugs on each joint. Each lug shall be designed to carry the entire weight of the assembly.
7. Provide each joint with a liner and mark a flow arrow on the outside to indicate direction of flow.
8. Provide each expansion joint with a Type 316 stainless steel nameplate indicating size, bellows material, pressure and temperature rating, lateral

and axial limits on movement, date of manufacturer, and the manufacturer.

D. Materials:

1. Bellows:
 - a) Inner Ply: Inconel alloy 625, minimum 0.048-inch thick.
 - b) Outer Ply: Inconel alloy 625, minimum 0.048-inch thick.
2. Liner: Type 316L stainless steel, minimum 0.1875-inch thick.
3. Flanges: Type 316L stainless steel, Class 150.
4. Limit Rods/Nuts and Hardware: Type 316 stainless steel.

E. Install joints in their neutral position.

2.11 BYPASS COUPLING SYSTEM

A. Acceptable Manufacturers

1. Precision Systems.
2. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Description

1. Bypass coupling connection and hatch shall include a 6" Camlock fitting manufactured for an NPT connection to valve vault riser pipe. Camlock fitting shall be integral to a rectangular stainless steel and aluminum assembly for casting in valve vault lid. Hatch shall be aluminum check plate, with lockable lid and waterproof lock.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install items in accordance with manufacturer's recommendations and as shown on the Drawings.
- B. Where changes in the pipe routing are required, the Contractor shall submit a drawing showing the proposed change to the Engineer for review.

- C. The Contractor shall provide all tools, labor and equipment necessary for the safe and expeditious installation of all piping and appurtenances as shown on the Drawings and specified herein, including fusion welding machines.
- D. Ensure interior lines parallel to building walls wherever possible. Install piping to accurate lines and grades, and support. Provide pipe supports as specified under Part 2.03 of this section. Where temporary supports are used, ensure rigidity, to prevent shifting or distortion of pipe. Provide for expansion.
- E. Before assembly, remove all dirt and chips from inside pipe and fittings.
- F. Use dielectric bushings or unions when ferrous pipes join nonferrous pipes carrying liquid either underground or elsewhere.
- G. Welding in accordance with ANSI Standard B31 and AWS B3.0.

3.02 WALL SLEEVE SEALS

- A. Pack annular spaces with extrudable preformed plastic gasket material to prevent debris from entering space between pipe and flexible boot.
- B. Install modular units in accordance with manufacturer's recommendations.

3.03 TEMPORARY PLUGS

- A. Close open ends of pipe with temporary plugs or caps when pipe installation is not in progress. Use watertight plugs for exterior, buried piping and if water or debris is in trench when work is resumed, do not remove until adequate provision has been made to prevent any water or debris entering pipe even if it necessitates dewatering trench.

3.04 TESTING

A. Pressure Test:

1. After pipe has been installed, joints completed, thrust blocks have been in place for at least five days, and trench has been partially backfilled, leaving joints exposed for examination, fill pipe with water to expel all air.
2. All hydrotesting of pipes shall be done with water provided by the Contractor. All equipment necessary for complete hydrotesting, such as hoses, auxiliary piping, pumps, compressors, meters, plugs, blinds, etc. shall be supplied by the Contractor. The Contractor shall also furnish all labor and supervision as necessary for testing and inspection. Contractor shall submit a schedule for hydrotesting to the Engineer for review.

3. Subject pipeline to a test pressure of 100 psi or 150 percent of working pressure, whichever is greater, for a period of at least two hours. Tests shall be witnessed by the Engineer.
4. After pressure is applied, pressurizing device must be disconnected or isolated from the system during inspection period. There shall be no allowable leakage and defects shall be corrected immediately. Testing shall be repeated after defects have been corrected until a successful test has been accomplished.
5. During hydrostatic pressure testing locally mounted indicating pressure gauges, where test pressure would exceed their scale range, shall be isolated or removed prior to testing. If removed, branch lines shall be plugged. All lines that are to be insulated shall be tested, cleaned and flushed prior to installation of insulation. All equipment shall be isolated from the system during testing of piping system. All air shall be vented from the system prior to application of test pressures for hydrostatic tests.
6. Open and close each valve several times during test.
7. Examine exposed pipe, joints, fitting, and valves for leaks. Stop visible leaks or replace defective pipe, fitting, joints, or valve.

B. Leakage Test:

1. Leakage test may be conducted subsequent to or concurrently with pressure test.
2. Place amount of water permitted as leakage for lines in a sealed container attached to supply side of test pump.
3. No other source of supply will be permitted to be applied to pump or line under test.
4. Pump water into line by test pump as required to maintain specified test pressure as described for pressure test for a two (2) hour period.
5. Exhaustion of supply or inability to maintain required pressure will be considered test failure.
6. PE pipe can experience diametric expansion and pressure elongation during initial testing.
7. Consult manufacturer prior to testing for special testing considerations.
8. Determine allowable leakage by the following I-P formula:
 - a. $L = NDP/K$ Where:
 - b. L = Allowable leakage in gallons per hour.
 - c. N = Number of joints in length of pipeline tested.
 - d. D = Nominal diameter of the pipe in inches.
 - e. P = Square root of the test pressure in psig.
 - f. K = 7400 for pipe materials.
9. At conclusion of test, measure amount of water remaining in container and record results in test report.

- C. Retesting: If any deficiencies are revealed during any test, correct such deficiencies and reconduct tests until results of tests are within specified allowances, without additional cost to Owner.

3.05 CLEANING AND ADJUSTMENT

- A. At the completion of the Work, all parts of the installations shall be thoroughly cleaned. All equipment, pipe, valves, and fittings shall be cleaned of grease, welding metal, slag, metal cuttings, and sludge which may have accumulated by operation of the systems for testing. Any discoloration or other damage to parts of the buildings, their finish, or furnishings due to the Contractor's failure to properly clean the piping systems shall be repaired by the Contractor without cost to the Owner. Special care shall be exercised to remove all metal particles from the piping system to assure no damage to valves and other operating mechanisms.

3.06 TOUCH-UP FIELD PAINTING:

- A. Repair or replace damaged or defective coating areas.
- A. Remove damaged or defective coatings by sand-blast cleaning in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.
- B. Before priming, provide surfaces dry and free of dust, oil, grease and other foreign material.
- C. Apply approved coating in accordance with valve manufacturer's printed recommendations.
- D. When small areas of coating need touch up, surface preparation may be done with suitable power needle gun to match specified blast cleaning.

3.07 CONTRACT CLOSEOUT:

- A. In accordance with Section 01 77 00 – Closeout Procedure.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement for the items specified in this section shall be made as follows:
 - 1. Lump sum for discharge piping and fittings.
 - 2. Lump sum for forcemain.
 - 3. Per foot for sanitary sewer.
 - 4. Per foot for storm sewer.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum prices for:
 - 1. DIP PUMP DISCHARGE PIPING AND FITTINGS.
 - 2. FORCEMAIN.
 - 3. SANITARY SEWER 6".
 - 4. SANITARY SEWER 8".
 - 5. SANITARY SEWER 10".
- B. Trench backfill for the sanitary pipes shall be paid for under the contract unit price for "Trench Backfill".
- C. Trench backfill for DIP Pump Discharge Piping and Forcemain shall be included under the individual pay items. Separate payment shall not be allowed.
- D. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- E. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 33 12 16
UTILITY PIPING VALVES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plug valve.
2. Rubber flap valve.
3. Ball valve.
4. Gate valve.
5. Check valve.
6. Air release valves.
7. Air vacuum valves.
8. Valve boxes.
9. Flap gates.
10. Flow switch.
11. Flow meter.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Section 09 90 00 – Paintings and Coatings
2. Section 33 11 00 – Utility Piping
3. Section 33 42 00 – Sewage Pumps and Accessories

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A48: Specification for Gray Iron Castings.
2. ASTM A126: Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
3. ASTM A536: Specification for Ductile-Iron Castings.

B. American National Standards Institute (ANSI):

1. ANSI B2.4: Hose Coupling Screw Threads.
2. ANSI B16.1: Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

3. ANSI B16.4: Cast-Iron Threaded Fittings, Class 125 and 250.

4. ANSI B16.10: Face-to-Face and End-to-End Dimensions of Ferrous Valves.

C. Standard Specifications for Water and Sewer Main Construction in Illinois

D. American Water Work Association (AWWA)

1.04 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01 03 00 – Submittal Procedures.

B. Shop drawings shall include:

1. Manufacturer's certificates of conformance.
2. Certified copies of test reports.
3. Piping layouts in full detail.
4. Location of pipe hangers and supports.
5. Location and type of backup block or device to prevent joint separation.
6. Large scale details of wall penetrations and fabricated fittings.
7. Schedules of all pipe, fittings, special castings, flexible connectors, adapters, couplings, expansion joints, and other appurtenances.
8. Reports as required for welding certifications per ANSI B31.1 Paragraph 127.6.
9. Catalog cuts of joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories.
10. Brochures and technical data on coatings and linings and proposed method for application and repair.
11. Manufacturer's descriptive literature and technical data on insulation and proposed method of installation.
12. Accessory items.
13. Manufacturer's literature as needed to supplement certified data.
14. Special tools.
15. Shop and field testing procedures and equipment to be used.
16. The most recent ISO 9000 series certification or quality system plan.
17. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and as indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified. And indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years.

Provide proposed materials at no additional cost to the Authority.

- b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.

1.05 SYSTEM DESCRIPTION

- A. Provide valves and appurtenances as shown on the Drawings, between the pumps and the forcemain.
- B. Provide valves along the forcemain as shown on the Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Section 01 60 00 – Material and Equipment.
- B. Shipping:
 - 1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
 - 2. Pack spare parts in watertight containers bearing labels clearly designating contents and pieces of equipment for which intended.
 - 3. The Contractor shall obtain spare parts from the manufacturer at the same time as pertaining equipment. The Contractor shall maintain possession of spare parts until Substantial Completion, at which time all spare parts shall be turned over to the Owner.
- C. Receiving:
 - 1. Inspect and inventory items upon delivery to site.
 - 2. Store and safeguard equipment, material and spare parts in accordance with manufacturers written instructions.

PART 2 - PRODUCTS

2.01 PLUG VALVES

- A. Manufacturers:
 - 1. Mueller
 - 2. DeZurik.

3. VAG GA Industries.
 4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.
- B. Minimum wall thickness for ductile iron pipe shall not be less than Class 52, unless otherwise shown.
- C. Type: Non-lubricated, eccentric.
- D. Body Working Pressure:
1. Cast Iron, ASTM A126 Class B or Ductile Iron, ASTM A536, Grade 64-45-12.
 - a. Valves 4-in. through 12-in: 175 psi.
- E. Ends:
1. Grooved: ANSI/AWWA C606 for ductile iron valves.
 2. Flanged: ANSI B16.1 125-lb for cast iron valves.
 3. Flanged: B16.5 150-lb for carbon steel and stainless steel valves.
 4. Buried Valves: Mechanical joint.
- F. Valve Ports:
1. Provide rectangular or circular except for pigging services.
 2. Valves 20-in and smaller: Not less than 80 percent of pipe area.
- F. Valve Seats:
1. Coat plug with seat material or hold by means of Type 316 stainless steel seat ring and attach to the valve with self-locking Type 316 stainless steel screws.
 2. Seat Material: Neoprene or Buna-N synthetic rubber.
 3. Provide valves with coated plugs with mating seats of 90 percent, minimum, pure nickel welded into the body of valves.
 4. Provide valves with seats clamped to valve with mating seat of 90 percent, minimum, pure nickel welded to the valve body.
- G. Upper and Lower Plug Journal Bearings:
1. Removable, permanently lubricated stainless steel bushings for valves 20-in and smaller.
 2. Provide grit seals for upper and lower plug shafts for all valves.
- H. Stem Seals:
1. Adjustable multiple V-packing or multiple point contact rubber rings.

2. Replaceable without valve disassembly.
3. Provide valves with two sets of packing rated for vacuum service for all pump suction isolation service and for services where a vacuum is specified and indicated.

I. Operators for Valves 4-in and larger:

1. Manual Operators:

- a. Gear shall be operated with handwheels. Levers are not acceptable.
- b. Operators shall be mounted as shown on the plans.
- c. Provide gear operators rated for bi-directional shutoff at the valve working pressure rating as specified herein.
- d. Gear operators: Totally enclosed worm gear, traveling nut type is not acceptable. Provide permanently lubrication, watertight and dustproof, with adjustable open and closed stops and plug position indicator.
- e. Provide all work gears designed and certified to withstand input loads up to 300-ft-lbs minimum at the stops without damage.
- f. Buried or submerged valves: Provide watertight gear operator with handwheel operated floorstand as indicated. Gear operator to be totally enclosed and gasketed with Type 316 stainless steel hardware.
- g. Chainwheels: Provide where required as specified herein.
- h. Where indicated provide Type 316 stainless steel stem extension to operating floor elevation as indicated and provide the bevel gear operator with a fabricated steel floorstand and handwheel.

J. Shop Testing:

1. Provide all plug valves tested and certified bubble tight in both directions at the full rated working pressure as specified herein.

K. Shop Painting:

1. Provide fusion bonded epoxy, 12 mils inside and out.
2. For valves installed in glass lined and ceramic epoxy lined piping systems, provide glass lined valves with epoxy paint coating as specified herein.

2.02 RUBBER FLAPPER CHECK VALVES

A. Manufacturers:

1. Mueller.
2. DeZurik.
3. APCO.

4. Val-Matic.
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Materials:

1. Body and Cover: Ductile Iron ASTM A536 Grade 65-42-12
2. Removable Body Seat: ASTM A276, Type 304 stainless steel
3. Rubber Flapper: Buna N 70 Durometer ASTM 2000-BG encapsulating an ASTM A36 steel plate.
4. Hinge Pin: AISI 1018
5. Disc arm and external levers shall be ductile iron.

C. Provide valves with a full pipe size flow area.

D. Provide valves 4-in and larger capable of passing a 3-inch sphere.

E. Provide a threaded connection with bronze plug on cover and on the bottom of the valve

F. Working Pressure: 250 psi for 2-in thru 24-in

G. Ends: Flanged ANSI B16.1, Class 125 (125 pound).

H. Provide seating surface at a 45 degree angle such that the flapper travels a maximum of 35 degrees from full closed to full open position.

I. Provide valve with cover designed for removal of the valve internals without removing the valve from the pipeline.

J. Lever and weight: Valve shall include a lever and weight assembly. The lever shall be equipped with three holes for adjusting the bolted weight assembly. When the valve is closed, the lever and weight shall be located 30 degrees below horizontal. Lever and weight shall be mounted on the side of the valve and in the direction as shown on the plans.

K. Position Indicator:

1. Provide a mechanical indicator to provide disc position for valves 4-in and larger.
2. Provide the indication with continuous contact with the disc

L. Limit Switch: A pre-wired limit switch shall be provided to indicate open/closed position to a remote location. The mechanical type limit switch shall be activated by the external arm and rated for NEMA 4 and shall have U.L. rated 5 amp, 125 VAC contacts.

2.03 SWING FLEX CHECK VALVES

A. Manufacturers:

1. Mueller.
2. DeZurik.
3. APCO.
4. Val-Matic.
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

C. Comply with AWWA C508.

D. Check valves shall permit free flow of sewage forward and provide a positive check against backflow.

E. Materials:

1. Body: Iron.
2. Disc: Stainless steel reinforced disc with rubber EDPM coating to provide a non-slam closing action.

F. Working Pressure: 250 psi for 2-in thru 24-in.

G. Ends: Flanged ANSI B16.1, Class 125 (125 pound).

H. Directly cast on body manufacturer's name, initials, or trademark size of valve, working pressure, and direction of flow.

I. Backflow actuator: A manual backflow actuator shall be provided to allow the check valve to be backflushed.

J. Position Indicator:

1. Provide a mechanical indicator to provide disc position.
2. Provide the indication with continuous contact with the disc.

K. Limit Switch: A pre-wired limit switch shall be mounted to position indicator to allow the check valve position to be monitored at a remote location. The switch shall be a mechanical type limit switch, rated 5 amp, 125 VAC contacts.

2.04 BALL VALVES

B. Manufacturers:

1. Jamesbury

2. KF
3. Inline
4. Kitz
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

A. Valves ½-in thru 4-in

1. Materials:

- a. Body and End Cap: Three piece, ASTM A351 Grade CF8M.
- b. Body Seal: PTFE.
- c. Seat: RTFE.
- d. Ball: Type 316 stainless steel.
- e. Stem: Type 316 stainless steel.
- f. Pressure Rating: 1000 psi at 100 deg F for ½-in thru 2-in.

2. Ends: 2-in and Smaller: Screwed or flanged.

B. Actuators: None, unless otherwise shown.

1. Manual: Provide lever operator.

2.05 GATE VALVES

A. Manufacturers:

1. Mueller.
2. DeZurik.
3. Pratt.
4. Clow.
5. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Gate valves for buried service and valve vaults shall be resilient wedge, non-rising stem (NRS), 2-inch square nut operated with mechanical joints applicable to the pipe or installation.

C. Furnish buried valves with extension stems comprising socket, extension stem and operating nut, and be of an appropriate length to bring operating nut to within six (6) inches of grade.

D. Furnish one 10-foot "T" handle valve wrench for each quantity of six (6) buried valves.

- E. Gate valves that are exposed or installed inside a structure shall be outside resilient wedge, non-rising stem, handwheel operated with flange ends, unless otherwise shown on the Drawings.
- F. Gate valve operating nuts and handwheels shall have an arrow and word "OPEN" cast in raised letters to indicate direction of opening.
- G. Gate valves 14 inches and larger shall be provided with gearing to reduce operating effort.
- H. Gate valves 14 inches and larger installed in horizontal lines in horizontal position with stems horizontal with bronze track, roller, and scrapers, shall be supported the full length of the valve body.
- I. Fit gate valves 14 inches and larger installed in vertical pipe lines with stems with slides to assist travel of gate assembly.

2.06 AIR RELEASE AND AIR/VACCUM VALVES

A. Manufacturers:

- 1. Vent-Tech.
- 2. Apco.
- 3. Dezurick.
- 4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

B. Design to permit release of air from an empty pipe during filling and provide capability of discharging accumulated air in line while line is in operation and under pressure.

C. Attach valves by means of threaded pipe connections.

D. Vent valves to atmosphere.

E. Provided with backflush kits.

F. Manual Air Release Valves:

- 1. Manual air release valves shall consist of a minimum of a 3- inch gate valve and 3-inch ductile iron pipe and fittings.
- 2. Install valve with its line of flow in horizontal position.

G. Automatic Air Release Valve:

- 1. Compound lever type capable of withstanding operating pressures of 150 psi.

2. Valve shall have a 1/2-inch outlet.
3. Fabricate body and cover of valve of iron with a stainless steel float.
4. Internal parts shall be stainless steel or bronze.
5. Valve shall be specifically adapted for use with sewage.
6. Each valve shall be complete with hose and blow-off valves to permit backflushing without dismantling valve.

2.07 VALVE BOXES

- A. Valve boxes shall be cast iron or concrete, except only install concrete boxes in locations not subject to vehicular traffic.
- B. Cast iron boxes shall be extension type with slide type adjustment and flared base.
- C. Minimum metal thickness shall be 3/16 inch.
- D. Box length shall be adaptable, without full extension, to depth of cover over pipe at valve locations.
- E. Concrete boxes shall be standard product of a manufacturer of precast concrete equipment. Cast word "SEWER" in cover, as otherwise shown on the Drawings.

2.08 FLAP GATES

- A. Manufacturers:
 1. Plasti-Fab.
 2. Fontaine.
 3. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.
- B. Product Description: Flexible flap gate shall be constructed of 1 ¼" thick neoprene with a durometer of 50-65, with stainless steel frame and stainless steel reinforcing channels. Mounting shall be standard 125 lb. flange. All fasteners shall be stainless steel.

2.09 FLOW SWITCH

- A. Manufacturers:
 1. Harwil.
 2. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.
- B. Flow switch consists of a normally open, SPDT reed switch.

- C. Switch shall be provided with power cord, with epoxy/urethane potted housing, and have an IP-66 rating. Contractor shall coordinate cable lengths and splicing with manufacturer to ensure rating.

2.10 FLOW METER (If Specified)

A. Manufacturers:

- 1. Krohne.
- 2. No Substitutions.

- B. Flow meter shall be an electromagnetic flow sensor (Krohne Optiflux 2000) for wastewater applications and be IP 68 rated for continuous submergence.
- C. Flow meter shall be provided with manufacturer power and signal cables. Splicing of power and signal cables shall not be allowed; Contractor shall coordinate cable lengths with manufacturer accordingly. All components shall be supplied by one manufacturer.
- D. Flow meter shall be provided with IFC wall-mounted converter. The converter shall be mounted in the pump controller cabinet.
- E. Contractor shall be responsible for furnishing all necessary signal converters, cables, accessories, grounding rings and connections for a fully operating flow meter.
- F. Flow meter shall be furnished with manufacturer ground rings and grounded in accordance with manufacturer recommendations.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Prior to installation, protect stored valves and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.
- B. Clean all debris, dirt, gravel, etc, from inside of piping before placing valves in place.
- C. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material. Clean out debris and foreign material from valve openings and seats, test operating mechanisms to check functioning, and check nuts and bolts for tightness. Repair, valves and other equipment which do not operate easily or are otherwise defective at no additional cost to the Owner.

- D. Set plumb and support valves in conformance with instructions of manufacturer. Shim valves mounted on face of concrete vertically and grout in place. Install valves in control piping for access.
- E. Provide bolted split sleeve coupling or flexible type grooved coupling on downstream side of buried valves to assist in valve removal.
- F. Where indicated provide Type 316 stainless steel stem extension to operating floor elevation as indicated and provide the bevel gear operator with a fabricated steel floorstand and handwheel.

3.02 GATE VALVES

- A. Install gate valve stem as shown on the Drawings, or with stems between vertical and 45 degrees above the horizontal. Valves installed with stems below horizontal are not acceptable.
- B. Plug valves used for bypass connections shall be installed in the vertical position and provided with gearing to allow the 2" nut valve to be accessible in from the top of the structures, as shown on Drawings.

3.03 CHECK VALVES

- A. Install swing check valves horizontally in pipelines.

3.04 PLUG VALVES

- A. Install valves in horizontal piping with shaft horizontal such that in open position, plug is located in upper part of valve body. Orient valves so that in closed position, flow is against the face of the plug.
- B. Plug valves used for bypass connections shall be installed in the vertical position and provided with gearing to allow the 2" nut valve to be accessible in from the top of the structures, as shown on Drawings.

3.05 VALVE BOXES

- A. Provide valve box for each buried valve, or as shown on the Drawings.
- B. Set box so top is flush with finished surface and so box does not bear on valve, or pipe.
- C. Center valve box over the 2" nut operator.

3.06 THRUST RESTRAINT

- A. Provide thrust restraint in accordance with Section 33 11 00 – Utility Piping.

3.07 TOUCH-UP FIELD PAINTING

- A. Repair or replace damaged or defective coating areas.
- B. Remove damaged or defective coatings by sand-blast cleaning in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.
- C. Before priming, provide surfaces dry and free of dust, oil, grease and other foreign material.
- D. Apply approved coating in accordance with valve manufacturer's printed recommendations.
- E. When small areas of coating need touch up, surface preparation may be done with suitable power needle gun to match specified blast cleaning.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Measurement will not be made for the Work specified in this Section.

4.2 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum price for DISCHARGE VALVES AND FITTINGS.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 33 42 00

SEWAGE PUMPS AND ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pump design and Construction.
2. Motors.
3. Guiderails and brackets.
4. Controls.
5. Flush valves and mixers.
6. Equipment nameplates.
7. Access frame and hatches.

1.02 RELATED SECTIONS

A. Applicable sections of the following:

1. Division 1 – General Requirements
2. Section 03 30 00 – Cast-in-Place Concrete.
3. Section 03 41 00 – Precast Concrete Structure.
4. Section 08 10 10 – Access Hatches and Boxes.
5. Section 26 00 10 – General Provisions for Electrical Work.
6. Section 26 00 20 – Basic Electrical Materials and Methods.
7. Section 26 05 10 – Low Voltage Electrical Power Conductors.
8. Section 26 05 23 – Control-Voltage Electrical Power Cables.
9. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
10. Section 26 05 33 – Raceways and Boxes for Electrical Systems.
11. Section 26 29 30 – Pump Controller.
12. Section 33 41 00 – Utility Piping.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. Hydraulic Institute (HI)

1. HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.
2. HI 11.6: Submersible Pump Tests.

- C. National Electric Manufacturers Association (NEMA)
- D. National Fire Protection Association (NFPA)
- E. National Electrical Code (NEC)
- F. Underwriters Laboratories, Inc. (UL)
- G. Standards Specifications for Water and Sewer Construction in Illinois
- H. Recommended Standards for Water Works for 10 State Standards
- I. Local codes and ordinances.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit shop drawings shall include:
 - 1. Show arrangement, dimensions, and materials.
 - 2. Clear opening requirements and dimensions.
 - 3. Manufacturer's warranty.
- C. Certificate of Coordination:
 - 1. A certification shall be provided that the pumps will fit through the submitted access hatch clear opening; the new precast flat top slab has been structurally designed to allow for the periodic removal of the pumps; should the pumps not fit through the installed access hatch, a new hatch and flat top slab assembly will be re-designed, supplied, and installed at no additional cost to the Owner.
- D. Test and evaluation reports:
 - 1. Characteristic performance curves for pumps, showing total dynamic head, efficiency, and brake horsepower plotted against capacity in gpm for conditions of head and capacity with required impeller.
 - 2. Motor test data and shop test results.
 - 3. Certified shop test curves.

1.05 PROJECT REQUIREMENTS

- A. Contractor shall furnish and install submersible sanitary sewer type pumps, associated hardware and accessories including, but not limited to:

1. Base Elbow.
2. Anchors.
3. Stainless Steel Safety Hook.
4. Stainless Steel Lifting Chain and Hooks.
5. Thermal and Seal Leak Monitoring.
6. Stainless Steel Guide Rails.
7. Intermediate Supports.
8. Stainless Steel Guide Rail Bracket.
9. Pump Power and Control Cable(s).
10. Cable Supports/Strain Relief.
11. Flush Valves.
12. Hardware Kits.

- B. One-day pump start-up services shall be provided by manufacturers representative.
- C. Contractor shall furnish impellers for pumps to achieve fully developed flow as shown on the Drawings.

1.06 CLOSEOUT SUBMITTALS

- A. Submit in accordance with Section 01 77 00 – Closeout Procedures.
- B. Operation and maintenance manuals shall include the following in addition minimum requirements listed in Section 01 77 00 – Closeout procedures:
1. Approved shop drawing submittals.
 2. Detail step-by-step procedures required for system startup, operation, and shutdown.
 3. Include manufacturer's name, model number, parts list, and brief description of equipment and basic operating features.
 4. List routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.
 5. Include piping and equipment layout and simplified wiring and control diagrams of system as installed.

1.07 QUALITY ASSURANCE

- A. Manufacturer's qualifications:
1. Pumps, hardware, and accessories shall be product from a single manufacturer.
 2. The manufacturer shall have a minimum of 5 years' experience producing substantially similar equipment and evidence of at least 5

installations in satisfactory operation for at least 5 years.

- B. Regulatory requirements: Comply with applicable provisions and recommendations of HI, NFPA 70 including Owner amendments, IEEE, ANSI, NEMA except as otherwise shown or specified.

1.08 MAINTENANCE MATERIALS

- A. Contractor shall provide the following spare parts:
 - 1. Each pump shall be furnished with a manufacturers repair kit that shall include as a minimum, one set of mechanical seals for each pump.
 - 2. Pack spare parts in watertight container with clear indelible identification markings.
 - 3. Store in a dry, warm location until transferred to Owner at conclusion of Project.
- B. Comply with requirements of Section 01 77 00 – Closeout Procedures.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are:
 - 1. Flygt.
 - 2. Grundfos.
 - 3. Sulzer.
 - 4. Substitutions will be allowed in accordance with Section 01 25 00 – Substitution Procedures.

2.02 GENERAL

- A. Pumping units shall consist of submersible pumps and motors, guide rails, lifting chains, discharge elbow and mounting plate, anchor bolts, access frame and cover, electric cables, controls, and accessories for a complete, operable system suitable for installation in Class 1, Division 1 Group D conditions.
- B. Pumps shall be suitable for pumping municipal wastewater and shall be capable of passing 3" (75 mm) spheres without clogging.
- C. Pumps shall be suitable for continuous, submerged, operation at flow conditions stated herein without excessive noise, vibration, heating,

cavitation, or damage to pump.

- D. Fit each pump with centered lifting loop and Type 316 stainless steel lifting chain of adequate strength to raise and lower pumping unit. Chain shall be of length required for installation depth shown on Drawings.
- E. Discharge connections shall be permanently installed in wet well with discharge piping. Pump shall automatically connect to discharge connection elbow when lowered into place and shall disengage easily and automatically without removal of fasteners or piping when pump is raised.
- F. Attach sliding guide bracket to pump units which will slide between a minimum of 2 guide rails (unless otherwise shown on the Drawings) to properly position pump discharge on discharge connection elbow.
- G. Pump, appurtenances, and cable shall be capable of continuous submergence underwater to depth of 65 feet or greater without loss of watertight integrity.
- H. Design pump motors to operate continuously at design conditions with 50% of motor unsubmerged without overheating.
- I. Pump shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater.

2.03 PUMP DESIGN AND CONSTRUCTION

- A. Type: Submersible, nonclog, sewage handling, bottom suction, single impeller, and integral discharge elbow with matting and guide rail connection.
- B. Quantity: As shown on Drawings.
- C. Duty Point(s):
 - 1. Each pump shall be capable of delivering the following performance point(s) and curve as shown on the Drawings:

Point	U.S. GPM	TDH (feet)
Single Pump	305	34

- 2. Shutoff head shall be minimum of 1.2 times rated head, unless otherwise directed by Owner.
 - 3. Start and stop upon rising and falling water levels.

D. Size pumps to allow increase in rated pump head by as much as 10% by replacement of impellers.

E. Materials:

1. Casing: Cast iron, ASTM A48, Class 35B.
2. Impeller: Hard iron, ASTM A532.
3. Shaft: Type 420 stainless steel.
4. Exposed nuts and bolts: Type 316 stainless steel.
5. Wear ring contact surface: Stainless steel or tungsten carbide.
6. Anchor bolts: Type 316 stainless steel.
7. Explosionproof in accordance with FM Class 1, Div. 1.

F. Fluid Pumped: raw unscreened sanitary sewage collected by the tributary sanitary sewer system.

G. Sealing:

1. Metal-to-metal contact between machined surfaces.
2. Provided with nitrile or viton rubber O-rings.

H. Cooling System:

1. Cooled by surrounding pump components with pumped media or air.
2. Water jacket shall not be required.

I. Casing:

1. Volute: Single-piece design with smooth fluid passages.
2. Pump casing shall be of sufficient thickness to withstand a minimum hydrostatic test pressure of 150 psig (1,030 kPa).
3. Provide with replaceable wearing ring.
4. Mating surfaces requiring watertight sealing shall be machined and fitted with nitrile rubber O-rings. Sealing shall be accomplished by metal-to-metal contact and controlled compression of O-ring without specific torque requirement.
5. Cable entry design:
 - a. Ensure a watertight and submersible seal without specific torque requirement.
 - b. Provide close tolerance fit against cable outside diameter and cable entry inside diameter and shall produce compression seal when installed.
 - c. Entry body shall provide strain relief separate from sealing function to prevent strain in cable from damaging seal and allowing entry of

water.

- d. Cable entry junction chamber and motor shall be separated by stator lead sealing gland or terminal board which shall prevent foreign material from coming in contact with motor interior.
- e. Junction chamber, containing terminal board with permanently affixed connectors between cable conductors and stator leads, shall provide completely leakproof seal from motor.

J. Impeller:

1. Semi-open, multi-vane, nonclog-type capable of handling solids normally present in sewage. Impeller shall be self-cleaning, and shall consist of a material that is designed to handle highly corrosive fluids/wastewater, and wear resistant to handle sand and grit.
2. Manufactured from hard iron, ASTM A532.
3. Capable of passing minimum of 3" solid.
4. Statically and dynamically balanced, securely positioned and locked to shaft using key and cap screw. Provide means for impeller clearance adjustment.
5. Impellers shall have smooth contours.

K. Shaft:

1. Machine and polish over entire length.
2. Dynamically balanced with impeller at all operating speeds.
3. Shaft shall provide rigid support of impeller and prevent critical vibration at all operating speeds.

L. Bearings:

1. Anti-friction ball and/or roller bearings, ABMA L10 life rating of 100,000 hours, designed to carry thrust and radial loads.
2. Lubrication: Permanently lubricated with grease or oil specifically suited for high temperature applications. Lubricant shall be FDA approved, nontoxic.

M. Thermal protection:

1. Provide thermal sensors to monitor stator temperatures. Three thermal switches, 1 in each stator phase, shall be embedded in end coils.
2. Provide 1 thermal sensor to monitor lower bearing temperatures.
3. Switches shall be connected to a control and status monitoring unit, mounted in the pump control panel.

N. Moisture protection: Provide 1 float-actuated reed switch in motor housing to

detect liquid leakage into stator area.

O. Seals:

1. Provide pump with shaft sealing system utilizing oil chamber.
 - a. Oil chamber shall provide means to compensate for changes in oil pressure.
 - b. Provide oil chamber with easily accessible drain and inspection plug equipped with positive, antileak seal. Access to plug shall not require any disassembly of pump.
2. Dual independent mechanical rotating shaft seal system running in oil reservoir.
 - a. Lower seal unit, between pump and oil chamber: 1 stationary and 1 positively driven rotating tungsten carbide or carbon ceramic ring. Impeller pump-out vane shall be used in conjunction with carbon ceramic.
 - b. Upper seal unit, between oil chamber and motor housing: 1 stationary tungsten carbide or carbon ceramic ring and 1 positively driven rotating carbon ring.
 - c. Seal faces: Hold in contact by integral springs and hydrodynamically lubricate at constant rate.
3. Seals shall require neither maintenance nor adjustment and shall be easily inspected and replaceable.
4. Cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.

2.04 MOTORS

- A. Standards: Applicable parts of NEMA MG1.
- B. Type: Squirrel cage induction, shell-type design, housed in air-filled, watertight chamber. Oil-filled ball bearing motor acceptable alternate.
- C. Inverter duty rated in accordance with NEMA MG1.
- D. Enclosure: Completely submersible, watertight.
- E. Ratings:
 1. Continuous duty.

2. 480-volt, 3-phase, 60 Hz.
 3. $\pm 10\%$ voltage tolerance.
 4. Class I, DIV 1, Explosionproof.
- F. Starts per hour: 10 evenly spaced starts per hour minimum.
- G. Service Factor: A minimum of 1.15.
- H. Insulation and temperature rating: Class H insulation rated at 180°C (356°F).
- I. Starting: Full-voltage, across-the-line, for constant-speed pumps.
- J. Nameplate horsepower shall be not less than maximum required pump input for all conditions of head and capacity for full range of impeller furnished.
- K. Monitor stator temperature for pumps using thermal sensors embedded in each stator winding. Sensors shall be used in conjunction with and supplemental to external motor overload protection.
- L. Motors shall be furnished with preassembled power and control cables:
1. Sufficient length to reach vented pump cable junction box without the need for any splices.
 2. Cables shall be oil resistant chlorinated polyethylene rubber.
 3. Capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.
 4. Power cables shall be sized in accordance with NEC, ICEA, and NEMA requirements.
 5. Control cables shall be tinned copper, shielded from power cables.

2.05 GUIDE RAILS AND BRACKETS

- A. Guide rails: Minimum Schedule 40, Type 316 stainless steel pipe of sufficient size to remain rigid and unbending under intended loading conditions.
- B. Guide bars shall not support any portion of weight of pump.
- C. Secure lower end of guide bars to discharge connection. Secure upper ends to frame of access cover.
- D. Provide intermediate guide bar spacer supports when clear span distances between supports will exceed 12' (3.6 m).
- E. Sliding guide brackets: Cast iron or fabricated steel, galvanized after fabrication.

2.06 CONTROLS

- A. System controls shall conform to Section 26 20 20 – Pump Controller.

2.07 FLUSH VALVES AND MIXER PUMPS

- A. Shall be provided as shown on the Drawings.
- B. Flush Valves: A minimum of one pump shall be provided with a manufacturer's automatic flush valve, which shall be capable of flushing water from the pump to the wet well temporarily to flush and suspend solids. The flush valve shall deactivate once pump is energized.
- C. Mixer Pumps (if required):
 - 1. Mixer pump shall consist of adjustable-speed mixer, submersible type, with an integrated motor control unit.
 - 2. Pump shall be rated for highly corrosive fluids/wastewater and wear resistant to handle sand and grit.
 - 3. Pump and components shall be in accordance with applicable sections of this Part 2 of this Section.
 - 4. Shall be mounted to the pump guiderails when the guide rail connection matches that of the submersible pumps.
 - 5. Provide with individual pump guiderails when guide rail connection differs from that of the submersible pumps.

2.08 EQUIPMENT NAMEPLATES

- A. Permanently attach stainless steel nameplate to pump. Nameplate shall contain following information:
 - 1. Equipment number (see Drawings).
 - 2. Serial number of pump.
 - 3. Capacity in gpm.
 - 4. Pumping head in feet.
 - 5. Speed, rpm.
 - 6. Manufacturer's name.
 - 7. Size and type of pump.
 - 8. Motor horsepower.
 - 9. Design pressure and temperature.
- B. Each pump shall be provided with a cast-in or permanently attached direction-of-rotation arrow.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install in accordance with manufacturer's recommendations.
- B. Embed access frame and cover in wet well concrete cover.

3.02 TESTING

A. Hydraulic performance shop test:

1. Submersible pumps shall be factory-tested at pump manufacturer's plant. Tests shall be in accordance with Test Code of Hydraulic Institute Standards.
2. Test curves shall cover full range of operation from shutoff to maximum capacity, and have capacity plotted as abscissas, and operating head, brake horsepower, net positive suction head required (NPSH_{rq}) and efficiency plotted as ordinates. Each test shall be witnessed by a registered professional engineer, who may be an employee of manufacturer. Registered engineer will sign and seal all copies of pump curves and shall certify that hydrostatic tests were performed.
3. Test points:
 - a. Shut off.
 - b. Maximum run out.
 - c. Design operating condition.
 - d. Two additional points, 1 on each side of design operating condition.
4. Test tolerances
 - a. Pumps less than 13HP:
 - 1) Pumps grade and tolerances shall be in accordance with ANSI/HI 14.6, Grade 1U:
 - 2) Rate of flow: 0% to +10%
 - 3) Total Head: 0% to 6%
 - 4) Power: 0% to 10%
 - b. Pumps 13HP and greater:
 - 1) Pumps grade and tolerances shall be in accordance with ANSI/HI 14.6, Grade 1U:
 - 2) Rate of flow: 0% to +10%
 - 3) Total Head: 0% to 6%

4) Power: 0% to 10%

- c. No minus tolerance or margin shall be allowed with respect to capacity or total head at rated or specified condition.
- d. Pump manufacturer shall provide shop space, tools, equipment, instruments, personnel, and all else required for satisfactory completion of tests. Payment for tests shall be included in Contract amount.
- e. Certified test curves shall be submitted and reviewed prior to pumps being released for shipment.

B. Pump tests:

- 1. Pump manufacturer shall perform following inspections and tests on pumps prior to shipment:
 - a. Inspect for conformance to Contract Documents with respect to correct model number, motor rating, and electrical connections.
 - b. Test motor and seal housing chambers for moisture content or insulation defects.
 - c. Prior to submergence, allow pump to run dry to establish correct rotation and mechanical integrity.
 - d. Discharge piping attached to pump shall operate submerged under a minimum of 6 feet of water for a minimum of 30 minutes.
 - e. After operational test, motor and cable shall be tested again for moisture content or insulation defects.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Provide qualified service representative to perform functions described in Section 01 43 00 – Qualified Assurance.
- B. Test removal and replacement of pumps to prove the pumps and guiderail systems are properly installed and aligned.
- C. After installation of pumping equipment, and after inspection, operation, testing and adjustment have been completed by manufacturer's field service technician, conduct running test for each pump in presence of the Engineer to determine its ability to deliver its rated capacity under specified conditions.
 - 1. Field testing will not be conducted without an approved procedure and calibration certificates for all testing equipment, gauges, and flow meters.
 - 2. During tests, observe and record head, capacity and motor inputs.

3. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
 4. Repeat tests until specified results are obtained.
 5. Contractor to provide all labor, piping, equipment, portable flow meters, calibrated gauges or calibrated test gauges, and materials for conducting tests. Tests will not be acceptable if equipment calibration is not within 60 days of the field testing.
- D. Calibrate transmitters and receivers to imposed input values representing 0 percent, 50 percent, 80 percent and 100 percent of full scale. Calibrate all process sensing variables and control signals using test equipment, (such as manometers for process pressure sensing and digital voltmeters for electronic control signals) which is at least five times more accurate than instrument to be calibrated.
- E. Adjust secondary functions such as alarm actuations during initial calibration, and demonstrated after system is placed in service.
- F. Conduct process calibration on all measuring systems. Document for records and submit to Engineer.

3.04 PAINTING

- A. All equipment specified in this Section shall be shop painted with the manufacturer's standard finish. For submersible pumps this finish shall consist of as a minimum an epoxy paint system.
- B. The Contractor shall be responsible for coordination of the compatibility between the manufacturer's standard finish and any field painting required.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Measurement will not be made for the Work specified in this Section.

4.2 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum price for SEWAGE PUMPS AND ACCESSORIES.
- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; and, for all labor, equipment, tools, and incidentals necessary to complete the items.

- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

SECTION 33 43 00

TEMPORARY BYPASS SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section Includes:
 - 1. System description.
 - 2. Design Requirements.
 - 3. Equipment.

1.02 RELATED SECTIONS

- A. Applicable sections of the following:
 - 1. Section 01 50 00 – Temporary Facilities and Controls.
 - 2. Section 33 42 00 – Pumps and Accessories.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. National Electric Manufacturers Association (NEMA)
- C. National Fire Protection Association (NFPA)
- D. National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL)
- F. Local codes and ordinances.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
- B. Include Pump Data:
 - 1. Pump performance curves. Draw curves for the specified conditions. Include head, brake horsepower, efficiency and required NPSH, all plotted as a function of capacity, from zero to maximum capacity.
 - 2. Calculations of static lift, friction losses, and flow velocity.
 - 3. Submit a specific, detailed description of the proposed pumping system.

4. Submit operating descriptions, component descriptions, control schematics, electrical connection diagrams and general arrangement drawings, for control equipment.

C. Detailed Drawings:

1. Submit detailed drawings, including arrangement and erection drawings of the equipment and equipment operating characteristics. Include the following:
 - a) Submit detailed plans and descriptions outlining all provisions and precautions to be taken regarding the handling of existing wastewater flows. The plan shall include schedules, locations elevations, capacities of equipment, materials and all other incidental items necessary and/or required to ensure proper protections of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and all permit conditions.
 - b) The plan shall include but not be limited to details of the following:
 - i. Staging areas for pumps.
 - ii. Number, size, material, location and method of installation of suction piping.
 - iii. Number, size, material, location of installation of discharge piping.
 - iv. Bypass pump sizes, capacity, number of each size to be on site and motor power of fuel requirements.
 - v. Standby power generator size, location.
 - vi. Downstream discharge plan.
 - vii. Thrust and restraint block sizes and locations.
 - viii. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
 - ix. Method of noise control for each pump and/or generator.
 - x. Any temporary pipe supports, and anchoring required.
 - xi. Design plans and computation for access to bypass pumping locations indicated on the drawings.
 - xii. Calculations for selection of bypass pumping pipe size.
 - xiii. Schedule for installation and maintenance of bypass pumping lines.
 - xiv. Plan indicated selection location of bypass pumping line locations.

D. No construction shall begin until all provisions and requirements have been reviewed by the Engineer and Owner.

E. Engineer and Owner's review of the bypass pumping system, and related submittals, shall in no way relieve the Contractor of the proper operation of the system.

1.05 SYSTEM DESCRIPTION

A. Existing Lift Station

1. The existing lift station is arranged as a duplex lift station. The station consists of two end suction pumps installed in a dry pit station, suctioning water from a 5ft concrete wet well. The existing pumps are sized so that there is one lead pump and one lag pump. There are three incoming sanitary sewer inlet pipes in the wet well, see plans for orientation and sizes.

B. Bypass Pumping Design Criteria

1. Estimated peak flow into the lift station = 274 GPM (based on PE calculations for current tributary area). There are three separate sanitary sewer pipes that are routed into the existing lift station.
 - a) The Contractor shall request flow information for individual pipes, as necessary for bypass system sizing.
2. See Drawings for additional requirements.

C. Design Requirements:

1. The plans were prepared to allow for the existing lift station to remain in operation throughout construction of the proposed lift station.
2. It is anticipated that the Contractor will have to bypass pump while the existing wet well is filled in with flowable concrete, to allow it to be used as a manhole as shown on the plans.
3. The Contractor will have to suction sanitary sewer flow from existing manholes located upstream of the affected structure as required. The Contractor shall coordinate suctioning flow from existing manholes, which cannot have flow temporarily diverted to the proposed station. Sewage shall be collected, transported offsite, and disposed of in accordance to IDOT, MWRDGC, and IEPA requirements. All work and collection times shall be coordinated with the Village, Engineer, and Residents.

D. Alternate System Requirements:

1. Alternate is to provide bypass pumping systems with firm capacity to pump down the flows listed and as shown on the plans.
2. Provide all pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the pumping station. Bypass pumping system will be

required to operate 24 hours per day and shall be rated for continuous duty.

3. Provide adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.
4. The bypass pumping system shall be capable of bypassing the flow around the work area as necessary for satisfactory performance of work.
5. Make all arrangements for bypass pumping during the time when the lift station is shut down for any reason. System shall overcome any existing forcemain pressure on discharge.

E. Control Requirements (for Alternate Pumping System Only):

1. Provide control system for the bypass pumping system which will automatically run the pump(s) unsupervised/unattended. Start and stop controls shall be provided to operate the bypass pumping system between levels indicated on the plans. Additional controls shall be required to detect high water elevation and pump failure, as shown on the plans, or as directed by the Engineer. High water level shall activate the backup pump and send an alarm to the Contractor and Owner.
2. The Contractor shall be responsible for installing and maintaining a cellular operated auto dialer system for the bypass pumping system. The auto dialer shall be programmed to call the Contractor, Owner and selected staff should the primary pump fail and when a high-water level alarm is triggered within the bypass manhole.
3. It is essential to the operations of the existing wastewater system that there be no interruption in the flow of sewage throughout the duration of the project. To this end, provide, maintain and operate all temporary facilities such as, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the wastewater flow before it reaches the point where it would interfere with the work, carry it past the work and return it to the existing wastewater downstream of the work.
4. Provide all necessary means to safely convey the raw wastewater past the work area. Do not stop or impede the main flows under any circumstances.

5. Maintain wastewater flow around the work area in a manner that will not cause surcharging of wastewater, damage to existing pipe line and that will protect public and private property from damage and flooding.
6. Bypass pumping units shall be rated to pump raw wastewater.
7. Furnish pumps which meet rating capacity and head indicated on the plans.
8. Pumps shall be capable of passing a minimum of a 3-inch non-deformable sphere.

1.06 DESIGN REQUIREMENTS

- A. Furnishing all materials, labor, equipment, power, maintenance, etc. to install a temporary pumping system for the purpose of diverting the existing raw wastewater flow around the work area at each lift station for the duration specified, and as specified herein. This work will include disassembly and removal of the bypass pumping system upon completion of the work.
- B. Be responsible for the design, installation and operation of the temporary pumping system. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- C. The Contractor is responsible to maintain flow at the station throughout the contract period of construction. Once the Contractor mobilizes and the Owner transfers the station operation to the Contractor, until Substantial Completion is reached.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

- A. Self-Priming Pumps: Pumps used shall be centrifugal self-priming units that do not require the use of foot valves or compressors in the priming system. The pumps shall be diesel or electric powered. Pumps shall have sound attenuation enclosure designed for operation at sound levels of 70 decibels and below. The Contractor is fully responsible for coordinating and obtaining temporary electrical service. Pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of influent flows. The pumps shall not be hydraulic submersible type.
- B. Submersible Pumps: Submersible, nonclog, sewage handling, bottom suction, and single impeller. Pumps shall be piped into the inflow of piping shown on the

Drawings and/or bypass piping. Pumps shall be capable of passing a minimum of a 3" solid.

- C. Standby pumps: Contractor shall include a standby bypass pump of size and type shown on the Drawings, on site at all times. Standby pump shall be on-line and piped into the inflow of piping shown on the Drawings and/or bypass piping so that upon starting the stand-by pump shall take over and pick up the flow. Standby pump shall be isolated from the primary bypass system by valving as required.
- D. Provide the automatic stop/start control system for each pump to allow for unsupervised/unattended operation. Controls shall also include a high-water level alarm, which shall be activated upon rising sewage level in the structure used for bypass pumping; and, simultaneously activate by-pass pump upon high water level. The control system shall remotely contact the Contractor and Owner with notification of any problem. The Contractor is responsible for responding within half an hour to the alarm and correcting the problem.
- E. In order to prevent accidental spillage of flows, all discharge piping systems shall be temporarily constructed of flexible pipe with restrained joints.
- F. Under no circumstances will aluminum "Irrigation" type piping and glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the Engineer. Provide piping materials of aluminum pipe, steel pipe, ductile iron pipe, or fused, high density polyethylene pipe.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Contractor shall be responsible for locating any existing utilities in the area selected for installing the bypass pipelines. Locate bypass pipelines to minimize any disturbance to existing utilities and obtain approval of the pipeline locations from the ENGINEER. All costs associated with relocating utilities and obtaining all approvals shall be included in the Contract Price.
- B. Equipment shall be installed in accordance with manufacturer's recommendations.
- C. All necessary shims, grout, lubrication, anchor bolts, and other items required for installation and testing shall be furnished including but not limited to oil, fuel, grease, tools, and spare parts that may be required to maintain the operation of the temporary bypass pumping system throughout the construction period. The Contractor shall be solely responsible for maintaining the temporary pumps and

appurtenances. All items of equipment shall be operated, adjusted, and tested for proper performance.

- D. The temporary bypass pumping system shall be placed into operational service and shall operate satisfactorily for a minimum of 24 hours prior to performing any renovation work in/at the existing lift station, and/or taking existing pumping units out of service. Bypass pumping units shall remain on site, in operational condition, ready for stand-by service for at least 48 hours after the installation of the pumps specified in Section 33 42 00 has been completed.
- E. Any wastewater collected from system shall be removed offsite and disposed of in accordance with IEPA requirements.

3.02 INSTALLATION AND REMOVAL

- A. Make connections to the existing wastewater pipelines and construct temporary bypass pumping structures only at the access location indicated on the drawings and as may be required to provide adequate suction conduit.
- B. Plugging or blocking of wastewater flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance or work, it is to be removed in a manner that permits the wastewater flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.
- C. A flume connection shall be installed in the wet well to maintain existing gravity flow through existing inlet pipes within the wet well structure. The flume connection shall consist of an inflatable flow through bypass plug on each incoming gravity sewer line, and a hard piped or flexible pipe between the flow through plugs to eliminate flow into the wet well while maintaining a hydraulic connection to the bypass manhole. Piping and plugs shall be maintained and supported to allow the lining process to be executed during the active gravity bypass.
- D. The installation of the bypass pipelines is prohibited in all wetland areas.
- E. The pipeline shall be located off streets and sidewalks and on the shoulder of the roads. When the bypass pipeline crosses local streets and private driveways, place the bypass pipelines in trenches and cover with temporary pavement.
- F. When bypass pipeline has to cross a sidewalk the Contractor shall furnish, install and maintain pipe protection ramp(s). Ramps shall be marked and/or striped with safety colors, or signage shall be installed to alert pedestrians of trip hazard.

- G. Upon completion of the bypass pumping operations, and after the receipt of written permission from the ENGINEER, remove all the piping, restore all property to pre-construction condition and restore all pavement. Be responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the city.

3.03 FIELD QUALITY CONTROL AND MAINTENANCE

- A. Perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. Test the piping at a test pressure of 50 psi. Provide 24-hour notice to the ENGINEER prior to testing.
- B. Prior to placing the temporary bypass pumping system into operation, field testing shall be performed to verify that the pumping unit(s) are properly sized for the existing flow.
- C. Intermediate inspection of bypass pumping and control system shall be performed to ensure that the system is working correctly.
- D. Ensure that the temporary pumping system is properly maintained, and a responsible operator is available to respond to bypass pumping outages and repairs at all times when pumps are operating.
- E. Installed bypass pumping equipment shall be installed and maintained in accordance with manufacturer's requirements and best practices.:
 - 1. Spare parts for pumps and piping shall be kept on site as required.
 - 2. Oil, fuel, grease, and maintenance tools shall be kept on site as required.
 - 3. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

- A. Measurement will not be made for the Work specified in this Section.

4.02 PAYMENT

- A. Payment for the Work specified in this Section will be made at the lump sum price for TEMPORARY BYPASS SYSTEM.

- B. These prices shall be full compensation for furnishing all materials; for all preparation and placing of the materials; for all labor, equipment, tools, and incidentals necessary to complete the items; and transportation and disposal fees.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be considered incidental and shall be included in the prices bid for the various items they pertain to.

--- END OF SECTION ---

APPENDIX A

APPENDIX B

**HAMPTON LIFT STATION
IMPROVEMENTS**

1869 HAMPTON ROAD

HOFFMAN ESTATES, ILLINOIS

RUBINO PROJECT No. G25.104

***Geotechnical
Engineering
Services
Report***

*Drilling
Laboratory Testing
Geotechnical Analysis*

PREPARED BY:

REVIEWED BY:

rubino
ENGINEERING INC.

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IL No. 062-061241, Exp. 11/30/2025**

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AUGUST 29, 2025

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 Appendix G – Site Vicinity Map & Boring Location Plan
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PROJECT INFORMATION

Rubino Engineering, Inc. (Rubino) understands that Ciorba Group, Inc. (Ciorba) is planning to construct a new wet well structure just south of the existing wet well in the public right-of-way near 1869 Hampton Road in Hoffman Estates, Illinois. The subject property currently houses an existing wet well and dry well.

Design Information / Structural Loads received: none; however, this proposal is based on the following:

- Maximum depth of proposed structure = 22 feet below existing grade
- Loads on bottom slab not exceeding 1,500 psf

Documents received:

- Marked up proposal from Ciorba included in attachment to email dated September 21, 2023 – revised structure depth and boring B-02 location

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the information on which this report is based is incorrect, please inform Rubino in writing so that we may amend the recommendations presented in this report (if appropriate, and if desired by the client). Rubino will not be responsible for the implementation of our recommendations if we are not notified of changes in the project.

Purpose / Scope of Services

The purpose of this study was to explore the subsurface conditions at the site in order to prepare geotechnical recommendations for utility installation foundation design, for the proposed construction. Rubino's scope of services included the following drilling program:

Table 1: Drilling Scope

NUMBER OF BORINGS	DEPTH (FEET BEG*)	LOCATION
1	44 ¼**	B-01 Near 1869 Hampton Road

*BEG = below existing grade

**Spoon refusal

Representative soil samples obtained during the field exploration program were transported to the laboratory for additional classification and laboratory testing. This report briefly outlines the following:

- *Summary of client-provided project information and report basis*
- *Overview of encountered subsurface conditions*
- *Overview of field and laboratory tests performed including results*



- *Geotechnical recommendations pertaining to:*
 - *Subgrade preparation and cut / fill recommendations*
 - *Foundations, including suitable foundation type(s), allowable bearing pressure(s), and estimated settlement*
 - *Seismic design site classification parameters*
 - *Lateral earth pressures for below grade walls*
 - *Coefficient of sliding friction of concrete against soil or fill for the base of the lift station*
- *Construction considerations, including temporary excavation and construction control of water*

DRILLING, FIELD, AND LABORATORY TEST PROCEDURES

In consultation with the Ciorba, Rubino selected the number of borings and the boring depth. Rubino located the boring in the field by measuring distances from known fixed site features. The boring was advanced utilizing 3 ¼ inch inside-diameter, hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process.

Selected soil samples were tested in the laboratory to determine material properties for this report. Drilling, sampling, and laboratory tests were accomplished in general accordance with ASTM procedures. The following items are further described in the Appendix of this report.

- *Field Penetration Tests and Split-Barrel Sampling of Soils (ASTM D1586)*
- *Field Water Level Measurements*
- *Laboratory Determination of Water (Moisture) Content of Soil by Mass (ASTM D2216)*

The laboratory testing program was conducted in general accordance with applicable ASTM specifications. The results of these tests are to be found on the accompanying boring logs located in the Appendix.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project site is located just south of the existing wet well near the northwest corner of 1869 Hampton Road in Hoffman Estates, Illinois.





The project site has an approximate latitude and longitude of 42.061769° and -88.091345°, respectively.

Surface Conditions

The soil boring was performed within the existing pavement of Hampton Road. The surface conditions are as follows:

Table 2: Existing Pavement Section Summary

BORING NUMBER	TOTAL OBSERVED PAVEMENT THICKNESS	TOTAL OBSERVED BASE STONE THICKNESS
B-01	10 INCHES OF ASPHALT	4 INCHES OF GRAVEL FILL

Please note that the above referenced thicknesses are considered approximate and based on visual observations in the borehole. Pavement and sub-base type and thickness may vary from the boring location. More specific pavement thickness would need to be determined by obtaining a physical pavement core.



Subsurface Conditions

Beneath the existing surficial pavement or gravel, subsurface conditions generally consisted of undocumented fill soils, gray silty clay, and gray sand.

- The **undocumented fill** soils were generally cohesive in nature
- The native **silty clay** soils were generally stiff to very stiff in consistency
- The **granular** soils were generally medium dense in apparent density

Table 3: Subsurface Conditions Summary

APPROXIMATE DEPTH RANGE (FEET BEG*)	SOIL DESCRIPTION	SPT N- VALUES (BLOWS PER FOOT)	MOISTURE CONTENT (%)	ESTIMATED SHEAR STRENGTH
1 – 6	FILL: brown silty clay, with sand and gravel	9	12 – 15	---
6 – 9	FILL: brown and gray silty clay, trace sand and gravel	7	21	---
9 – 18 ½	Stiff, gray silty CLAY, trace sand and gravel	13	13 – 19	$c \cong 1,950$ psf
18 ½ – 24	Medium dense, gray SAND, with gravel	26	8	$\phi \cong 34^\circ$
24 – 43 ½	Stiff to very stiff, gray silty CLAY, trace sand and gravel	13 – 18	17 – 24	$c \cong 1,950 - 2,700$ psf
43 ½ – 44 ¼	Very hard, gray silty CLAY, trace sand and gravel	50+	12	$c \cong 4,000$ psf

*BEG = Below existing grade

The native soils were visually classified as silty clay (CL) and well-graded sand (SW) according to the Unified Soil Classification System (USCS). The above table is a general summary of subsurface conditions. Please refer to the boring logs for more detailed information.

Estimated shear strength of clay soils is based on empirical correlations using N-values, moisture content, and unconfined compressive strength, as applicable.

Groundwater Conditions

Groundwater was encountered in the boring during drilling operations. The following table summarizes groundwater observations from the field:



Table 4: Groundwater Observation Summary

BORING NUMBER	APPROXIMATE GROUNDWATER LEVEL DURING DRILLING (FEET BEG*)	APPROXIMATE GROUNDWATER LEVEL UPON AUGER REMOVAL (FEET BEG*)
B-01	18 ½	N/A

*BEG = below existing grade

It should be noted that fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. Groundwater may not have been observed in some areas due to the low permeability of soils. Additionally, discontinuous zones of perched water may exist within the soils. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project. **When bidding this project, the contractor should anticipate that groundwater will be present during excavation.**

Undocumented Fill Discussion

Undocumented fill was observed in the boring to a depth of approximately 9 feet below existing grade.

Deleterious materials were not observed within the undocumented fill materials during the drilling operations. Although deleterious materials were not encountered in the undocumented fill materials, this does not eliminate the possibility that deleterious materials could be present within the undocumented fill materials at other locations along the project.

Undocumented fill is defined as fill that has been placed without being documented as to its placed density and moisture content.

Deleterious materials could include, but are not limited to, bricks, asphalt, concrete, metal, wood, or other building debris.

SUMMARY OF GEOTECHNICAL CONSIDERATIONS

The main geotechnical design and construction considerations at this site are:

- **Subgrade soils** generally consisted of undocumented fill, gray silty clay and gray sand. See the Subsurface Conditions and Undocumented Fill Discussion sections for more detailed information.
- **Free groundwater was observed** within the boring during drilling operations. See the Groundwater Conditions section for more information.
- **Internally braced trench boxes** will be needed to support the open cut construction planned for the project. See the Trench Box Excavation Recommendations and Lateral Earth Pressures sections for more information.



The geotechnical-related recommendations in this report are presented based on the subsurface conditions encountered and Rubino's understanding of the project. Should changes in the project criteria occur, a review must be made by Rubino to determine if modifications to our recommendations will be necessary.

EVALUATION AND RECOMMENDATIONS

The geotechnical-related recommendations in this report are presented based on the subsurface conditions encountered and Rubino's understanding of the project. Should changes in the project criteria occur, a review must be made by Rubino to determine if modifications to our recommendations will be necessary.

Site Preparation Recommendations

The following comments are considered site-specific. To reference general subgrade preparation recommendations and compaction recommendations, please refer to the Appendix of this report.

- During construction, the site should be stripped of existing concrete, foundations, abandoned utilities, and pavement sections including asphalt, subbase, and curbs if applicable.
- Please note that clay subgrade soils are sensitive to moisture and can be easily disturbed by precipitation, groundwater, or construction equipment. Therefore, extra care should be used to avoid disturbing these soils during construction activities.

Utility Installation Considerations

Rubino anticipates that the proposed lift station will bear at approximately 22 feet below existing surface grade. The following geotechnical considerations should be taken into account when considering either trenching or trenchless techniques performed as part of this project:

Table 5: Geotechnical Considerations for Utility Installation

BORING NUMBER	APPROXIMATE DEPTH RANGE (FEET BEG*)	SOIL CONSIDERATIONS
B-01	1 – 9	▪ Undocumented fill that may not be self-supporting
	18 ½ – 24	▪ Free groundwater ▪ Granular soils that may not be self-supporting

*BEG = below existing grade



Please note, problematic soils may be encountered at other locations or depths for this project and therefore, trench boxes should be anticipated for the entire project. Lateral earth pressures should be considered when using trench boxes or other shoring methods for the excavations.

Utility Installation and Backfill Recommendations

If granular material is used for the backfill of the utility trench, the **granular material should have a gradation that will filter protect the backfill material from the adjacent fine-grained soils as applicable**. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the following compaction criteria.

Structural fill placed in utility trenches shall be evaluated in accordance with the following table:

MATERIAL TESTED	PROCTOR TYPE ^{*-1}	MIN % DRY DENSITY	PLACEMENT MOISTURE CONTENT RANGE	FREQUENCY OF TESTING ^{*-2}	MAXIMUM LOOSE LIFT HEIGHT
Utility Trench Backfill	Standard	95%	-2 to +2 %	1 per 200 LF of fill placed	4 – 6 inches

^{*-1} The test frequency for the laboratory reference shall be one laboratory Proctor test for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

^{*-2} A minimum of one test per lift is recommended unless otherwise specified.

In general, utility trench backfill materials should:

- Have a Standard Proctor maximum dry density greater than 100 pcf
- Be free of organic or other deleterious materials
- Have a maximum particle size no greater than 3 inches
- Each lift of compacted, engineered fill should be tested and documented by a representative of the geotechnical engineer prior to placement of subsequent lifts
- Soils classified as GP, GW, SP, and SW will generally be suitable for use as utility trench backfill.
- Soils classified as CL, ML, SC, SM, OL, OH, MH, CH, and PT should be considered unsuitable.
- If water must be added, it should be uniformly applied and thoroughly mixed into the soil

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures. The above test frequencies should be discussed with the contractor prior to starting the work.

The geotechnical engineer of record can only certify work that was performed under their direct observation, or under the observation of a competent person under their specific direction.



Trench Box Excavation Recommendations

Excavation for trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. Within those regulations, OSHA created a classification of soils in decreasing order of stability. According to the OSHA classification method of soils, Rubino expects that the soils acting on the trench boxes would classify as Type A, Type B, and Type C soils.

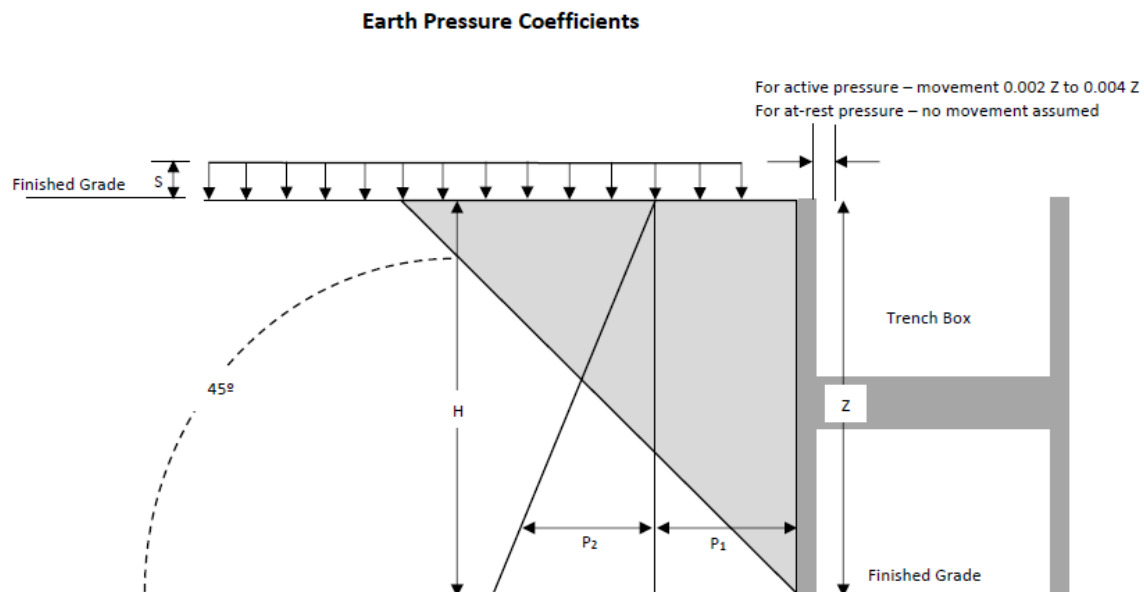
If open cut excavations are planned for this project, trench boxes should be budgeted and utilized throughout the construction as necessary and as required by OSHA. Lateral earth pressures should be considered when using trench boxes or other shoring methods for excavations. Please see the Lateral Earth Pressures section for additional information.

Lateral Earth Pressures

Lateral earth pressures will be influenced by the conditions of wall or support restraint, methods of construction and/or compaction and the strength of the materials being restrained.

Lateral earth pressure is developed from the soils present within a wedge formed by the vertical below-grade walls and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle.

The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K . Rubino recommends designing the bracing for the temporary excavation for the lift station for the “at-rest” lateral earth pressure condition using K_o .



The following table provides the recommended “at-rest” lateral earth pressure coefficients for the soils encountered. Also included are the “active” lateral earth pressure coefficients if needed.

Table 6: “K-Factor” Lateral Earth Pressures

APPROXIMATE DEPTH RANGE (FEET BEG*)	SOIL TYPE	ESTIMATED TOTAL UNIT WEIGHT (LB/FT ³)	ESTIMATED FRICTION ANGLE	K _o	K _A
1 – 9	FILL	110 – 120	26°	0.56	0.39
9 – 18 ½ 24 – 44 ¼	Stiff to Very Hard Silty CLAY	120 – 130	28°	0.53	0.36
18 ½ - 24	Medium Dense SAND	120 – 130	28°	0.53	0.36

*BEG = below existing grade

**For soils below the groundwater table, subtract 62.4 pcf from the total unit weight

The following equations were used to calculate the earth pressure coefficients “k”.

At-Rest:	$k_o = 1 - \sin \phi$	If the walls are rigidly attached to the structure and not free to rotate or deflect at the top such as shallow tunnels
Active:	$k_a = \tan^2(45 - \frac{\phi}{2})$	Walls that are permitted to rotate and deflect at the top

Conditions applicable to the above conditions include:

- For active earth pressure, wall must rotate about base, with top lateral movements 0.002Z to 0.004Z, where Z is the wall height
- Uniform surcharge, where S is surcharge pressure
- Hydrostatic Pressure designed to elevations as recommended herein
- No safety factor included

Lift Station Foundation Recommendations

Design – Soil Bearing Pressure

The proposed lift station structure can be supported on a mat foundation. Rubino recommends that the foundation be supported on the granular soils encountered at depth in the boring. Alternatively, the foundation could also be supported on compacted and documented structural fill.



Table 7: Lift Station Bearing Capacity Recommendations

DESCRIPTION	LIFT STATION FOUNDATION RECOMMENDATIONS
Anticipated Foundation Type:	Mat Foundation
Max Net Allowable Bearing Pressure:	4,000 psf
Anticipated Bearing Depth:	~22 feet below existing grade
Anticipated bearing soil classification:	Well-graded gravelly SAND in a dewatered condition, densified by a plate compactor
Geotechnical Considerations:	• Excavation should be in accordance with OSHA standards. • Granular soils will need to be supported by trench boxes during excavation • Shallow groundwater will be encountered and should be removed during construction • Buoyancy should be considered during design due to the presence of groundwater.

The net allowable soil bearing pressure is based on dead load plus design live load and represents the pressure that is in excess of the minimum surrounding overburden pressure at the footing base elevation.

Based on the known subsurface conditions, laboratory testing, and past experience, Rubino anticipates that properly designed and constructed footings supported on the recommended, observed and documented natural soils, or properly compacted structural fill should experience maximum total settlement of less than 1 inch.

Dewatering Recommendations

Dewatering will be necessary during excavation of the soils due to the presence of shallow groundwater encountered in the borings. Other factors that may affect dewatering are; precipitation, surficial runoff, and the presence of sand seams or other conditions not apparent at the time of drilling. Shoring or trench boxes may be required where the soils are granular, saturated, or have low shear strengths. Please reference the anticipated groundwater levels on the attached boring logs and in the Groundwater Conditions section of this report.



Seismic Site Classification

The 2015 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soil type (i.e., depth of soil and strata types). Based on the estimated depth to rock and the estimated shear strength of the soil at the boring locations, Site Class "D" is recommended.

This site class is recommended based on Rubino's opinion and experience in the area that the consistency of the soils below the depth explored remain consistent or improve in density. Actual determination of soil properties to a depth of 100 feet was beyond the scope of this project.

The SEAOC/OSHPD probabilistic ground motion values near latitude 42.061769° and longitude -88.091345° are shown in the table to the right.

Design Code Reference Document	IBC-2015	
Risk Category	II	
Site Class	D	
Type	Value	Description
S _S	0.139	MCE _R ground motion. (for 0.2 second period)
S ₁	0.061	MCE _R ground motion. (for 1.0s period)
S _{MS}	0.223	Site-modified spectral acceleration value
S _{M1}	0.146	Site-modified spectral acceleration value
S _{DS}	0.148	Numeric seismic design value at 0.2 second SA
S _{D1}	0.097	Numeric seismic design value at 1.0 second SA
Type	Value	Description
SDC	B	Seismic design category
F _a	1.6	Site amplification factor at 0.2 second
F _v	2.4	Site amplification factor at 1.0 second
PGA	0.072	MCE _G peak ground acceleration
F _{PGA}	1.6	Site amplification factor at PGA

Recommendations for Additional Testing

Once the structural loads, site plan and grading plans are finalized, please notify Rubino so that we can review our recommendations for the direct use of the structure and development of the site. Changes in lift station location, foundation depth, and structural loading can affect the geotechnical recommendations for this site.

During construction, Rubino recommends that one of our representatives be onsite for typical **observations and documentation** of exposed subgrade for trench excavation and foundations, including penetrometer testing.

CLOSING

The recommendations submitted are based on the available subsurface information obtained by Rubino Engineering, Inc. and design details furnished by Ciorba Group, Inc. for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Rubino should be notified immediately to



determine if changes in the foundation recommendations are required. If Rubino is not retained to perform these functions, we will not be responsible for the impact of those conditions on the project.

The scope of services did not include an environmental assessment to determine the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater or air on, below, or around this site. Any statements in this report and/or on the boring logs regarding odors, colors, and/or unusual or suspicious items or conditions are strictly for informational purposes.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Ciorba Group, Inc. and their consultants for the specific application to the proposed Hampton Lift Station in Hoffman Estates, Illinois.



Appendix A – Drilling, Field, and Laboratory Test Procedures

ASTM D1586 Penetration Tests and Split-Barrel Sampling of Soils

During the sampling procedure, Standard Penetration Tests (SPT's) were performed at regular intervals to obtain the standard penetration (N-value) of the soil. The results of the standard penetration test are used to estimate the relative strength and compressibility of the soil profile components through empirical correlations to the soils' relative density and consistency. The split-barrel sampler obtains a soil sample for classification purposes and laboratory testing, as appropriate for the type of soil obtained.

Water Level Measurements

Water level observations were attempted during and upon completion of the drilling operation using a 100-foot tape measure. The depths of observed water levels in the boreholes are noted on the boring logs presented in the appendix of this report. In the borings where water is unable to be observed during the field activities, in relatively impervious soils, the accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.

Ground Surface Elevations

At this time, no site-specific elevations were available to Rubino. The depths indicated on the attached boring logs are relative to the existing ground surface for each individual boring at the time of the exploration. Copies of the boring logs are located in the Appendix of this report.

ASTM D2216 Water (Moisture) Content of Soil by Mass (Laboratory)

The water content is an important index property used in expressing the phase relationship of solids, water, and air in a given volume of material and can be used to correlate soil behavior with its index properties. In fine grained cohesive soils, the behavior of a given soil type often depends on its natural water content. The water content of a cohesive soil along with its liquid and plastic limits as determined by Atterberg Limit testing are used to express the soil's relative consistency or liquidity index.

:

Appendix B – Fill Recommendations

In general, fill materials should meet the following:

- Standard Proctor maximum dry density >100 pcf
- Free of organic or other deleterious materials
- Have a maximum particle size no greater than 3 inches
- Have a liquid limit <45 and plasticity index <25
- Testing should include areas at least 5 feet outside the parking area perimeters, if applicable
- Each lift of compacted, engineered fill should be tested and documented by a representative of the geotechnical engineer prior to placement of subsequent lifts
- If a fine-grained silt or clay soil is used for fill (CL or ML), close moisture content control will be essential to achieve the recommended degree of compaction
- If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying

Suitable Soil Classifications:

CL, SC, GW, and SW will generally be suitable for use as structural fill under pavements.

Unsuitable Soil Classifications:

OL, OH, MH, ML, SM, CH and PT should be considered unsuitable.

Structural fill added to the site shall be evaluated in accordance with the following table:

MATERIAL TESTED	PROCTOR TYPE ^{*-1}	MIN % DRY DENSITY	PLACEMENT MOISTURE CONTENT RANGE	FREQUENCY OF TESTING ^{*-2}	MAXIMUM LOOSE LIFT HEIGHT
Structural Fill (Cohesive & Well-graded Granular)	Standard	98%	-2 to +3 %	1 per 2,500 yd ² of fill placed	8 inches
Random Fill (non-load bearing)	Standard	95%	-3 to +3 %	1 per 5,000 yd ² of fill placed	8 inches
Utility Trench Backfill	Standard	95%	-2 to +2 %	1 per 200 LF of fill placed	4 – 6 inches

^{*-1} The test frequency for the laboratory reference shall be one laboratory Proctor or Relative Density test for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

^{*-2}A minimum of one test per lift is recommended unless otherwise specified.

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures. The above test frequencies should be discussed with the contractor prior to starting the work.

The geotechnical engineer of record can only certify work that was performed under their direct observation, or under the observation of a competent person under their specific direction.

Appendix C – Foundation Construction Recommendations

Rubino recommends that soils at the bottom of the footing design elevation be observed, documented, and tested by a representative of Rubino prior to concrete placement to evaluate the consistency of the soils in the field with the geotechnical report findings. The remedial procedures described in the following paragraph can be used to provide suitable foundation support where unsuitable material such as soft or loose soils, existing fill, or organic soils are encountered.

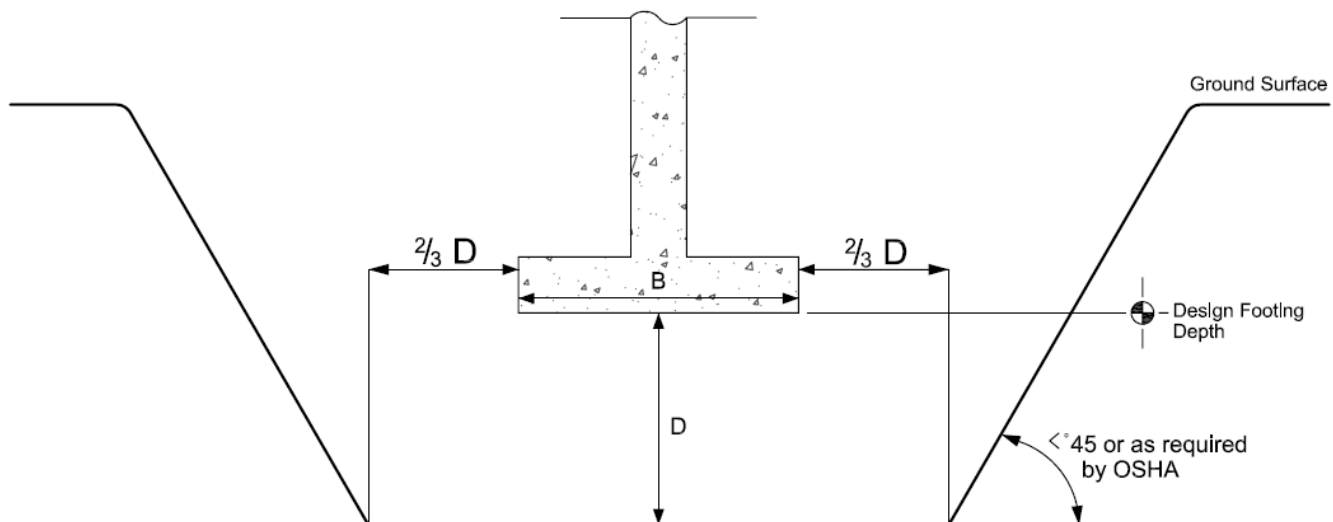
After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface runoff water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, the soils in the excavation should be protected to reduce evaporation or entry of moisture.

If unsuitable bearing soils are encountered in a footing excavation, the footing should be deepened to competent bearing soil and the footing could be lowered, or an over excavation and backfill procedure could be performed. If an over excavation and backfill procedure will be utilized, it would require widening the deepened excavation in all directions at least 8 inches beyond the edges of the footing for each 12 inches of over excavation depth (See "Over Excavation and Backfill Procedure" diagram below).

The over excavation should then be backfilled in a maximum of 8-inches thick loose lifts with suitable granular fill material, such as $\frac{3}{4}$ -inch stone with fines (CA-6), compacted to at least 98% of the maximum Standard Proctor dry density (ASTM D 698).

Another alternative is to undercut and refill the unsuitable area with flowable mortar up to the design elevation of the footings. The flowable mortar would serve as a protection to the subgrade during construction of the foundations. In this case, widening the footings is not necessary.

Over Excavation and Backfill Procedure



* Drawing not to scale

Appendix D – Report Limitations

Subsurface Conditions:

The subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data as well as water level information. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition between layers may be gradual. The samples, which were not altered by laboratory testing, will be retained for up to 60 days from the date of this report and then will be discarded.

Geotechnical Risk:

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools that geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free, and more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations, presented in the preceding section, constitute Rubino's professional estimate of the necessary measures for the proposed structure to perform according to the proposed design based on the information generated and reference during this evaluation, and Rubino's experience in working with these conditions.

Warranty:

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

Federal Excavation Regulations:

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. This federal regulation mandates that all excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person," as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. Rubino is providing this information solely as a service to our client. Rubino is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Appendix E – Soil Classification General Notes

DRILLING & SAMPLING SYMBOLS:

SS: Split Spoon - 1 3/8" I.D., 2" O.D., unless otherwise noted
 ST: Thin-Walled Tube - 3" O.D., Unless otherwise noted
 PM: Pressuremeter
 RB: Rock Bit
 DB: Diamond Bit - 4", N, B

PS: Piston Sample
 WS: Wash Sample
 HA: Hand Auger
 HS: Hollow Stem Auger
 BS: Bulk Sample

Standard "N" Penetration: Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split spoon sampler (SS), except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of ground water levels is not possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION:

Soil Classification is based on the Unified Soil Classification System as defined in ASTM D-2487 and D-2488. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays, if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse grained soils are defined on the basis of their relative in-place density and fine-grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

CONSISTENCY OF FINE-GRAINED SOILS:

Unconfined Compressive Strength, Qu (tsf)	N-Blows/ft.	Consistency
< 0.25	< 2	Very Soft
0.25 - 0.5	2 - 4	Soft
0.5 - 1	4 - 8	Medium Stiff
1 - 2	8 - 15	Stiff
2 - 4	15 - 30	Very Stiff
4 - 8	30 - 50	Hard
> 8	> 50	Very Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

N-Blows/ft.	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 49	Dense
50 - 80	Very Dense
80+	Extremely Dense

RELATIVE PROPORTIONS OF SAND & GRAVEL

Descriptive Term	% of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

GRAIN SIZE TERMINOLOGY

Major Component	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. To 3 in. (300mm to 75mm)
Gravel	3 in. To #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)

*Descriptive Terms apply to components also present in sample

Appendix F – Soil Classification Chart

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

Appendix G – Site Vicinity Map & Boring Location Plan



rubino
ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

Project Name:
Project Location:

Client:
Rubino Project # :

Hampton Lift Station Improvements

Hampton Road and Jamison Lane
Hoffman Estates, Illinois

Ciorba Group, Inc.

G25.104

**Site
Vicinity
Map**



rubino
ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

Project Name:
Project Location:

Client:
Rubino Project # :

Hampton Lift Station Improvements

Hampton Road and Jamison Lane
Hoffman Estates, Illinois

Ciorba Group, Inc.

G25.104

Boring
Location
Plan

Appendix H – Boring Log

LOG OF BORING B-01

Sheet 1 of 1

Rubino Job No.: G25.104	Drilling Method: 3 1/4 Hollow Stem Auger	WATER LEVELS***
Project: Hampton Lift Station Improvements	Sampling Method: Split Spoon	▽ While Drilling 18.5 ft
Location: 1869 Hampton Road	Hammer Type: Automatic	▼ Upon Completion N/A
City, State: Hoffman Estates, Illinois	Boring Location: Hampton Road near Jamison Lane	▼ Delay N/A
Client: Ciorba Group, Inc.		

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	Station: N/A Offset: N/A	MATERIAL DESCRIPTION	Classification	SPT Blows per 6-inch	Moisture, %	STANDARD PENETRATION TEST DATA	Additional Remarks
											◎ Moisture × PL ▲ Qu (Rimac) *Qp/Qr 0 25 50 STRENGTH, tsf 0 2.0 4.0	
0	0			1	8		Approximately 10 inches of ASPHALT		4-4-5 N=9	15		Qp=3.00 tsf
				2	4		Approximately 4 inches of GRAVEL FILL		4-4-5 N=9	12		Qp=3.50 tsf
	5			3	10		FILL: brown, black, and gray silty clay, trace to with sand and gravel		2-3-4 N=7	21		Qp=2.00 tsf
				4	16		Stiff, gray silty CLAY, trace sand and gravel		5-6-7 N=13	13		Qp=4.25 tsf
	10			5	13			CL	4-5-8 N=13	19		
	15			6	16		Medium dense, gray gravelly SAND	SW	7-11-15 N=26	8		
	20			7	18		Stiff to very stiff, gray silty CLAY, trace sand and gravel		6-7-11 N=18	17		Qp=3.25 tsf
	25			8	14				4-6-9 N=15	17		Qp=3.50 tsf
	30			9	18			CL	5-6-8 N=14	20		Qp=2.50 tsf
	35			10	18				5-6-7 N=13	24		Qp=2.50 tsf
	40			11	8		Very hard, gray silty CLAY, trace sand and gravel	CL	13-50/3"-	12		>> Qp=3.00 tsf
							Spoon refusal at approximately 44 1/4 feet below existing grade. End of boring at approximately 44 1/4 feet below existing grade.					

Completion Depth: 44.3 ft	Sample Types:	Direct Push	Latitude: 42.0617561
Date Boring Started: 8/5/25	Auger Cutting	Shelby Tube	Longitude: -88.0914510
Date Boring Completed: 8/5/25	Split-Spoon	Grab Sample	Drill Rig: Geoprobe 3126GT
Logged By: J.K.	Rock Core	No Recovery	Remarks: Offset ~8 feet SW due to utilities
Drilling Contractor: Rubino Engineering, Inc.			Log Entry: P. Patel
			Checked By:

The stratification lines represent approximate boundaries. The transition may be gradual.

***Please reference the geotechnical report text for specific groundwater / dewatering recommendations and elevation definitions.