Specifications and
Contract Documents

ST. JOHN THE BAPTIST PARISH MAIN WASTEWATER PUMP STATION REHABILITATION

Prepared for:

ST. JOHN THE BAPTIST PARISH
1801 W. Airline Highway
LaPlace, LA 70068

JANUARY 2019
PEC PROJECT NO. 11161

Prepared by:

PEC
PROFESSIONAL ENGINEERING CONSULTANTS CORPORATION

7600 Innovation Park Drive
Baton Rouge, LA 70820
P: 225.769.2810
F: 225.769.2882
PECLA.com

SET NO. _____

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STATE OF LOUISIANA
License No. 23244
PROFESSIONAL ENGINEER
CIVIL ENGINEERING

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ST. JOHN THE BAPTIST PARISH
MAIN WASTEWATER PUMP STATION REHABILITATION

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ST. JOHN THE BAPTIST PARISH
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DIVISION 0

BIDDING REQUIREMENTS AND CONTRACTING REQUIREMENTS

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

ADVERTISEMENT FOR BIDS

ST. JOHN THE BAPTIST
MAIN WASTEWATER PUMP STATION REHABILITATION

St. John the Baptist Parish (herein referred to as the "Owner")

Sealed Bids will be received by St. John the Baptist Parish Council in the Government Complex Building,1811 W. Airline Highway, LaPlace, La. 70068, at the receptionist's desk, until **2:45 p.m., Thursday, February 14, 2019** for the following:

ST. JOHN THE BAPTIST PARISH
LAPLACE MAIN WASTEWATER PUMP STATION

Proposals shall be addressed to the St. John the Baptist Parish Council and delivered to the receptionist at St. John the Baptist Parish located at 1811 W. Airline Highway, LaPlace, LA 70068 and delivered no later than **2:45 p.m. on Thursday, February 14, 2019** designated as **"Sealed Bid – St. John the Baptist Parish- Bid for Main Wastewater Pump Station."** Any bids received after the specified time and date will not be considered. The sealed bids will be publicly opened and read aloud at **3:00 o'clock p.m. on Thursday, February 14, 2019** in the St. John the Baptist Parish Government Complex Council Chambers located at 1811 W. Airline Highway, LaPlace, LA 70068.

The Bid Proposal, Plans and Specifications may be examined at Professional Engineering Consulting Corp. (PEC) located at 7600 GSRI Road, Baton Rouge, La. 70820. Copies may be obtained at that office upon payment of **$150.00** which constitutes the cost of reproduction and handling and is non-refundable. Details may be viewed, and electronic bids are being accepted at **www.centralbidding.com**. All Bid Documents and Specifications may also be viewed at the Parish website, **www.sjbparish.com.**

Bidders are invited to attend a pre-bid meeting to be held at 1811 W. Airline Hwy, LaPlace, LA 70068 in the Government Complex Council Chambers on **Wednesday, January 30, 2019 at 2:00 p.m. Attendance is not mandatory**. All questions should be directed to Jean Stewart, Director of Purchasing and Procurement via email to j.stewart@stjohn-la.gov and/or Janice Gauthier at j.gauthier@stjohn-la.gov

The Owner reserves the right to accept or reject any and all bids and to waive any irregularities or informalities incidental thereto, and to accept any bid, which the Owner feels, serves their best interest. Such action will be in accordance with Louisiana R.S. 38:2214.

The Owner requires that each bidder attach to his bid a certified check, cashier's check or bid bond equivalent to 5% of the total bid as evidence of good faith of the bidder. Sureties used for obtaining bonds must appear as acceptable on the U.S. Department of Treasury's Circular 570.

No bidder may withdraw his/her bid within forty-five (45) days after the actual date of the opening thereof except as provided by law.

The Contractor shall begin mobilization and procurement of necessary materials within ten (10) working days of the receipt of the Notice to Proceed.

St. John the Baptist Parish Council, being a government agency, is exempt from all sales tax. The vendor awarded the contract will be provided documentation to support their tax free purchases for this project. Therefore, ***the amount you bid should contain no sales tax.***

The Specifications have been prepared by St. John the Baptist Parish Utility Department setting forth those items deemed necessary by St. John the Baptist Parish personnel.

Equal Opportunity in Employment: All qualified applicants will receive consideration for employment without regard race, color, religion, sex, or national origin. Bidders on this work will be required to comply with the President's Executive Order No.11246, as amended.

If the contract is to be awarded, it will be awarded to the lowest, responsive, and responsible Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project.

Any person with disabilities requiring Special Accommodation must contact St. John the Baptist Parish at **(985) 652-9569** no later than seven (7) days prior to bid opening. Participation by minority and female owned business, as well as businesses located in this Parish is encouraged.

ST. JOHN THE BAPTIST PARISH
Natalie Robottom, Parish President

Publish: January 16. 2019
January 23, 2019
January 30, 2019

SECTION 00300
LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: St. John the Baptist Parish
1801 West Airline Hwy.
LaPlace, LA 70068
(Owner to provide name and address of owner)

BID FOR: St. John the Baptist Parish
Main Wastewater Pump Station Rehabilitation
PEC Project No. 11161.05
(Owner to provide name of project and other identifying information)

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: **Professional Engineering Consultants Corp.** and dated: **January 2019**
(Owner to provide name of entity preparing bidding documents)

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____.

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as Alternates in the unit price description.

Alternate No. 1 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ N/A)

Alternate No. 2 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ N/A)

Alternate No. 3 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ N/A)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC WORK BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

** A CORPORATE RESOLUTION OR WRITTEN EVIDENCE of the authority of the person signing the bid for the public work as prescribed by LA. R.S. 38:2212(B)5.

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38:2218.A is attached to and made a part of this bid.

SECTION 00410 –
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

as PRINCIPAL, and _____ as SURETY, are hereby held and firmly bound unto __

St. John the Baptist Parish as OWNER in the penal sum of _____

_____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns. Signed, this _____ day of _____,2019 .

The condition of the above obligation is such that whereas the PRINCIPAL has submitted to **St. John the Baptist Parish** _____ a certain BID, attached hereto and hereby made a part hereof to enter into a CONTRACT in writing, for **Main Wastewater Pump Station Rehabilitation** .

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the PRINCIPAL shall execute and deliver a CONTRACT in the FORM OF CONTRACT attachment hereto properly completed in accordance with said BID and shall furnish a BOND for faithful performance of said CONTRACT, and for the payment of all persons performing labor and furnishing materials in connection therewith, and shall in all other respects perform the AGREEMENT created by the acceptance of said BID.

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the SURETY for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The SURETY, for value received, hereby stipulates and agrees that the obligations of said SURETY and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said SURETY does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the PRINCIPAL and the SURETY have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and to be signed by their proper officers, the day and year first set forth above.

_____ _____
Principal Witness

By:_____

_____ _____
Surety Witness

By:_____

IMPORTANT - SURETY companies executing BONDS must appear on the U.S. Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

(SUCCESSFUL BIDDER MUST PROVIDE WITH BID, IF APPLICABLE)

SECTION 00420 -
CORPORATE RESOLUTION

EXCERPT FROM MINUTES OF MEETING OF THE BOARD OF DIRECTORS OF _ _____, INCORPORATED.

AT THE MEETING OF DIRECTORS OF _____, INCORPORATED, DULY NOTICED AND HELD ON _____, 2019, A QUORUM BEING THERE PRESENT, ON MOTION DULY MADE AND SECONDED. IT WAS:

RESOLVED THAT _____, BE AND IS HEREBY APPOINTED, CONSTITUTED AND DESIGNATED AS AGENT AND ATTORNEY-IN-FACT OF THE CORPORATION WITH FULL POWER AND AUTHORITY TO ACT ON BEHALF OF THIS CORPORATION IN ALL NEGOTATIONS, BIDDING, CONCERNS AND TRANSACTIONS WITH **ST. JOHN THE BAPTIST PARISH**, THE GOVERNING AUTHORITY OF THE **ST. JOHN THE BAPTIST PARISH** OR ANY OF ITS AGENCIES, DEPARTMENTS, EMPLOYEES OR AGENTS, INCLUDING BUT NOT LIMITED TO THE EXECUTION OF ALL BIDS, PAPERS, DOCUMENTS, AFFIDAVITS, BONDS, SURETIES, CONTRACTS AND ACTS AND TO RECEIVE AND RECEIPT THEREFORE ALL PURCHASE ORDERS AND NOTICES ISSUED PURSUENT TO THE PROVISIONS OF ANY SUCH BID OR CONTRACT, THIS CORPORATION HEREBY RATIFYING, APPROVING, CONFIRMING AND ACCEPTING EACH AND EVERY SUCH ACT PERFORMED BY SAID AGENT AND ATTORNEY-IN-FACT.

I HEREBY CERTIFY THE FOREGOING TO BE A TRUE AND CORRECT COPY OF AN EXCERPT OF THE MINUTES OF THE ABOVE DATED MEETING OF THE BOARD OF DIRECTORS OF SAID CORPORATION, AND THE SAME HAS NOT BEEN REVOKED OR RESCINDED.

_____
SECRETARY-TREASURER

_____
DATE

(SUBMIT BY EACH BIDDER WITHIN 10 DAYS AFTER BID OPENING)

SECTION 00430
ATTESTATIONS

Main Wastewater Pump Station Rehabilitation — **11161.05**
Name of Project — **Project No.**

STATE OF Louisiana
PARISH OF St. John the Baptist

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)
(b) Corrupt influencing (R.S. 14:120)
(c) Extortion (R.S. 14:66)
(d) Money laundering (R.S. 14:23)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)
(b) Identity Theft (R.S. 14:67.16)
(c) Theft of a business record (R.S.14:67.20)
(d) False accounting (R.S. 14:70)
(e) Issuing worthless checks (R.S. 14:71)
(f) Bank fraud (R.S. 14:71.1)
(g) Forgery (R.S. 14:72)
(h) Contractors; misapplication of payments (R.S. 14:202)
(i) Malfeasance in office (R.S. 14:134)

LA. R.S. 38:2212.10 VERIFICATION OF EMPLOYEES

A. At the time of bidding, Bidder is registered and participates in a status verification system to verify that all new hires in the state of Louisiana are legal citizens of the United States or are legal aliens.

B. If awarded the contract, Bidder shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

C. If awarded the contract, Bidder shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

(SUBMIT BY EACH BIDDER WITHIN 10 DAYS AFTER BID OPENING)

Main Wastewater Pump Station Rehabilitation — **11161.05**
Name of Project — **Project No.**

LA. R.S. 23:1726(B) CERTIFICATION REGARDING UNPAID WORKERS COMPENSATION INSURANCE

A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.

B. By signing this bid/proposal, Bidder certifies that no such assessment is in effect against the bidding/proposing entity.

NAME OF BIDDER	**NAME OF AUTHORIZED SIGNATORY OF BIDDER**
DATE	**TITLE OF AUTHORIZED SIGNATORY OF BIDDER**

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER

SECTION 00490 –
NOTICE OF AWARD

TO: _____
_____
_____

PROJECT Description: **Main Wastewater Pump Station Rehabilitation**.

The OWNER has considered the BID submitted by you for the above described WORK in response to its ADVERTISEMENT FOR BIDS dated [Date first advertised], and INSTRUCTIONS TO BIDDERS.

You are hereby notified that your BID has been accepted for items in the amount of $_____ _____.

You are required by the INSTRUCTIONS TO BIDDERS to execute the AGREEMENT and furnish the required CONTRACTOR'S PERFORMANCE BOND, PAYMENT BOND, and CERTIFICATE OF INSURANCE within fourteen (14) calendar days from the date of this NOTICE to you.

If you fail to execute said AGREEMENT and to furnish said BONDS within fourteen (14) calendar days from the date of this NOTICE, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of_____, 20____.

St. John the Baptist Parish
OWNER

By Mrs. Natalie Robottom

TITLE Parish President

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____ _____ this _____ day of _____, 2019.

BY_____

TITLE_____

THIS AGREEMENT, made this _____ day of _____, 2019 , by and between

ST. JOHN THE BAPTIST PARISH

hereinafter called "OWNER" and _____doing business as a _____

_____ hereinafter called "CONTRACTOR".

(Individual/Partnership/Corporation)

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the **Main Wastewater Pump Station Rehabilitation** .

2. The CONTRACTOR will furnish all of the materials, supplies, tools, equipment, labor, and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the WORK required by the CONTRACT DOCUMENTS within fourteen (14) calendar days after the date of the NOTICE TO PROCEED and will complete the same within **two hundred and seventy (270)** calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS. Liquidated damages in the amount of **$ 750** per day will be assessed for each day this PROJECT is not completed beyond the completion date.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of $_____.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

00050 ADVERTISEMENT FOR BIDS
00100 INFORMATION TO BIDDERS
00300 BID FORM
00410 BID BOND
00420 CORPORATE RESOLUTION *(SUCCESSFUL BIDDER MUST PROVIDE WITH BID, IF APPLICABLE)*
00430 ATTESTATIONS *(SUBMITTED BY EACH BIDDER WITHIN 10 DAYS OF BID OPENING)*
(LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS)
(LA. R.S. 38:2212.10 VERIFICATION OF EMPLOYEES)
(LA. R.S. 23.1726(B) CERTIFICATION REGARDING UNPAID WORKERS COMPENSATION INSURANCE)
00440 CONTRACTOR AFFIDAVIT (R.S. 38:2224) *(SUCCESSFUL BIDDER MUST PROVIDE POST BID)*
00490 NOTICE OF AWARD
ACCEPTANCE OF NOTICE OF AWARD
00500 AGREEMENT
00550 NOTICE TO PROCEED
ACCEPTANCE OF NOTICE TO PROCEED
00610 PAYMENT BOND
00620 PERFORMANCE BOND
00630 CERTIFICATE AS TO CORPORATE PRINCIPAL
00660 PERIODIC ESTIMATE FOR PAYMENT
00670 CONTRACT CHANGE ORDER
00680 CERTIFICATE OF SUBSTANTIAL COMPLETION
00700 GENERAL CONDITIONS
00800 SUPPLEMENTARY GENERAL CONDITIONS
00900 SPECIAL CONDITIONS
DIVISIONS 1 THRU 16 - TECHNICAL SPECIFICATIONS

DRAWINGS prepared by Professional Engineering Consultants Corporation numbered 1 through 12, dated January, 2019.

SPECIFICATIONS prepared or issued by Professional Engineering Consultants Corporation dated January, 2019.

ADDENDA:

No. _____ dated _____ 20 ____
_____ _____ 20 ____
_____ _____ 20 ____
_____ _____ 20 ____

6. The OWNER will pay to the CONTRACTOR, in the amount and at such times as set forth in the GENERAL CONDITIONS, such amounts as required by the CONTRACT DOCUMENTS.

7. This AGREEMENT shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed or caused to be executed by their duly authorized officials, this AGREEMENT in six (6) copies each of which shall be deemed an original on the date first above written.

(SEAL) OWNER:

ATTEST:

St. John the Baptist Parish

BY _____ (Please Type) BY _____

TITLE _____ NAME Natalie Robottom
Parish President

(SEAL) CONTRACTOR:

ATTEST:

_____ _____

BY _____ (Please Type) BY _____

TITLE _____ NAME _____ (Please Type)

ADDRESS _____

_____

SECTION 00550 –
NOTICE TO PROCEED

TO: _____ Date: _____

_____

_____

Project: **Main Wastewater Pump Station Rehabilitation**
11161.05

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 2019 , on or before _____, 2019 , and you are to complete the WORK within two hundred and seventy (270) consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 2019 .

St. John the Baptist Parish
OWNER

By: _____
Natalie Robottom

Title: Parish President

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____ _____, this the _____, 2019 .

By _____

Title _____

Employer Identification
Number _____

SECTION 00610 –
PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____
(Corporation, Partnership, or Individual)

hereinafter called PRINCIPAL and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called SURETY, are held and firmly bound unto

ST. JOHN THE BAPTIST PARISH
(Name of Owner)

1801 W. AIRLINE HIGHWAY LaPLACE, LA 70068
(Address of Owner)

hereinafter called OWNER and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the CONTRACT and to their successors and assigns in the total aggregate penal sum of _____Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that WHEREAS, the PRINCIPAL entered into a certain CONTRACT with the OWNER, dated the _____ day of _____, 20__, a copy of which is hereto attached and made a part hereof for the construction of:

Main Wastewater Pump Station Rehabilitation

NOW, THEREFORE, if the PRINCIPAL shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such CONTRACT and any authorized extensions or modification thereof, including all amounts due for materials, equipment and tools, consumed or used in connection with the construction of such WORK, and for all labor cost incurred in such WORK including that by a SUBCONTRACTOR, and to any mechanic or materialman lienholder whether it acquires its lien by operation of State or Federal law; then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the SUBCONTRACTOR, and persons, firms, and corporations having a direct contract with the PRINCIPAL or its SUBCONTRACTOR.

PROVIDED, FURTHER, that the said SURETY for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this CONTRACT or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no suit or action shall be commenced hereunder by any claimant:

(a) Unless claimant, other than one having a direct contract with the PRINCIPAL, shall have given written notice to any two of the following: The PRINCIPAL, the OWNER, or the SURETY above named within ninety (90) days after such claimant did or performed the last of the WORK or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the WORK or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the PRINCIPAL, OWNER or SURETY, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the states in which the aforesaid PROJECT is located, save that such service need not be made by a public officer.

(b) After the expiration of one (1) year following the date of which PRINCIPAL ceased WORK on said CONTRACT, it being understood, however, that if any limitation embodied in the BOND is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the CONTRACT PRICE more than THIRTY (30) percent, so as to bind the PRINCIPAL and SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, the CONTRACT or the loan documents shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each of which shall be deemed an original, this being the _____ day of _____, 20_____.

ATTEST:

_____
(Principal)

_____ By _____
(Principal) Secretary

_____
(Address)

_____ _____
Witness as to Principal

_____
(Address)

_____ _____
Surety

ATTEST:

_____ By _____
Witness as to Surety Attorney-in-Fact

_____ _____
(Address) (Address)

_____ _____

NOTE: Date of BOND must not be prior to date of CONTRACT.

If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

SECTION 00620 –
PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____
(Corporation, Partnership, or Individual)

hereinafter called PRINCIPAL
and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called SURETY, are held and firmly bound unto

ST. JOHN THE BAPTIST PARISH
(Name of Owner)

1801 W. AIRLINE HIGHWAY LaPLACE, LA 70068
(Address of Owner)

hereinafter called OWNER, in the total aggregate sum of _____Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the PRINCIPAL entered into a certain CONTRACT with the OWNER, dated the _____ day of _____, 20__, a copy of which is hereto attached and made a part hereof for the construction of:

Main Wastewater Pump Station Rehabilitation

NOW, THEREFORE, if the PRINCIPAL shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said CONTRACT during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the SURETY and during the one (1) year guaranty period and if the PRINCIPAL shall satisfy all claims and demands incurred under such CONTRACT, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said SURETY, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT or to WORK to be performed thereunder or the SPECIFICATIONS accompanying same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the CONTRACT or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that it is expressly agreed that the BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the CONTRACT PRICE more than THIRTY (30) percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", wherever used in this BOND, and whether referring to this BOND, the CONTRACT or the Loan Documents shall include any alteration, addition, extension, or modification of any character whatsoever.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each one of which shall be deemed an original, this being the _____ day of _____, 20___.

ATTEST:

_____
(Principal)

_____ By _____
(Principal) Secretary

_____
(Address)

_____ _____
Witness as to Principal

_____
(Address)

_____ _____
Surety

ATTEST:

_____ By _____
Witness as to Surety Attorney-in-Fact

_____ _____
(Address) (Address)

_____ _____

NOTE: Date of BOND must not be prior to date of CONTRACT.

If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

SECTION 00660
CONTRACTOR'S APPLICATION FOR PAYMENT

PERIODIC ESTIMATE FOR PAYMENT No: _____ PERIOD: _____ THRU _____ SHEET 1 of _____

OWNER: *ST. JOHN THE BAPTIST PARISH* PROJECT: MAIN WASTEWATER PUMP STATION REHABILITATOIN

ENGINEER: *Professional Engineering Consultants Corp.* CONTRACT : MAIN WASTEWATER PUMP STATION REHABILITATOIN

CONTRACTOR: _____ PERCENT COMPLETE: _____ %

PROJECT NO.: *11161.10* ORIGINAL CONTRACT TIME: *270* DAYS TIME REMAINING: _____ DAYS

CONTRACT COMPLETION DATE: _____

In accordance with this Contract and the attached Estimate for Payment, the Contractor is entitled to payment in the amount stipulated below. The present status of the account for this Contract is as follows:

Change Order No.	Additions	Deductions
	$ -	$ -
	$ -	$ -
	$ -	$ -
	$ -	$ -
	$ -	$ -
	$ -	$ -
	$ -	$ -
TOTAL	$ -	$ -
Net Change:	$	-

Original Contract Sum:	
Change Orders (Net Change):	$ -
Contract Sum to Date:	$ -
Material Stored:	$ -
Work Completed to Date:	$ -
Total Completed to Date:	$ -
5 % Retainage:	$ -
Total Earned Less Retainage:	$ -
Less Previous Estimates:	
Total Due This Estimate:	**$ -**

CERTIFICATION OF CONTRACTOR: According to the best of my knowledge and belief, I certify that all items and amounts shown on the face of this Periodic Estimate for Partial Payment are correct; that all work has been performed and/or material supplied in full accordance with the requirements of the referenced contract, and/or duly authorized deviations, up to and including the last day of the period covered by this Periodic Estimate; and that no part of the "Balance Due This Payment" has been received.

Contractor: **By:** **Date:**

CERTIFICATION OF ENGINEER: I certify that I have checked and verified the above and foregoing Periodic Estimate for Partial Payment; that to the best of my knowledge and belief it is a true and correct statement of work performed and/or material supplied by the Contractor; that all work and/or material included in the Periodic Estimate has been inspected by me and/or my duly authorized representative or assistants, and that it has been performed and/or supplied in full accordance with the requirements of the referenced contract; and that partial payment claimed and requested by the Contractor is correctly computed on the basis or work performed and/or material supplied to date.

Engineer: ***Professional Engineering Consultants Corp.*** **By:** **Date:**

CERTIFICATION OF OWNER: I do hereby accept the foregoing Periodic Estimate for Payment and do recommend and approve the partial payment claimed and requested by the Contractor.

Owner: ***St. John the Baptist Parish*** **By:** **Date:**

PERIODIC ESTIMATE FOR PAYMENT NO.: PERIOD: through SHEET 2 of

ITEM NO.	DESCRIPTION OF ITEM	SUMMARY ORIGINAL CONTRACT				WORK COMPLETED PREVIOUS PERIODS		ESTIMATE OF WORK COMPLETED THIS PERIOD		ESTIMATE OF WORK COMPLETED TO DATE	
		UNIT PRICE	QUANTITY	UNIT	EXTENSION	QUANTITY	EXTENSION	QUANTITY	EXTENSION	QUANTITY	EXTENSION
1					$0.00						
2					$0.00						
3					$0.00						
4					$0.00						
5					$0.00						
6					$0.00						
7					$0.00						
8					$0.00						
9					$0.00						
10					$0.00						
11					$0.00						
12					$0.00						
13					$0.00						
14					$0.00						
15					$0.00						
16					$0.00						
17					$0.00						
18					$0.00						
19					$0.00						
20					$0.00						
21					$0.00						
22					$0.00						
		TOTAL			$0.00						

SECTION 00670 –
CONTRACT CHANGE ORDER

Project No. 11161.10 Date: _____

Change Order No. _____ State: Louisiana

Parish: St. John the Baptist Parish

Contract For: Main Wastewater Pump Station Rehabilitation

Owner: St. John the Baptist Parish 1801 W. Airline Highway LaPlace, LA 70068

To (Contractor): _____

You are hereby requested to comply with the following changes from the Contract Plans and Specifications:

DESCRIPTION OF CHANGES	DECREASE IN CONTRACT PRICE	INCREASE IN CONTRACT PRICE
TOTALS:		
NET CHANGE IN CONTRACT PRICE:		

JUSTIFICATION:

The amount of the Contract will be increased/decreased by the sum of: _____

_____ Dollars ($_____).

The Contract Total, including this and previous Change Orders, will be: _____

_____ Dollars ($_____).

The Contract Period provided for Completion will be increased/decreased _____ days.

The Contract Completion Date is _____.

This document will become a supplement to the Contract and all provisions will apply thereto.

Recommended: _____ _____
Professional Engineering Consultants Corporation Date

Accepted: _____ _____
Contractor Date

Approved: _____ _____
Owner Date

SECTION 00680 –
CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT: MAIN WASTEWATER PUMP STATION REHABILITATION

PROJECT NO. 11161

OWNER: ST. JOHN THE BAPTIST PARISH
1801 W. AIRLINE HIGHWAY
LaPLACE, LA 70068

CONTRACTOR:

ENGINEER: Professional Engineering Consultants Corporation
7600 Innovation Park Drive
Baton Rouge, Louisiana 70820

DATE OF SUBSTANTIAL COMPLETION: _____

DEFINITION OF SUBSTANTIAL COMPLETION

The date of Substantial Completion of a project, or specified part of a project is the date when the construction is sufficiently completed in accordance with the contract documents, so that the project, or specified part of the project, can be utilized for the purpose for which it was intended.

The Work performed under this Contract has been reviewed by authorized representatives of the Owner, Contractor, and Engineer and the Project is hereby declared to be substantially complete in accordance with the Contract Documents on the above date.

The date of Substantial Completion is the date upon which all guarantees and warranties begin.

A list of items to be completed or corrected is as follows: (This list may not be all-inclusive, and the failure to include an item does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents).

Final completion and release of the retainage to the Contractor will occur when the Owner is provided a clear lien certificate and all items listed on the previous page for Contractor completion have been satisfactorily completed.

PROFESSIONAL ENGINEERING CONSULTANTS CORPORATION

Recommended: _____ Date: _____

CONTRACTOR

Accepted: _____ Date: _____

ST. JOHN THE BAPTIST PARISH

Approved: _____ Date: _____

SECTION 00700 – GENERAL CONDITIONS

1. Definitions
2. Additional Instructions and Detail Drawings
3. Schedules, Reports, and Records
4. Drawings and Specifications
5. Shop Drawings
6. Materials, Services, and Facilities
7. Inspection and Testing
8. Substitutions
9. Patents
10. Surveys, Permits, Regulations
11. Protection of Work, Property, Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion and Liquidated Damages
16. Correction of Work
17. Subsurface Conditions
18. Suspension of Work, Termination, and Delay
19. Payments to Contractor
20. Acceptance of Final Payment as Release
21. Insurance
22. Contract Security
23. Assignments
24. Indemnification
25. Separate Contracts
26. Subcontracting
27. Engineer's Authority
28. Land and Rights-of-Way
29. Guaranty
30. Taxes
31. Environmental Requirements

1. DEFINITIONS

1.1 Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated and shall be applicable to both the singular and plural thereof:

1.2 ADDENDA - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS and SPECIFICATIONS, by additions, deletions, clarifications, or corrections.

1.3 BID - The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.

1.4 BIDDER - Any person, firm, or corporation submitting a BID for the WORK.

1.5 BONDS - Bid, Performance, and Payment Bonds and other instruments of surety, furnished by the CONTRACTOR and the CONTRACTOR'S surety in accordance with the CONTRACT DOCUMENTS.

1.6 CHANGE ORDER - A written order to the CONTRACTOR authorizing an addition, deletion, or revision in the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or CONTRACT TIME.

1.7 CONTRACT DOCUMENTS - The contract, including Advertisement For BIDS, Information For BIDDERS, BID, BID BOND, Agreement, Payment BOND, Performance BOND, NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE ORDER, DRAWINGS, SPECIFICATIONS, and ADDENDA.

1.8 CONTRACT PRICE - The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

1.9 CONTRACT TIME - The number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

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

1.11 DRAWINGS - The parts of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ENGINEER.

1.12 ENGINEER - The person, firm, or corporation named as such in the CONTRACT DOCUMENTS.

1.13 FIELD ORDER - A written order effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, issued by the ENGINEER to the CONTRACTOR during construction.

1.14 NOTICE OF AWARD - The written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

1.15 NOTICE TO PROCEED - Written communication issued by the OWNER to the CONTRACTOR authorizing him/her to proceed with the WORK and establishing the date for commencement of the WORK.

1.16 OWNER - A public or quasi-public body or authority, corporation, association, partnership, or an individual for whom the WORK is to be performed.

1.17 PROJECT - The undertaking to be performed as provided in the CONTRACT DOCUMENTS.

1.18 RESIDENT PROJECT REPRESENTATIVE - The authorized representative of the OWNER who is assigned to the PROJECT site or any part thereof.

1.19 SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, SUPPLIER or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.

1.20 SPECIFICATIONS - A part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

1.21 SUBCONTRACTOR - An individual, firm, or corporation having a direct contract with CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

1.22 SUBSTANTIAL COMPLETION - That date certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed, in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

1.23 SUPPLEMENTAL GENERAL CONDITIONS - Modifications to General Conditions required by a Federal agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS, or such requirements that may be imposed by applicable state laws.

1.24 SUPPLIER - Any person or organization who supplies materials or equipment for the WORK, including that fabricated to a special design, but who does not perform labor at the site.

1.25 WORK - All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

1.26 WRITTEN NOTICE - Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at their last given address, or delivered in person to said party or their authorized representative on the WORK.

2. *ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS*

2.1 The CONTRACTOR may be furnished additional instructions and detail drawings, by the ENGINEER, as necessary to carry out the WORK required by the CONTRACT DOCUMENTS.

2.2 The additional drawings and instructions thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

3. SCHEDULES, REPORTS AND RECORDS

3.1 The CONTRACTOR shall submit to the OWNER such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the CONTRACT DOCUMENTS for the WORK to be performed.

3.2 Prior to the first partial payment estimate the CONTRACTOR shall submit construction progress schedules showing the order in which the CONTRACTOR proposes to carry on the WORK, including dates at which the various parts of the WORK will be started, estimated date of completion of each part and, as applicable:

3.2.1 The dates at which special detail drawings will be required; and

3.2.2 Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

3.3 The CONTRACTOR shall also submit a schedule of payments that the CONTRACTOR anticipates will be earned during the course of the WORK.

4. DRAWINGS AND SPECIFICATIONS

4.1 The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS and all incidental work necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

4.2 In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over general DRAWINGS.

4.3 Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site conditions or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.

5. SHOP DRAWINGS

5.1 The CONTRACTOR shall provide SHOP DRAWINGS as may be necessary for the prosecution of the WORK as required by the CONTRACT DOCUMENTS. The ENGINEER shall promptly review all SHOP DRAWINGS. The ENGINEER'S approval of any SHOP DRAWING shall not release the CONTRACTOR from responsibility for deviations from the CONTRACT DOCUMENTS. The approval of any SHOP DRAWING which substantially deviates from the requirement of the CONTRACT DOCUMENTS shall be evidenced by a CHANGE ORDER.

5.2 When submitted for the ENGINEER's review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.

5.3 Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been approved by the ENGINEER. A copy of each approved SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ENGINEER.

6. *MATERIALS, SERVICES AND FACILITIES*

6.1 It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

6.2 Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

6.3 Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

6.4 Materials, supplies, and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

6.5 Materials, supplies, or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

7. *INSPECTION AND TESTING*

7.1 All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

7.2 The OWNER shall provide all inspection and testing services not required by the CONTRACT DOCUMENTS.

7.3 The CONTRACTOR shall provide at the CONTRACTOR'S expense the testing and inspection services required by the CONTRACT DOCUMENTS.

7.4 If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing or approval.

7.5 Inspections, tests, or approvals by the engineer or others shall not relieve the CONTRACTOR from the obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.

7.6 The ENGINEER and the ENGINEER'S representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records or personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection or testing thereof.

7.7 If any WORK is covered contrary to the written instructions of the ENGINEER it must, if requested by the ENGINEER, be uncovered for the ENGINEER'S observation and replaced at the CONTRACTOR'S expense.

7.8 If the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request, will uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such WORK is defective, the CONTRACTOR will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, if, however, such WORK is not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT

PRICE or an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate CHANGE ORDER shall be issued.

8. SUBSTITUTIONS

8.1 Whenever a material, article, or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue numbers, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

9. PATENTS

9.1 The CONTRACTOR shall pay all applicable royalties and license fees, and shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or product of a particular manufacturer or manufacturers is specified, however, if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, the CONTRACTOR shall be responsible for such loss unless the CONTRACTOR promptly gives such information to the ENGINEER.

10. SURVEYS, PERMITS, REGULATIONS

10.1 The OWNER shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the WORK together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pipe locations and other working points, lines, elevations and cut sheets.

10.2 The CONTRACTOR shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, shall be charged with the resulting expense and shall be responsible for any mistake that may be caused by their unnecessary loss or disturbance.

10.3 Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SUPPLEMENTAL GENERAL CONDITIONS. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, the CONTRACTOR shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in Section 13, CHANGES IN THE WORK.

11. PROTECTION OF WORK, PROPERTY, AND PERSONS

11.1 The CONTRACTOR will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR will take all necessary precautions for the safety of, will provide the necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

11.2 The CONTRACTOR will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The CONTRACTOR will erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. The CONTRACTOR will notify owners of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone directly or indirectly employed by any of them or anyone of whose acts any of them be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the OWNER, of the ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.

11.3 In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instructions or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury or loss. The CONTRACTOR will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.

12. SUPERVISION BY CONTRACTOR

12.1 The CONTRACTOR will supervise and direct the WORK. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR will employ and maintain on the WORK a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CONTRACTOR and all communications given to the supervisor shall be as binding as if given to the CONTRACTOR. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

13. CHANGES IN THE WORK

13.1 The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the Agreement. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by CHANGE ORDER.

13.2 The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles the CONTRACTOR to a change in CONTRACT PRICE or TIME, or both, in which event the CONTRACTOR shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

14. CHANGES IN CONTRACT

14.1 The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

a. Unit prices previously approved.

b. An agreed lump sum.

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1 The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

15.2 The CONTRACTOR will proceed with the WORK at such rate of progress to insure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK.

15.3 If the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR will pay to the OWNER the amount for liquidated damages as specified in the BID for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS.

15.4 The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the OWNER or ENGINEER.

15.4.1 To any preference, priority or allocation order duly issued by the OWNER.

15.4.2 To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

15.4.3 To any delays of SUBCONTRACTORS occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

16. CORRECTION OF WORK

16.1 The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and reexecute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.

16.2 All removal and replacement WORK shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected WORK within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such WORK and store the materials at the expense of the CONTRACTOR.

17. SUBSURFACE CONDITIONS

17.1 The CONTRACTOR shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the OWNER by WRITTEN NOTICE of:

17.1.1 Subsurface or latent physical conditions at the site differing materially from those indicated in the CONTRACT DOCUMENTS; or

17.1.2 Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the CONTRACT DOCUMENTS.

17.2 The OWNER shall promptly investigate the conditions, and if it is found that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the WORK, an equitable adjustment shall be made and the CONTRACT DOCUMENTS shall be modified by a CHANGE ORDER. Any claim of the CONTRACTOR for adjustment hereunder shall not be allowed unless the required WRITTEN

NOTICE has been given; provided that the OWNER may, if the OWNER determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

18. SUSPENSION OF WORK, TERMINATION, AND DELAY

18.1 The OWNER may suspend the WORK or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR and the ENGINEER which shall fix the date on which WORK shall be resumed. The CONTRACTOR will resume that WORK on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any suspension.

18.2 If the CONTRACTOR is adjudged a bankrupt or insolvent, or makes a general assignment for the benefit of its creditors, or if a trustee or receiver is appointed for the CONTRACTOR or for any of its property, or if CONTRACTOR files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or repeatedly fails to make prompt payments to SUBCONTRACTORS or for labor, materials or equipment or disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the WORK or disregards the authority of the ENGINEER, or otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and its surety a minimum of ten (10) days from delivery of a WRITTEN NOTICE, terminate the services of the CONTRACTOR and take possession of the PROJECT and of all materials, equipment, tools, construction equipment and machinery thereon owned by the CONTRACTOR, and finish the WORK by whatever method the OWNER may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished. If the unpaid balance of the CONTRACT PRICE exceeds the direct and indirect costs of completing the PROJECT, including compensation for additional professional services, such excess SHALL BE PAID TO THE CONTRACTOR. If such costs exceed such unpaid balance, the CONTRACTOR will pay the difference to the OWNER. Such costs incurred by the OWNER will be determined by the ENGINEER and incorporated in a CHANGE ORDER.

18.3 Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

18.4 After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, the OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the PROJECT and terminate the CONTRACT. In such case the CONTRACTOR shall be paid for all WORK executed and any expense sustained plus reasonable profit.

18.5 If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER or awarded by arbitrators within thirty (30) days of its approval and presentation, then the CONTRACTOR may, after ten (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER terminate the CONTRACT and recover from the OWNER payment for all WORK executed and all expenses sustained. In addition and in lieu of terminating the CONTRACT, if the ENGINEER has failed to act on a request for payment or if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may upon ten (10) days written notice to the OWNER and the ENGINEER stop the WORK until paid all amounts then due, in which event and upon resumption of the WORK CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME or both to compensate for the costs and delays attributable to the stoppage of the WORK.

18.6 If the performance of all or any portion of the WORK is suspended, delayed, or interrupted as a result of a failure of the OWNER or ENGINEER to act within the time specified in the CONTRACT DOCUMENTS, or if no time is specified, within a reasonable time, an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, shall be made by CHANGE ORDER to compensate the CONTRACTOR for the costs and delays necessarily caused by the failure of the OWNER or ENGINEER.

19. PAYMENT TO CONTRACTOR

19.1 At least ten (10) days before each progress payment falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect the OWNER'S interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing approval of payment, and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing the reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within sixty (60) days of presentation of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate less the retainage. The retainage shall be an amount equal to 5% of said estimate for contracts over $500,000.00 and 10% for contracts under $500,000.00. If at any time thereafter when the progress of the WORK is not satisfactory, additional amounts may be retained. Upon substantial completion of the work, any amount retained may be paid to the CONTRACTOR. When the WORK has been substantially completed except for WORK which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgment of the OWNER are valid reasons for noncompletion, the OWNER may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the WORK still to be completed.

19.2 The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

19.3 Prior to SUBSTANTIAL COMPLETION, the OWNER, with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

19.4 The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK except such as may be caused by agents or employees of the OWNER.

19.5 Upon completion and acceptance of the WORK, the ENGINEER shall issue a certificate attached to the final payment request that the WORK has been accepted under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of the WORK.

19.6 The CONTRACTOR will indemnify and save the OWNER or the OWNER'S agents harmless from all claims growing out of the lawful demand of SUBCONTRACTORS, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the CONTRACTOR shall be resumed in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, the CONTRACTOR'S Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

19.7 If the OWNER fails to make payment thirty (30) days after approval by the ENGINEER, in addition to other remedies available to the CONTRACTOR, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the CONTRACTOR.

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

20.1 The acceptance by the CONTRACTOR of final payment shall be and shall operate as a release to the OWNER of all claims and all liability to the CONTRACTOR other than claims in stated amounts as may be specifically excepted by the CONTRACTOR for all things done or furnished in connection with this WORK and for every act and neglect of the OWNER and others relating to or arising out of this WORK. Any payment, however, final or otherwise, shall not release the CONTRACTOR or its sureties from any obligations under the CONTRACT DOCUMENTS or the Performance and Payment BONDS.

21. INSURANCE

21.1 The CONTRACTOR shall purchase and maintain such insurance as will protect it from claims set forth below which may arise out of, or result from, the CONTRACTOR'S execution of the WORK, whether such execution be by the CONTRACTOR, any SUBCONTRACTOR, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

21.1.1 Claims under workmen's compensation, disability benefit and other similar employee benefit acts;

21.1.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of employees;

21.1.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than employees;

21.1.4 Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the CONTRACTOR, or (2) by any other person; and

21.1.5 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

21.2 Certificates of Insurance acceptable to the OWNER shall be filed with the OWNER prior to commencement of the WORK. These Certificates shall contain a provision that coverage's afforded under the policies will not be canceled unless at least fifteen (15) days prior WRITTEN NOTICE has been given to the OWNER.

21.3 The CONTRACTOR shall procure and maintain, at the CONTRACTOR'S own expense, during the CONTRACT TIME, Liability insurance as hereinafter specified:

21.3.1 CONTRACTOR'S General Public Liability and Property Damage Insurance including vehicle coverage issued to the CONTRACTOR and protecting the CONTRACTOR from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the CONTRACT DOCUMENTS, whether such operations be by the CONTRACTOR or by any SUBCONTRACTOR employed by the CONTRACTOR or anyone directly or indirectly employed by the CONTRACTOR or by a SUBCONTRACTOR employed by the CONTRACTOR. Insurance shall be written with a limit of liability of not less than $500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than $500,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $200,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than $200,000 aggregate for any such damage sustained by two or more persons in any one accident.

21.3.2 The CONTRACTOR shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the PROJECT to the full insurable value thereof for the benefit of the OWNER, the CONTRACTOR, and SUBCONTRACTORS as their interest may appear. This provision shall in no way release the CONTRACTOR or CONTRACTOR'S surety from obligations under the CONTRACT DOCUMENTS to fully complete the PROJECT.

21.4 The CONTRACTOR shall procure and maintain, at the CONTRACTOR'S own expense, during the CONTRACT TIME, in accordance with the provisions of the laws of the state in which the WORK is performed, Workmen's Compensation Insurance, including occupational disease provisions, for all of the CONTRACTOR'S employees at the site of the PROJECT and in case any WORK is sublet, the CONTRACTOR shall require such SUBCONTRACTOR similarly to provide Workmen's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. In case any class of employees engaged in hazardous work under this contract at the site of the PROJECT is not protected under Workmen's Compensation statue, the CONTRACTOR shall provide, and shall cause each SUBCONTRACTOR to provide, adequate and suitable insurance for the protection of its employees not otherwise protected.

21.5 The CONTRACTOR shall secure, if applicable, "All Risk" type Builder's Risk Insurance for WORK to be performed. Unless specifically authorized by the OWNER, the amount of such insurance shall not be less than the CONTRACT PRICE totaled in the BID. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the CONTRACT TIME, and until the WORK is accepted by the OWNER. The policy shall name as the insured the CONTRACTOR, and the OWNER.

22. CONTRACT SECURITY

22.1 The CONTRACTOR shall within fourteen (14) days after the receipt of the NOTICE OF AWARD furnish the OWNER with a Performance BOND and a Payment BOND in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these BONDS shall be borne by the CONTRACTOR. If at any time a surety on any such BOND is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the list of Surety Companies accepted on Federal Bonds, CONTRACTOR shall within fourteen (14) days after notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

23. ASSIGNMENTS

23.1 Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of any right, title or interest therein, or any obligations thereunder, without written consent of the other party.

24. INDEMNIFICATION

24.1 The CONTRACTOR will indemnify and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

24.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by any employee 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, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

24.3 The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, its agents or employees arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, CHANGE ORDERS, designs or SPECIFICATIONS.

25. SEPARATE CONTRACTS

25.1 The OWNER reserves the right to let other contracts in connection with this PROJECT. The CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and the execution of their WORK, and shall properly connect and coordinate the WORK with theirs. If the proper execution or results of any part of the CONTRACTOR'S WORK depends upon the WORK of any other CONTRACTOR, the CONTRACTOR shall inspect and promptly report to the ENGINEER any defects in such WORK that render it unsuitable for such proper execution and results.

25.2 The OWNER may perform additional WORK related to the PROJECT or the OWNER may let other contracts containing provisions similar to these. The CONTRACTOR will afford the other CONTRACTORS who are parties to such Contracts (or the OWNER, if the OWNER is performing the additional WORK) reasonable opportunity for the introduction and storage of materials and equipment and the execution of WORK, and shall properly connect and coordinate the WORK with theirs.

25.3 If the performance of additional WORK by other CONTRACTORS or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the CONTRACT, written notice thereof shall be given to the CONTRACTOR prior to starting any such additional WORK. If the CONTRACTOR believes that the performance of such additional WORK by the OWNER or others involves it in additional expense or entitles it to an extension of the CONTRACT TIME, the CONTRACTOR may make a claim thereof as provided in Sections 14 and 15.

26. SUBCONTRACTING

26.1 The CONTRACTOR may utilize the services of specialty SUBCONTRACTS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.

26.2 The CONTRACTOR shall not award WORK to SUBCONTRACTOR(s), in excess of fifty (50%) percent of the CONTRACT PRICE, without prior written approval of the OWNER.

26.3 The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of its SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as the CONTRACTOR is for the acts and omissions of persons directly employed by the CONTRACTOR.

26.4 The CONTRACTOR shall cause appropriate provisions to be inserted in all subcontracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS insofar as applicable to the WORK of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.

26.5 Nothing contained in this CONTRACT shall create any contractual relationship between any SUBCONTRACTOR and the OWNER.

27. ENGINEER'S AUTHORITY

27.1 The ENGINEER shall act as the OWNER'S representative during the construction period, shall decide questions which may arise as to quality and acceptability of materials furnished and WORK performed, and shall interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ENGINEER will make visits to the site and determine if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS.

27.2 The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship, and execution of the WORK. Inspections may be made at the factory or fabrication plant of the source of material supply.

27.3 The ENGINEER will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

27.4 The ENGINEER shall promptly make decisions relative to interpretation of the CONTRACT DOCUMENTS.

28. LAND AND RIGHTS-OF-WAY

28.1 Prior to issuance of NOTICE TO PROCEED, the OWNER shall obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.

28.2 The OWNER shall provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.

28.3 The CONTRACTOR shall provide at its own expense and without liability to the OWNER any additional land and access thereto that the CONTRACTOR may desire for temporary construction facilities, or for storage of materials.

29. GUARANTEE

29.1 The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of one (1) year from the date of SUBSTANTIAL COMPLETION. The CONTRACTOR warrants and guarantees for a period of one (1) year from the date of SUBSTANTIAL COMPLETION of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance BOND shall remain in full force and effect through the guarantee period.

30. TAXES

30.1 Note: St. John the Baptist Parish will provide documentation to support their tax free purchases for this project.

31. ENVIRONMENTAL REQUIREMENTS

The CONTRACTOR, when constructing a project involving trenching and/or other related earth excavation, shall comply with the following environmental constraints.

31.1 WETLANDS - The CONTRACTOR, when disposing of excess, spoil, or other construction materials on public or private property, WILL NOT FILL IN or otherwise CONVERT WETLANDS.

31.2 FLOODPLAINS - The CONTRACTOR, when disposing of excess, spoil, or other construction materials on public or private property, WILL NOT FILL IN or otherwise CONVERT 100 YEAR FLOODPLAIN areas delineated on the latest FEMA Floodplain Maps.

31.3 HISTORIC PRESERVATION - Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the PROJECT ENGINEER. Construction shall be temporarily halted pending the notification process and further directions issued after consultation with the State Historic Preservation Officer (SHPO).

31.4 ENDANGERED SPECIES - The CONTRACTOR shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of the CONTRACTOR, the CONTRACTOR will immediately report this evidence to the PROJECT ENGINEER. Construction shall be temporarily halted pending the notification process and further directions issued after consultation with the U.S. Fish and Wildlife Service.

END OF SECTION

SECTION 00800 –
SUPPLEMENTAL GENERAL CONDITIONS

The provisions of the Supplemental General Conditions as described herein change, amend, or supplement the General Conditions and shall supersede any conflicting provisions of this CONTRACT. All provisions of the General Conditions which are not changed, amended, or supplemented, remain in full force.

1 CONTRACT APPROVAL
2 CONTRACT CHANGE ORDERS
3 PARTIAL PAYMENT ESTIMATES
4 CONFLICT OF INTEREST
5 PROTECTION OF LIVES AND PROPERTY
6 REMEDIES
7 GRATUITIES
8 AUDIT AND ACCESS TO RECORDS

1. CONTRACT APPROVAL

1.1 Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

2. CONTRACT CHANGE ORDERS

2.1 All changes affecting the project's construction cost or modifications of the terms or conditions of the contract must be authorized by means of a written contract change order which is mutually agreed to by the OWNER and CONTRACTOR. The contract change order will include extra work, work for which quantities have been altered from those shown in the bidding schedule, as well as decreases or increases in the quantities of installed units which are different than those shown in the bidding schedule because of final measurements. All changes must be recorded on a contract change order before they can be included in a partial payment estimate.

2.2 When the CONTRACT sum is, in whole or in part, based on unit prices, the OWNER reserves the right to increase or decrease a unit price quantity as may be deemed reasonable or necessary in order to complete the work contemplated by this CONTRACT.

3. PARTIAL PAYMENT ESTIMATES

3.1 The OWNER may after consultation with the ARCHITECT/ENGINEER withhold or, on account of subsequently discovered evidence, nullify the whole or part of any approved partial payment estimate to such extent as may be necessary to protect the OWNER from loss on account of:

3.1.1 Defective work not remedied.

3.1.2 Claims filed.

3.1.3 Failure of CONTRACTOR to make payments properly to subcontractors or suppliers.

3.1.4 A reasonable doubt that the WORK can be completed for the balance then unpaid.

3.1.5 Damage to another CONTRACTOR.

3.1.6 Performance of WORK in violation of the terms of the CONTRACT DOCUMENTS.

3.2 Where WORK on unit price items is substantially complete but lacks testing, clean-up and/or corrections, amounts shall be deducted from unit prices in partial payment estimates to amply cover such testing, clean-up and/or corrections.

3.3 When the items in 3.2 and 3.3 are cured, payment shall be made for amounts withheld because of them.

3.4 Payments will not be made that would deplete the retainage nor place in escrow any funds that are required for retainage nor invest the retainage for the benefit of the CONTRACTOR.

4. CONFLICT OF INTEREST

4.1 Unacceptable bidders. An ENGINEER (individual or firm including persons they employ) who has prepared plans and specifications will not be considered an acceptable bidder. Any firm or corporation in which such ENGINEER (including persons they employ) is an officer, employee, or holds or controls a substantial interest will not be considered an acceptable bidder. Contracts or purchases by the CONTRACTOR shall not be awarded or made to a supplier or manufacturer if the ENGINEER (firm or individual) who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Bids will not be awarded to firms or corporations which are owned or controlled wholly or in part by a member of the governing body of the OWNER or to an individual who is such a member.

4.2. The OWNER'S officers, employees, or agents shall not engage in the award or administration of this CONTRACT if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (a) the employee, officer or agent; (b) any member of their immediate family; (c) their partner or (d) an organization which employs, or is about to employ, any of the above has financial or other interest in the CONTRACTOR. The OWNER'S officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from the CONTRACTOR or subcontractor.

5. PROTECTION OF LIVES AND PROPERTY

5.1 In order to protect the lives and health of its employees under the CONTRACT, the CONTRACTOR shall comply with all pertinent provisions of the Occupational Safety and Health Administration (OSHA) and any State Safety and Health agency requirements.

5.2 The CONTRACTOR alone shall be responsible for the safety, efficiency, and adequacy of its plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation.

6. REMEDIES

Unless otherwise provided in this CONTRACT, all claims, counterclaims, disputes, and other matters in question between the OWNER and the CONTRACTOR arising out of or relating to this CONTRACT or the breach thereof will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State in which the OWNER is located.

7. GRATUITIES

7.1 If the OWNER finds after a notice and hearing that the CONTRACTOR, or any of the CONTRACTOR'S agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of the OWNER, in an attempt to secure this CONTRACT or favorable treatment in awarding, amending, or making any determinations related to the performance of this CONTRACT, the OWNER may, by written notice to the CONTRACTOR, terminate this CONTRACT. The OWNER may also pursue other rights and remedies that the law or this CONTRACT provides. However, the existence of the facts on which the OWNER bases such findings shall be an issue and may be reviewed in proceedings under the Remedies clause of this CONTRACT.

7.2 In the event this CONTRACT is terminated as provided in paragraph 7.1 the OWNER may pursue the same remedies against the CONTRACTOR as it could pursue in the event of a breach of the CONTRACT by the

CONTRACTOR. As a penalty, in addition to any other damages to which it may be entitled by law, the OWNER may pursue exemplary damages in an amount (as determined by the OWNER) which shall be not less than three nor more than ten times the costs the CONTRACTOR incurs in providing any such gratuities to any such officer or employee.

8. AUDIT AND ACCESS TO RECORDS

For all negotiated contracts (except those of $10,000 or less), the OWNER or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the CONTRACTOR, which are pertinent to the CONTRACT, for the purpose of making audits, examinations, excerpts and transcriptions. The CONTRACTOR shall maintain all required records for three years after final payment is made and all other pending matters are closed.

END OF SECTION

1.01 SCOPE OF WORK

Work to be performed under this Project shall include, but is not necessarily limited to the following: Pump replacement, piping replacement, new concrete slab, painting/coating, electrical and instrumentation work and bypass pumping.

1.02 TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Contractor shall begin work on or before the date stipulated in the Notice to Proceed. Due consideration has been given to normal bad weather and delays in specifying the contract times. By entering this Contract, each respective CONTRACTOR and the OWNER both mutually agree that failure to complete the Contract within time limits constitutes due cause for liquidated damages. Furthermore, both parties to the Contract hereby agree that the amount of liquidated damages is recognized as the amount of actual damage to the OWNER and is not assessed as a penalty.

Contract	Consecutive Calendar Days	Liquidated Damages/ Day
Main Wastewater Pump Station Rehabilitation	270	$750

Reasonable anticipated days for bad weather shall not be cumulative and are as follows:

January	11 days	July	6 days
February	10 days	August	5 days
March	8 days	September	4 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	8 days

The Contractor shall ask for total adverse weather days; and shall only be allowed for the number days in excess of the days stated above. Adverse Weather shall be defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:

i. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure.
ii. Temperatures that do not rise above or drop below that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
iii. Sustained wind in excess of twenty-five (25) m.p.h.

Adverse Weather may include, if appropriate, "dry-out" or "mud" days resulting from precipitation days;

i. only if there is a hindrance to site access or site work and Contractor has taken all reasonable accommodations to avoid such hindrance; and,
ii. at a rate no greater than 1 make-up day for each day or consecutive days of precipitation that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Designer.

1.03 LABOR

All skilled and unskilled labor, craftsmen and mechanics must be proficient in their respective trades as deemed satisfactory to the ENGINEER.

1.04 PERFORMANCE-PAYMENT BOND

It is a condition of these Contracts that the Performance-Payment Bond shall be countersigned by a properly licensed resident agent of the State in which the Contract is performed.

1.05 HEALTH AND SAFETY

The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction, promulgated under the Occupational and Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), and updated laws and acts.

1.06 CHANGES IN SCOPE OF WORK

The OWNER shall have the right to increase or diminish the amount of work to be done under the Contract at any time or times during the life of the Contract, provided that the total increase or diminution does not exceed thirty percent (30%) of the amount of the contract as bid on. The total increase or decrease may be applied to any one item or to any number of items, or any item or items may be entirely eliminated. No allowances will be made for real or supposed loss of anticipated profits on account of such increase or diminution. Any claim for an extension of time caused by additions to the work shall be adjusted at the time such addition is authorized. Charges or credits for the work covered by the approved change shall be determined by the method in the General Conditions.

Change Orders which exceed the thirty percent (30%) change in the total contract price shall be determined by the method of actual cost plus percentage adjustment for profit and overhead to the mutual satisfaction of the OWNER and the Contractor.

1.07 INSPECTION BY GOVERNMENT AGENCIES

Representatives of Federal, state and local agencies, concerned directly or indirectly with the project, shall have access to the work wherever it is in preparation or progress, and the CONTRACTOR shall provide proper facilities for such access and inspection.

1.08 WORK SCHEDULES

The Contractor shall supply the ENGINEER with daily work schedules that give the type of work to be performed, location of work, and time the work will begin. This work schedule shall be given to the ENGINEER at least 24 hours prior to commencing the work so listed.

1.09 MEASUREMENT AND PAYMENT

Payment will be made only for the items of work listed in the BID FORM. The cost of all other work necessary shall be included in the items for which unit prices are established.

Partial payment, cost breakdown, estimates, etc. shall be in accordance with the General Conditions.

1.10 "OR EQUAL" CLAUSE

Where specific manufacturers' names are used to describe requirements of the Specifications, it is understood that an approved equal product will be considered.

1.11 GUARANTEE

The Contractor shall guarantee all workmanship and materials under this Contract for a period of twelve (12) months after FINAL ACCEPTANCE of the Contract and shall in the event of failure of any item due to faulty workmanship or materials replace same without cost to the OWNER.

1.12 PRECONSTRUCTION CONFERENCE

The preconstruction conference will be held at a time and place as directed by the ENGINEER. The successful Bidder shall submit his construction schedule to the OWNER at least seven (7) days prior to the preconstruction conference for review and approval. The preconstruction conference will not be scheduled until the contractor submits his construction schedule.

1.13 PLANS AND SPECIFICATIONS

The ENGINEER shall furnish to the CONTRACTOR without charge two (2) copies of the Plans and Specifications for the CONTRACTOR's use in constructing the project.

The ENGINEER shall provide to the CONTRACTOR additional copies of the Plans and Specifications at a cost of $150.00 per set.

1.14 LOCATION, PROTECTION AND REPAIR OF ANY DAMAGE TO EXISTING UTILITIES

The Contractor is advised that existing overhead and underground utilities such as (but not limited to) electrical lines and poles, telephone cables, gas lines, water lines, fiber optic cables, and sanitary sewers, exist in the rights-of-way where the proposed improvements are to be installed, all in accordance with the provisions of R.S. 38:2223. It shall be the Contractor's responsibility to protect these existing utilities during construction of the work to be installed under this Contract and any damage to existing utilities caused by negligent acts of the Contractor shall be repaired by the Contractor at his own expense. The Contractor shall contact Louisiana One Call a minimum of 48 hours prior to beginning construction in the work area.

1.15 SHOP DRAWINGS AND MATERIALS

Prior to final acceptance, the CONTRACTOR shall furnish to the OWNER three (3) copies of diagrams, curves, data, operation and maintenance manuals, and spare parts lists for all pieces of equipment furnished.

Materials data, information, dimensions, and specifications, shall be submitted to the ENGINEER for review prior to ordering for major material items such as pipe, fittings, valves, prefabricated manholes and casing pipe.

1.16 RECORD DRAWINGS

Contractor shall furnish all necessary field information to the Owner such as marked up drawings for completion of record drawings.

1.17 GENERAL AND SUPPLEMENTAL CONDITIONS

If any conflicts occur between the General and Supplemental Conditions, then the most stringent will govern.

1.18 EXCAVATION AND REPLACEMENT OF CULVERTS, DRIVEWAYS, AND LAWNS

The Contractor shall be responsible for excavation, removal and replacement (or reinstallation) of all culverts, driveways and lawns damaged where as required to install sewer lines. The cost for the removal and replacement shall be included in the unit price bid in Section 00300. If reinstallation is not possible contractor shall replace driveway, lawn or culvert to the approval of the Engineer. At the end of each day, the Contractor shall make all driveways accessible unless given

approval by the Resident Project Representative or Engineer.

1.19 CONFORMANCE TO MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

During performance of work within the right-of-way of interstate, state, or rural highways, the CONTRACTOR shall provide traffic control and warning devices in accordance with the latest revision of the "Manual on Uniform Traffic Control Devices" as adopted by the Louisiana Department of Transportation and Development."

1.20 AUTHORIZATION TO EXECUTE DOCUMENTS

The successful BIDDER shall furnish a certified copy of the minutes of the corporation or partnership meeting which authorized the party executing the bid and contract to sign on behalf of the CONTRACTOR.

1.21 TOOLS, PLANT AND EQUIPMENT

If at any time before the commencement or during the progress of the work, tools, plant, or equipment appear to the ENGINEER to be insufficient, inefficient, or inappropriate to secure the quality of work required or the proper rate of progress, the ENGINEER may order the CONTRACTOR to increase their efficiency to improve their character, to augment their number, or to substitute new tools, plant, or equipment as the case may be, and the CONTRACTOR must conform to such order; but the failure of the ENGINEER to demand such increase of efficiency number, or improvement shall not relieve the CONTRACTOR of his obligation to secure the quality of work and the rate of progress necessary to complete the work within the time required by this Contract to the satisfaction of the OWNER.

1.22 PLANS

The word PLANS shall have the same meanings as the word DRAWINGS in the Specifications and Contract Documents.

1.23 LETTER OF SUBSTANTIAL COMPLETION

The Letter of Substantial Completion will be issued by the ENGINEER to the CONTRACTOR for filing at the Parish Court House to initiate the final forty-five (45) day lien period for the Contract. There shall be attached to the Certificate of Substantial Completion a "tentative list of items" (with designated dollar values) to be completed or corrected prior to the final payment. This will be called the "Special Retainage Punch List" and the value of said punch list items times two will be withheld from the Contractor until all such items have been completed. No payment of the special retainage shall be made until all items on the "Special Retainage Punch List" have been completed unless specifically approve by the Owner, at his sole discretion. In no instance will the special retainage exceed the retainage authorized by state of five percent (5%) on contracts of $500,000 and more or the ten percent (10%) retainage on contracts of less the $500,000. If after the 45 day lien period the Contractor fails to address, to the satisfaction of the Owner and Engineer, the "tentative list of items", the Owner shall have the right to reinstate the liquidated damages provision of the Contract at a rate of $250.00 per day.

1.24 USE OF CHEMICALS

All chemicals used during construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or other classification, must show approval of DNR or U.S.D.A. Use of such chemicals and disposal of residues shall be in strict conformance with the instructions.

1.25 BID ANALYSIS AND AWARD

If the contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. Alternates, if accepted, shall be accepted in the order in which they appear on the bid form. Determination of the low bidder shall be on the basis

of the base bid plus any alternates accepted, if any. The Owner reserves the right to reject any and all bids for just cause as permitted by public bid laws.

1.26 NOTIFICATION OF COMMENCEMENT OF WORK

Prior to the CONTRACTOR starting the job, he shall notify the ENGINEER at least forty-eight (48) hours in advance of his proposed time of commencement.

1.27 WASTE MATERIALS

All waste materials from excavations or removals shall be hauled from the site and shall be disposed of by the CONTRACTOR in a manner acceptable to the ENGINEER at no cost to the OWNER unless otherwise directed by the ENGINEER and the OWNER to be turned over to the OWNER.

1.28 SEQUENCE OF CONSTRUCTION

Before commencing work, the CONTRACTOR shall submit to the ENGINEER for approval his proposed sequence of construction. Subsequent to the ENGINEER'S approval, deviations from the approved sequence of construction shall not be made without written approval of the ENGINEER.

1.29 INTERRUPTION OF TRAFFIC

During construction, the CONTRACTOR shall under no circumstances block traffic at more than one end of the same block. Traffic will always be allowed entry and exit from blocks. Detours shall be provided where through traffic will be blocked. The CONTRACTOR shall provide a schedule and plan of work on street crossing to the Resident Project Representative or ENGINEER for approval prior to the start of construction.

1.30 EROSION AND SILTATION

The Contractor shall proceed with all construction activities in a manner that will minimize siltation and bank erosion during construction. Upon completion of all construction activities, all disturbed areas shall be returned to existing or better conditions.

1.31 WELL POINTS, SHEETING AND BRACING (NO DIRECT PAY ITEM)

The Contractor shall include in the unit price for sewer lines, pump stations, and other structures the required dewatering and shoring of excavations during construction. The cost for dewatering and shoring shall be included in the unit prices for sewer lines, manholes, pumping stations, and other structures and no additional payment will be made therefore.

1.32 RECORD DRAWINGS (NO DIRECT PAY ITEM)

Record information concurrently with construction progress and do not conceal any work until required information is recorded.

A. Legibly mark drawings to record actual construction.

1. Elevations of various structure elements in relation to elevation datum.

2. All underground piping and appurtenances, including service lines, sewer main, man holes, service wyes, cleanouts, etc. with elevations and dimensions, changes to piping, locations, horizontal and vertical location of underground piping, utilities (including electrical) and appurtenances referenced to permanent surface improvements, actual installed pipe material, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction by referencing to visible and accessible features of the structure.
4. Field changes of dimensions and details.
5. Changes made by field order or by change orders.
6. Details not on original contract drawings.
7. Equipment and piping relocations.

B. Furnish certified site survey and line elevations and stationing at 100 foot increments at all points of change of directions of pipelines by a registered land surveyor.

1.33 AUDIO-VIDEO RECORDS (NO DIRECT PAY ITEM)

Prior to commencement of any Contract or performance of any work, the Contractor shall provide a professionally made video tape of the entire site area. The video tape shall clearly show the existing conditions of the work area and adjacent to the work area and Contractor staging areas.

Additional features, if existent, shall also be video taped as follows:

1. Pavement
2. Curbs
3. Driveways
4. Sidewalks
5. Drainage Ditches and Catch Basins
6. Landscapes
7. Fences

The list above shall not be construed as all inclusive and the entire construction site area shall be included on the video.

Each video tape shall begin at one end of the project site and proceed uninterrupted to the other end of the project site. Progression along the project site shall be recorded and referenced to a tape counter and the plans in respect to items and areas being viewed. The contractor shall provide one (1) copy of the tape to the Owner/Engineer and retain the original.

The video inspection and tape will be provided by the contractor at no direct pay.

1.34 SPECIAL INSTRUCTIONS

Contractor shall record the Contract Agreement, Payment and Performance Bonds, and Insurance Certificate of this project at the St. John the Baptist Parish Court House and provide the recordation information to the Engineer prior to the commencement of work under this contract (No Additional Payment).

1.35 CONSTRUCTION MEETING

Construction meetings may be held at the discretion of the ENGINEER. Representatives of the OWNER, ENGINEER, RESIDENT PROJECT REPRESENTATIVE, CONTRACTOR, SUBCONTRACTORS and testing lab shall be present. The purpose of these meetings is to track progress and keep each party informed. The ENGINEER will be responsible for keeping minutes of the meetings. The CONTRACTOR will be responsible for bringing updated as-built drawings and construction schedules to each meeting for review by the ENGINEER.

1.36 ROADSIDE OBSTRUCTIONS (MAIL BOXES, SIGNS, TREES, ETC.)

The contractor is advised that obstructions exist along the roadside where the work is to be performed. These obstructions may include mailboxes, street signs, trees, etc. The contractor is further advised that obstructions of this nature shall be

removed and or removed and replaced as directed by the project engineer as necessary to properly carry out the work. THE CONTRACTOR SHALL RECEIVE NO DIRECT PAY FOR THIS WORK.

1.37 TECHNICAL SPECIFICATION CONFLICTS

In the event any provisions in any of the technical specifications or referenced technical specifications or standards may be in conflict or inconsistent with one another the more stringent shall apply. Reference is made to the "Louisiana Standard Specifications For Roads And Bridges" latest edition and copies shall be provided onsite for each project representative.

1.38 STORMWATER PERMITS (NO DIRECT PAY ITEM)

It shall be the Contractor's full responsibility to follow all applicable Best Management Practices as related to Stormwater Pollution Prevention and to obtain all required permits from the Louisiana Department of Environmental Quality (or any other Federal, State or Local Agency as applicable). If required by those agencies, the Contractor shall develop and maintain on site a Stormwater Pollution Prevention Plan. All such permits and/or plans shall be provided at no additional cost to the Owner.

1.39 DEMOBILIZATION NOTICE

Contractor shall give the Owner and the Engineer a 72-hour notice prior to demobilization of significant equipment off the jobsite.

1.40 MINIMAL INSURANCE COVERAGE REQUIREMENTS

Contractor shall have and maintain, until final acceptance of the Work by the Owner and Council, the minimum insurance described herein with an insurance company authorized to do business in the State of Louisiana that has an industry rating of at least A-, Class VI, according to Best's Key Rating Guide. Contractor shall deliver to Owner certificates of insurance showing such insurance is in effect prior to execution of the Contract, which certificates shall incorporate a provision that no cancellation or change in such insurance shall be effected without at least 30 days prior written notice being given to the Owner and Engineer. These requirements shall not be construed to limit any obligations of indemnity and/or defense of the Contractor or Surety, but constitutes minimum insurance requirements, which must be provided and maintained.

A. Standard Workmen's Compensation – Full statutory liability under Louisiana law with Employer's Liability Coverage.

B. Commercial General Liability coverage (ISO form CG 00 01) when the Contract amount is as follows:

1. General Aggregate:

CONTRACT AMOUNT	MINIMUM LIMITS OF INSURANCE
Less than 1,000,000	$1,000,000
$1,000,000 to $5,000,000	$2,000,000
$5,000,000 to $10,000,000	$3,000,000
Greater than $10,000,000	$4,000,000

2. Products – Completed Operations Aggregate:

CONTRACT AMOUNT	MINIMUM LIMITS OF INSURANCE
Less than 1,000,000	$1,000,000
$1,000,000 to $5,000,000	$2,000,000
$5,000,000 to $10,000,000	$3,000,000
Greater than $10,000,000	$4,000,000

3. Personal and Advertising Injury:

CONTRACT AMOUNT	MINIMUM LIMITS OF INSURANCE
Less than 5,000,000	$1,000,000
Greater than $5,000,000	$2,000,000

4. Each Occurrence:

CONTRACT AMOUNT	MINIMUM LIMITS OF INSURANCE
Less than $5,000,000	$1,000,000
Greater than $5,000,000	$2,000,000

The above Commercial General Liability coverage shall not be narrowed endorsement without the express written agreement of the Owner.

C. Business Auto Policy – Combined single limit $1,000,000.

D. Umbrella Liability: Lower primary limits will be accepted if Umbrella Coverage is provided with limits of at least $1,000,000 in excess of primary coverage shown on the certificate.

E. The **OWNER** shall be named on all liability policies described above as "additional insured" as respects liability arising out of the Project; products and completed operations of the Contractor, as well as premises owned, occupied or used by the Contractor. The additional insured coverage shall contain no special limitations on the scope of protection afforded to any additional insured. It is understood that the business auto policy under "Who is and Insured" automatically provides liability coverage in favor of the Owner. Any failure of Contractor to comply with any reporting provision of any policy shall not affect coverage provided to an additional insured.

F. Waiver of subrogation in favor of the **OWNER** is required on Worker's Compensation insurance.

G. The certificate holder shall be listed as follows:

ST. JOHN THE BAPTIST PARISH
Attn: Purchasing Division
1801 W. Airline Highway
LaPlace, LA 70068

H. The insurance to be provided by Contractor shall not include any exclusion or endorsement precluding coverage for claims between insureds and/or additional insureds.

END OF SECTION

DIVISION 1

GENERAL REQUIREMENTS

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

PART 1 - GENERAL

1.01 SCOPE AND INTENT

A. Description

1. The work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all work included in this Contract. The summary of the work is presented in Section 01010.

B. Work Included

1. The Contractor shall furnish all labor, superintendence, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all applicable required permits. He shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

2. The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefor.

3. The Contractor shall provide and maintain such modern tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment, prior approval of the Engineer notwithstanding.

C. Public Utility Installations and Structures

1. Prior to construction, the Contractor shall familiarize himself with the location of all existing utilities and facilities within the Project Sites, and with the applicable provisions of the General Conditions.

2. The Contractor shall notify utility companies at least 48 hours, excluding Saturdays, Sundays, and legal holidays, prior to excavation. Utility companies shall be contacted by calling the Louisiana One Call (D.O.T.T.I.E.) at 1-800-272-3020.

3. Public utility installations and structures understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water or other public or private property which may be affected by the work shall be deemed to be included hereunder.

4. The Contract Documents may contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.

5. The Contractor shall protect all public utility installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means approved by the Engineer. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor which are shown on the plans or have been located in the field by the utility shall be repaired by the Contractor, at his expense, as directed by the Engineer. No separate payment shall be made for such protection or repairs to public utility installations or structures.

6. Public utility installation or structures owned or controlled by the Owner or other governmental body which are shown on the plans to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as a part of the general cost of doing the work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefor.

7. Where public utility installations or structures owned or controlled by the Owner or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the engineer, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the General Conditions.

8. The Contractor shall, at all times in performance of the work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public utility installations and structures; and shall, at all times in the performance of the work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end. All Owner and other governmental utility departments and other owners of public utilities which may be affected by the work will be informed in writing by the Engineer within two weeks after the execution of the Contract or Contracts covering the work. Such notice will set out, in general, and direct attention to the responsibilities of the Owner and other governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the work and will be accompanied by one set of Plans and Specifications covering the work under such Contract or Contracts.

9. The Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the utility companies indicated on the Drawings.

10. The maintenance, repair, removal, relocation or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the Engineer.

1.02 PLANS AND SPECIFICATIONS

A. Plans

1. The Plans referred to in the Contract Documents bear the general project name and number as shown in the Advertisement for Bids.

2. When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

B. Copies Furnished to Contractor

1. In addition to the executed set of Contract Documents, the Owner will furnish, free of charge to the Contractor, two (2) sets of paper prints of the Plans and Specifications, the same size as the original drawings and specifications. Any additional Plans and Specifications, when requested, will be sold to the Contractor at the cost of reproduction.

2. The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as maybe required for their work.

C. Supplementary Drawings

1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer and five (5) paper prints thereof will be given to the Contractor.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Plans. Where such Supplementary Drawings require either less or more than the estimated quantities of work, credit to the Owner or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

D. Contractor to Check Plans and Data

1. The Contractor shall verify all dimensions, quantities and details shown on the plans, Supplementary Drawings, schedules, Specifications or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies and shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions he discovered. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

E. Specifications

1. The Technical Specifications consist of three (3) parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

F. Intent

1. All work called for in the Specifications applicable to this Contract, but not shown on the plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

3. The inclusion of the Related Requirements (or work specified elsewhere) in the General part of the specifications is only for the convenience of the Contractor, and shall not be interpreted as a complete list of related Specification Sections.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer

1. The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for approval, in accordance with the General Conditions as early as possible, to afford proper investigation and checking. Such approval must be obtained before Shop Drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. He shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

2. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor requests, in writing to the Engineer and the Engineer approves that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

3. Any two (2) or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery

1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the work so as to complete the work within the allotted time. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

C. Tools and Accessories

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

D. Spare parts shall be furnished as specified

1. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rating data.

E. Installation of Equipment

1. The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.

2. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the Engineer during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

3. The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the Engineer and made of ample size and strength for the purpose

intended. Substantial templates and working drawings for installation shall be furnished.

4. The Contractor shall, at his own expense, furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations. Grout shall completely fill the space between the equipment base and the foundation. All metal surfaces coming in contact with concrete or grout shall receive two (2) coats (9 mils each coat) of coal tar epoxy equal to Kop-Coat 300M.

F. Service of Manufacturer's Engineer

1. The Contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General

1. The Engineer may require testing by certified personnel of certain materials to be incorporated in the Work, such as: soils density, pavement, concrete pipe and appurtenances, and welds.

2. In the event any such testing is required by the Engineer, a detailed description will be found in these Technical Specifications concerned with the specific item of Work.

3. Inspection and testing of materials will be performed by the Owner unless otherwise specified.

4. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Five (5) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

5. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract, the Contractor will be notified thereof and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the Owner.

6. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

7. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

B. Costs

1. All inspection and testing of materials furnished under this Contract will be performed by the Owner or duly authorized inspection engineers or inspection bureaus without cost to the Contractor, unless otherwise expressly specified.

2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the Contract price.

3. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests on materials and equipment which are rejected for non-compliance.

C. Inspection of Materials

1. The Contractor shall give notice in writing to the Engineer, sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Engineer will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or he will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived. The Contractor must comply with these provisions before shipping any material. Such inspection shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

D. Certificate of Manufacture

1. When inspection is waived or when the Engineer so requires, the Contractor shall furnish to him authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer. The certificates shall be delivered to the Engineer prior to shipment of the materials.

E. Shop Tests of Operating Equipment

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the work until the Engineer notifies the Contractor, in writing, that the results of such tests are acceptable.

2. Five (5) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be forwarded to the Engineer for approval.

3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

F. Preliminary Field Tests

1. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments and replacements required. The furnishing Contractor shall assist in the preliminary field tests as applicable.

G. Final Field Tests

1. Upon completion of the work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contact Documents.

2. The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment and instruments necessary for all acceptance tests, at no additional cost to the Owner. The Furnishing Supplier shall assist in the final field tests as applicable.

H. Failure of Tests

1. Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to make these corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees or specified requirements, the Owner, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the Contractor to remove them from the site at his own expense.

2. If the failure during testing is fully or partly due to the equipment provided by the Furnishing Supplier, as determined by the Engineer, the Furnishing Supplier shall make all requirement improvements at no cost to the Owner.

3. In case the Owner rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the Owner may, after the expiration of a period of thirty (3) calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under his Contract.

4. The Owner agrees to obtain other equipment within a reasonable time and the Contractor agrees that the Owner may use the equipment furnished by him without rental or other charges until the new equipment is obtained.

I. Final Inspection

1. During such final inspections, the work shall be clean and free from water. In no case will the final estimate be prepared until the Contractor has complied with all requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

1.05 TEMPORARY STRUCTURES

A. Temporary Fences

1. If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall provide a suitable temporary fence at his own expenses, which shall be maintained until the permanent fence is replaced. The Engineer shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

B. Responsibility for Temporary Structures

1. In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation and will indemnify and save harmless the Owner from all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.06 SAFETY

A. Accident Prevention

1. Precaution shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, and existing building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, and OSHA's Safety and Health Standards (29 CFR 1926/1910) U.S. Department of Labor, to the extent that such provisions are not in contravention of applicable law of the state of Louisiana.

B. First Aid

1. The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when men are employed on the work.

1.07 LINES AND GRADES

A. Grade

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as given by the Owner/Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

2. The Owner/Engineer will establish bench marks and base line controlling points.

B. Surveys

1. The Contractor shall furnish, maintain, and be responsible for, at his own expense, stakes and other such materials required.

C. Safeguarding Marks

1. The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of recertifying work improperly installed due to not maintaining or protecting or to remove without authorization such established points, stakes and marks.

2. The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost or reestablishing them if disturbed or destroyed.

1.08 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility

1. The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the

various Contract Items and no separate payments will be made therefor. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the Engineer will interfere with the work, payment therefor will be made as provided for in the General Conditions.

2. Contractor is expressly advised that the protection of buildings, structures, tunnels, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the Contractor.

3. Contractor shall, before starting operations, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the Owner and to the satisfaction of the Engineer. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the Engineer.

4. Prior to the beginning of any excavations the Contractor shall advise the Engineer of all buildings or structures on which he intends to perform work or which performance of the project work will affect.

B. Lawn Areas

1. Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed, and later replaced, or the area where sod has been removed shall be restored with new sod in the manner described in the Workmanship and Materials section.

C. Restoration of Fences

1. Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the Engineer. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific Item is provided therefor, as part of the overhead cost of the work, and no additional payment will be made therefor.

1.09 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights

1. During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public, in accordance with state and local requirements.

B. Smoke Prevention

1. The Contractor shall use hard coal, coke, oil or gas as fuel for equipment generating steam. A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires will be permitted.

C. Noise

1. The Contractor shall eliminate noise to as great as extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power

equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.

2. Except in the event of an emergency, no work shall be done between the hours of 7:00 P.M. and 7:00 A.M. If the proper and efficient prosecution of the work requires operations during the night, the written permission of the Engineer shall be obtained before starting such items of the work.

D. Access to Public Services

1. Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves, or manholes.

E. Dust Prevention

1. The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas sprinkled with water at all times.

1.10 CUTTING AND PATCHING

A. The Contractor shall do all cutting, fitting or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the Engineer and in accordance with the Plans and Specifications. The work must be done by competent workmen skilled in the trade required by the restoration.

1.11 CLEANING

A. During Construction

1. During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the Engineer, such material, debris, or rubbish constitutes a nuisance or is objectionable.

2. The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops. Contractor shall be responsible and liable for all spillage and incur all associated costs including, but not limited to, costs related to repair and maintenance resulting from damages thereof.

B. Final Cleaning

1. At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances,

2. The Contractor shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished and new condition.

1.12 INSPECTION AUTHORITY

A. The Engineer has ultimate responsibility for contract administration and inspection for the Project. Field

inspection responsibilities may be assigned to a Design Professional and/or Owner Inspector.

B. Each step of construction is subject to approval by the Engineer prior to proceeding with a subsequent step in accordance with General Conditions.

C. During the progress of the Work and up to the date of final acceptance, the Contractor shall at all times afford representatives of the Owner, the City/Parish, the State, the Department of Environmental Quality, the Department of Labor, or any other agency with jurisdiction, every reasonable, safe, and proper facility for observation of the Work done or being done at the site, and also the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

D. The Project line of authority will be presented at the Pre-Construction Meeting.

1.13 SAMPLES

A. The Contractor shall, when required, submit to the Engineer for approval, typical samples of material and appliances. The samples shall be properly identified by tags and shall be submitted sufficiently in advance of the time when they are to be incorporated into the Work so that rejections thereof will not cause delay. A letter of transmittal from the Contractor requesting approval shall accompany all such samples.

1.14 EQUIVALENT QUALITY

A. In the Contract Documents, whenever an article, material, apparatus, equipment, or process is called for by trade name or by name of a patentee, manufacturer, or dealer, or by reference to catalog of a manufacturer or dealer followed by "or equal", it shall be understood as intending to mean and specify the article, material, apparatus, equipment, or process designated, or any equal thereto in quality, finish, design, efficiency, and durability, and equally serviceable for the purposes for which it is intended.

B. Whenever material or equipment is submitted for approval as being equal to that specified, the submittal shall include sufficient information and data to demonstrate that the material or equipment conforms to the contract requirements. The decision as to whether or not such material or equipment is equal to that specified shall be made by the Engineer.

C. Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the contract, the Contractor shall immediately proceed to furnish the designated material or equipment.

D. Neither the approval by the Engineer of alternate material or equipment as being equivalent to that specified, nor the furnishing of the material or equipment specified, shall in any way relieve the Contractor of responsibility for failure of the material or equipment, due to faulty design, material, or workmanship, to perform the functions required of them by the Contract Documents.

E. Items requiring "pre-approval" must be submitted to the Engineer a minimum of twenty one (21) days prior to the bid opening for consideration, and if acceptable will be incorporated by Addendum.

1.15 MISCELLANEOUS

A. Protection Against Siltation and Bank Erosion

1. The Contractor shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.

2. The Contractor, at his own expense, shall remove any siltation deposits and correct any erosion problems as directed by the Engineer which results from his construction operations.

B. Protection of Wetland Areas

1. The Contractor shall properly dispose of all surplus material, including spoil, in accordance with Local, State and Federal regulations. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Louisiana Department of Environmental Quality.

C. Existing Facilities

1. The work shall be so conducted to maintain existing facilities in operation insofar as is possible. Requirements and schedules of operation for maintaining existing facilities in service during construction shall be as described in these Specifications.

D. Use of Chemicals

1. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must shown approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

E. Cooperation With Other Contractors Forces

1. During progress of work under this Contract, it may be necessary for other contractors and persons employed by the Owner to work in or about the Site. The Owner reserves the right to put such other contractors to work and to afford such access to the Site of the Work to be performed hereunder at such times as the Owner deems proper. The Contractor shall not impede or interfere with the work of such other contractors engaged in or about the Work and shall so arrange and conduct his work that such other contractors may complete their work at the earliest date possible.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. The single construction contract system will be used for this PROJECT.

B. CONTRACTOR shall furnish all labor, permits, fees, equipment, supplies, materials, services and incidentals required to complete the WORK.

C. Mention herein or indication on the DRAWINGS of articles, operations, or methods requires that the CONTRACTOR provide each item mentioned, indicated, or necessary as an adjunct to the item, subject to qualifications noted, and perform according to conditions required.

1.02 DESCRIPTION OF WORK

A. This WORK includes furnishing all labor, materials and equipment for the rehabilitation of an existing pumping station, including but not limited to demolishing existing pumps piping and electrical and replacing with five new 100 hp self primers along with associated piping electrical and controls as well as civil site and painting.

1.03 CONSTRUCTION LIMITS AND STORAGE

A. Refer to the DRAWINGS for the location of the PROJECT.

B. CONTRACTOR shall limit his construction activities to the right-of-way and to approved storage areas for the PROJECT.

C. Access to private property must be maintained during construction.

D. CONTRACTOR shall provide barricades, safety or warning devices, signs and warning lights required for the protection of employees, the public and property.

E. The OWNER will designate storage areas to be used for material and equipment deliveries and access.

1.04 COORDINATION OF WORK WITH OWNER AND OTHERS

A. The CONTRACTOR shall coordinate WORK and cooperate with OWNER working in the PROJECT area. Contractors shall coordinate, cooperate and schedule their work to complete all work in an efficient manner in the areas of common occupancy.

B. The CONTRACTOR shall limit his use of the premises for WORK and for storage to allow for work by other SUBCONTRACTORS, utility agencies, and OWNER operations.

C. ST. JOHN THE BAPTIST PARISH personnel may require access to the PROJECT site. The CONTRACTOR shall coordinate all stored products or equipment under his control with the RESIDENT PROJECT REPRESENTATIVE to prevent interference with operation of the OWNER.

1.05 MEASUREMENTS AND PROJECT LAYOUT

A. The CONTRACTOR is responsible for survey and complete layout of all vertical and horizontal controls necessary to construct the PROJECT. The CONTRACTOR shall verify all field conditions, elevations and dimensions affecting the construction of the WORK and be responsible for correctness of same.

B. No extra compensation will be allowed for differences between actual elevations, dimensions or measurements indicated on DRAWINGS. Differences found shall be reported to the ENGINEER for consideration before proceeding with the WORK.

C. Contract Drawings:

1. DRAWINGS indicate the general area of construction routing and levels; CONTRACTOR shall field verify and coordinate.

2. Adjustments in dimensions, elevations, routing and connections shall be made for field coordination with other trades.

3. All field adjustments shall be subject to the ENGINEER's approval.

1.06 EASEMENTS

A. All necessary easements have been obtained by the OWNER.

1.07 WORKMANSHIP

A. Materials, methods and workmanship shall be the best obtainable within established trade standard tolerance.

B. Uniformity: The CONTRACTOR shall provide uniform quality and appearance throughout the PROJECT.

C. Stability: All members shall be rigid and shall be securely anchored in place. Members subject to vibration or wracking shall be adequately attached. Connections shall be adequate to withstand stress to which they would be subject.

D. Joints: Joints in all materials shall be true, neat and inconspicuous. Joints between materials of different kinds shall be closely fitted.

E. Surfaces: Surfaces of all materials fabricated into a single article of composition or into an assembly of units shall be uniform, true, plumb, level, properly curved or pitched as required, and free from defects and blemishes. All edges, angles and corners shall be uniform and true.

F. Finish: Exposed surfaces of materials in which natural irregularity does not contribute to desired character shall be smooth and free from blemishes of any kind.

1.08 CONSTRUCTION GUARANTEE

A. The CONTRACTOR shall guarantee all equipment, materials and workmanship incorporated in the PROJECT for a period of one year following date of FINAL ACCEPTANCE by the OWNER.

B. The CONTRACTOR shall immediately correct all deficiencies reported to him without cost to the OWNER within this guarantee period.

1.09 CODES, STANDARDS AND REGULATIONS

A. All WORK shall conform to the latest edition of the codes or regulations of the following:

1. "Standard Specifications For Roads And Bridges", Louisiana Department of Transportation And Development.
2. Louisiana Department of Health & Hospitals.
   a. State Sanitary Code
   b. Recommended Standards For Wastewater Facilities (Ten States Standard)
   c. Recommended Standards For Water Works (Ten States Standards)
3. Local Utility Service Company Requirements for electric services.
4. National Electric Code.
5. National Plumbing Code.
6. American Water Works Association Standards.
7. American Society of Testing and Materials Standards.
8. Occupational Safety And Health Administration Standards.
9. American Concrete Institute.
10. American Institute of Steel Construction.
11. American Welding Society.
12. Anti-Friction Bearing Manufacturers Association.
13. Concrete Reinforcing Steel Institute.
14. Factory Mutual Association (FM).
15. Instrument Society of America (ISA).
16. National Bureau of Standards (NBS) Voluntary PROJECT Standard (PS).
17. National Electrical Manufacturer's Association (NEMA).
18. National Fire Protection Association (NFPA).
19. Steel Structures Painting Council (SSPC).
20. Underwriters' Laboratories, Inc. (UL).
21. Occupational Safety and Health Administration Standards (OSHA).

1.10 NOTICE TO UTILITY COMPANIES AND AGENCIES

A. Notify all utility companies a minimum of 48 hours prior to excavation, or as required by the utility company.

B. Obtain permission of utility owner to excavate in the vicinity of their utility.

C. Arrange with owners and operators of respective utility systems to mark the location, and if necessary or prudent, to expose existing utilities or structures prior to construction of the facilities contained in this CONTRACT.

D. If in course of the WORK it is found necessary to repair utility systems or structures damaged by the CONTRACTOR's activities, repairs or revisions shall be made by employees of the respective utilities and agencies with all costs borne by the CONTRACTOR.

1.11 EXISTING UTILITIES

A. In general, the locations of existing underground utilities are <u>not</u> indicated on the DRAWINGS. The OWNER does not guarantee the accuracy or completeness of the information shown on the DRAWINGS, and it is to be understood that aboveground or underground facilities not shown on the DRAWINGS may be encountered during the course of the WORK.

B. Existing aboveground utilities including, not limited to, power distribution and telephone systems, whether shown on the DRAWINGS or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary in a manner satisfactory to owners and operators of the utilities and to the OWNER.

C. Existing underground utilities and appurtenance structures, whether shown on the DRAWINGS or not, shall be maintained, relocated, rerouted, removed and restored in a manner satisfactory to owners and operators of the utilities and to the OWNER. In the following special cases, the CONTRACTOR will be reimbursed in accordance with the GENERAL CONDITIONS for all costs of modifying, rerouting or relaying utilities:

1. An existing utility is shown on the DRAWINGS as being above or below the pipeline or structure to be constructed under this CONTRACT but is found during construction to be in conflict with the proposed WORK.

2. An existing utility is shown on the DRAWINGS in plan, but not in profile, and is found during construction to be in conflict with the proposed WORK.

3. An existing utility is not shown on the DRAWINGS but is found during construction to be in conflict with the proposed WORK.

4. An existing utility is not shown on the drawings and is found during construction to cross or project into the allowable excavation for the proposed WORK at an angle of 30 degrees or less at any elevation.

D. Minor underground utility service lines including, but not limited to, sanitary sewer services, water services, house or yard drains, and electric or telephone services, shall be maintained, relocated, rerouted, removed and restored with the least possible interference with such services, and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed hereinbefore.

E. The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the WORK. Except as specifically noted, all costs thus incurred shall be incidental to the CONTRACT, and borne by the CONTRACTOR.

1.12 RESTORATION OF STRUCTURES AND SURFACES

A. General: Whenever any of the work is accomplished on or through property other than that owned by the PROJECT OWNER, before final acceptance of the WORK by the PROJECT OWNER, a written release from the adjoining property owner or proper authority citing for the owner of the property affected stating that the restoration of structures and surfaces has been satisfactorily accomplished. If in the opinion of the PROJECT OWNER the release is arbitrarily withheld, the PROJECT OWNER may, at its sole discretion, accept the portion of the WORK involved and cause final payment therefore to be made.

In addition to the requirements of any applicable utility permit, street use permit or franchise relating to this CONTRACT, the CONTRACTOR shall, as a minimum for any restoration work, conform to standard plans and specifications of the agency which controls the use of the right-of-way in which this construction WORK is performed.

B. Structures: The CONTRACTOR shall remove such existing above and below-ground structures as may be necessary for the performance of the WORK and, if required, shall rebuild the structures thus removed in as good a condition as found with minimum requirements as herein specified. He shall also repair all existing structures which may be damaged as a result of the WORK under this CONTRACT. Reconstruction shall be of the same kind of material with the same finish and in not less than the same dimensions as the original work. All concrete shall be as specified herein unless otherwise indicated. Repairs shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing any damaged part. All WORK shall match the appearance of the existing improvements as nearly as possible.

C. Roads and Streets: All roads and streets in which the surface is removed, broken or damaged, or in which the ground has caved or settled due to WORK under this CONTRACT, shall be resurfaced and brought to the original grade and crown section unless otherwise indicated. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces. Roadways used by the CONTRACTOR for hauling materials, equipment, supplies, and the like, shall be cleaned and repaired if the

condition of the roadway is damaged or otherwise affected due to the CONTRACTOR's operations.

D. Planted Areas and Other Surface Improvements: All planted areas, such as trees or lawns, and other surface improvements which are damaged by actions of the CONTRACTOR, shall be restored as nearly as possible to their original condition. The CONTRACTOR shall resod areas which have been damaged during construction.

E. Existing Stakes and Marks: All section, section subdivision, plat, U.S.C. and G.S., U.S.G.S. and other official monuments or bench marks shall be carefully preserved or replaced. In the event any such monument or marker is disturbed as a result of the CONTRACTOR's operations, the CONTRACTOR shall effect the replacement or resetting of the monument or marker in a manner satisfactory to the ENGINEER. Replaced or reset monuments shall be of acceptable type and quality, and shall be located so as to clear existing utilities or any other interferences. They shall be placed by a licensed surveyor in a manner consistent with good and recognized engineering and surveying practices.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01025 - MEASUREMENT AND PAYMENT (PUMP STATION IMPROVEMENTS)

PART 1 - GENERAL

1.1 MEASUREMENT AND PAYMENT

A. Partial payment of BID ITEMS shall be in conformance with the GENERAL CONDITIONS. Partial payment for WORK completed, and materials on site, which will become an integral part of the finished WORK, shall be determined by the OWNER and shall be made on the basis of duly certified and approved estimates of the WORK, which, in the opinion of the OWNER, has been satisfactorily completed. It is understood that the determination by the OWNER as to whether or not a certificate or estimate for payment should be issued, or the amount of said payment, shall be based entirely upon the opinion of the OWNER. Said determination shall include without limitation the following factors:

1. All phases of the WORK being accomplished in a proper manner and being pursued in a proper sequence of operation, particularly with regard to testing, cleanup and surface restoration.

2. The observance by the CONTRACTOR of the requirement that all WORK and operations be preceded by necessary submittals and approvals.

3. On the monthly estimates, partial payment for WORK performed but not completed shall be made in accordance with GENERAL CONDITIONS.

B. The CONTRACT PRICE shall constitute full compensation for furnishing all labor, equipment and materials, as specified, and as shown on the DRAWINGS.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The CONTRACTOR shall be solely responsible for coordination of all of the WORK. The CONTRACTOR shall supervise, direct and cooperate fully with all SUBCONTRACTORS, manufacturers, fabricators, suppliers, distributors, installers, testing agencies and all others whose services, materials or equipment are required to ensure completion of the WORK within the CONTRACT TIME.

B. The CONTRACTOR shall cooperate with and coordinate his WORK with the work of any other contractor, utility service company or OWNER's employees performing additional WORK related to the PROJECT at the site.

C. The CONTRACTOR shall attend and participate in all project coordination or progress meetings and report on the progress of all WORK and compliance with schedules.

D. The CONTRACTOR shall cooperate with others doing WORK in the area or who require access to various parts of the site. Whenever there is interference between WORK under this CONTRACT with work or access by others, the ENGINEER shall decide the manner in which the WORK shall proceed. The CONTRACTOR shall cooperate in scheduling his WORK as required by the ENGINEER.

E. The CONTRACTOR shall be responsible for maintaining continued and uninterrupted operation of all facilities in the PROJECT area.

F. The CONTRACTOR shall coordinate his efforts with the efforts of the clearing & grubbing contractor working for the ST. JOHN THE BAPTIST PARISH.

1.02 COORDINATION

A. Coordination: Coordinate construction activities included under various sections of these SPECIFICATIONS to assure efficient and orderly installation of each part of the WORK. Coordinate construction operations included under different sections of the SPECIFICATIONS that are dependent upon each other for proper installation, connection, and operation.

Where installation of one part of the WORK is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

Make adequate provisions to accommodate items scheduled for later installation.

Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

B. Work Site Boundary Coordination: Strict adherence to predetermined WORK site boundaries is required. Where construction activities overlap in perimeter areas, WORK shall be coordinated to prevent activities outside of these boundaries.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction work activities to avoid conflicts and ensure orderly progress of the WORK. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules;
2. Installation and removal of temporary facilities;
3. Delivery and processing of submittals;
4. Progress meetings; and,
5. Project close-out activities.

1.03 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate SHOP DRAWINGS.

2. Indicate required installation sequences.

3. Comply with requirements contained in Section 01340 - Shop Drawings, Product Data and Samples.

B. Staff Names: CONTRACTORS shall provide proposed organization charts, listing both home and field office personnel to be assigned to the PROJECT.

1. Within 15 days of NOTICE TO PROCEED, submit a list of the CONTRACTOR's principal staff assignments, including the superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

2. Post copies of the list in the PROJECT meeting rooms, the temporary field office, and at each temporary telephone.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which WORK is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in CONTRACT DOCUMENTS.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Recheck measurements and dimensions before starting each installation.

E. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

F. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.02 CLEANING AND PROTECTION

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

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

A. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Heavy traffic.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Promptly after award of the CONTRACT, the CONTRACTOR shall prepare and submit to the ENGINEER estimated construction progress and payment schedules for the WORK, with subschedules of related activities which are essential to its progress.

B. Submit revised progress schedules periodically.

1.02 FORM OF PROGRESS SCHEDULES

A. Submit network analysis system using either critical path method, generally as outlined in Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors" or a bar graph schedule containing sufficient information for analysis. Revised schedule showing current status of the WORK as compared to projected status shall be submitted on a regular basis as described herein.

B. Format of Listings: The chronological order of the start of each item of WORK.

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

1.03 CONTENT OF PROGRESS SCHEDULES

A. Show the complete sequence of construction by activity.

B. Activities shall identify all WORK that must be accomplished to achieve SUBSTANTIAL COMPLETION and final completion, such as WORK related to prerequisite approvals from agencies with jurisdiction over the PROJECT; work involved in the preparation, submittal, and approval of SHOP DRAWINGS and samples; work pertaining to the fabrication and delivery of materials and equipment; work associated with CONTRACTOR's installation, erection and construction activities; WORK required by the existence of underground facilities, WORK required to implement closures or cut-offs, power shutdowns, or temporary or permanent take-down of existing facilities, WORK associated with the performance of preoperational, start-up and final testing; WORK related to the tentative list of items to be completed or corrected before and subsequent to preoperational, start-up and final testing.

C. Show the dates for the beginning, and completion of, each major element of construction. Include time for SHOP DRAWING and O&M manual production, submittal, and review. Specifically list:

1. Mobilization
2. Order pumps, controls and electrical gears
3. Receive pumps, controls and electrical gear
4. Remove and Replace Existing Concrete Slab
5. Install pumps
6. Install piping
7. Install electrical/controls
8. Date of Substantial Completion
9. Date of Final Completion

1.04 PROGRESS SCHEDULE SUBMITTALS

A. Detailed Schedule Submittal: Set shall consist of an initial (detailed) schedule diagram which will show detailed

activities for WORK to be performed from date of commencement of the WORK until substantial completion of the WORK, or parts thereof, and summary activities for the balance of the WORK (until final completion).

1. Within one week of the PRECONSTRUCTION CONFERENCE, CONTRACTOR shall deliver three (3) copies of the Initial Detailed Schedule. The Initial Detailed Schedule shall use the date for commencement of the WORK as the date from which all activity dates are calculated; expand, revise, and modify the preliminary progress schedule submittal; reflect CONTRACTOR's preliminary plan of operations for the performance of the WORK; and point out schedule coordination requirements with respect to work by other contractors. CONTRACTOR is responsible for ensuring that the Initial Detailed Schedule Diagram has been reviewed by CONTRACTOR's subcontractors. No application for progress payment will be processed until CONTRACTOR's schedule is reviewed and concurred as reasonable.

2. If a resubmittal is required, CONTRACTOR shall be required to respond with three (3) copies of a revised, adjusted, or modified Detailed Schedule Diagram within seven (7) days.

B. Monthly Status Report: Monthly Status Report submittal sets shall consist of "marked-up" versions of the corresponding Detailed Schedule Diagram in accordance with the requirements of this Section of the CONTRACT DOCUMENTS.

1. CONTRACTOR shall submit three (3) copies of monthly (schedule) status reports with each application for progress payment. The first such status report shall be submitted with the first application following initial submittal of the detailed schedule, and include data as of the cut-off day of the pay period. No application for progress payment will be processed until CONTRACTOR furnishes the corresponding Monthly Status Report.

2. Monthly Status Reports will be used in the processing of progress payments. The ENGINEER and CONTRACTOR will review status reports at monthly scheduled meetings, and CONTRACTOR will be required to address ENGINEER's comments on the subsequent Monthly Status Report.

3. Indicate progress of each activity to date of submission. Show changes occurring since previous submission of schedule.

   a. Major changes in scope.
   b. Activities modified since previous submission.
   c. Revised projections of progress and completion.
   d. Other identifiable changes.

1.05 ENGINEER SCHEDULE REVIEW RESPONSIBILITY

A. ENGINEER will, upon receipt and review of each schedule submittal, either indicate in writing his concurrence as noted, or return the submittal to CONTRACTOR indicating in writing reasons for refusing to concur with the submittal. In the latter case, CONTRACTOR may be required to make the necessary corrections or alterations and resubmit within the prescribed period. If CONTRACTOR fails to provide schedule submittals as required, he will be deemed not to have provided the basis upon which progress can be evaluated, which may force OWNER to refuse to make payments of the full amount requested on any pending applications for payment, or which may alternatively entitle OWNER to a set-off against the amount requested.

B. ENGINEER's review of schedule submittals shall be only for conformance with CONTRACT times, sequencing restraints, and other information given in the CONTRACT DOCUMENTS, and shall not extend beyond the limitations applicable to the review of SHOP DRAWINGS or samples set forth in the SPECIFICATIONS.

C. ENGINEER's review of schedule submittals will be predicated on stamps or approvals signed off by CONTRACTOR and CONTRACTOR's subcontractor (as that term is defined in the GENERAL

CONDITIONS) performing WORK under an appropriate agreement with CONTRACTOR. CONTRACTOR's stamp of approval on schedule submittals shall constitute a representation to OWNER that CONTRACTOR has either determined or verified all data on the schedule submittal, and assumes full responsibility for doing so, and that CONTRACTOR and his subcontractor's have reviewed and coordinated the sequences shown in the schedule submittal with the requirements of the WORK under the CONTRACT DOCUMENTS.

D. ENGINEER'S review of schedule submittals shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the CONTRACT DOCUMENTS.

E. The most current approved detailed schedule will be considered the official schedule as long as it is prepared, submitted, used and kept current by CONTRACTOR in accordance with the requirements of this Section or the CONTRACT DOCUMENTS.

1.06 SUBMITTAL SCHEDULE

A. Provide a schedule of all SHOP DRAWINGS, product data, and samples as required by the SPECIFICATIONS. Schedule shall be in the form of a chronological list indicating the date of each SHOP DRAWING, product and sample. Where more than one submittal is to be made on a particular product, sample or element of work, each such submittal shall be numbered separately and a date for such submittal shall be assigned.

B. Submit schedule at or prior to the pre-construction conference.

1.07 PAYMENT SCHEDULE

A. Payment schedule shall be graphically constructed to show the job progress by month on one ordinate and the cumulative anticipated job costs shown on the other ordinate. The graph should represent the CONTRACTOR's best estimate of job expenditures per month as of commencement of WORK. Payment schedule may be integral to construction schedule. Submit within 30 days of NOTICE TO PROCEED.

B. Submit revised payment schedule as necessary to coordinate with construction schedule.

1.08 SUBMISSIONS

A. Submit the number of copies which the CONTRACTOR requires, but not more than three (3), plus three (3) copies which will be retained by the ENGINEER.

1.09 DISTRIBUTION

A. Distribute copies of the reviewed schedules to:

1. Job size file (progress and payment schedule).
2. Subcontractors (progress schedule only).
3. Other concerned parties (progress schedule only).

B. Instruct recipients to report promptly to the CONTRACTOR, in writing, any problems anticipated by the projections shown in the schedules.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01340 –
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 SHOP DRAWINGS

A. The term "SHOP DRAWINGS" as used herein shall include detailed design calculations; fabrication and installation drawings; material and parts lists; graphs; test data; operating instructions; and other items as specified or shown which shall include but not necessarily be limited to:

1. Drawings and/or catalog information and cuts.
2. Specifications, parts lists, suggested spare parts lists, and equipment drawings.
3. Complete lubrication, maintenance and operation instructions, including initial startup instructions.
4. Applicable certifications.
5. Anchor bolt templates, mounting instructions and mounting design calculations as required per the Contract Documents.
6. Required maintenance operations to allow all installed equipment to remain idle for the period of time prior to its installation.
7. Other technical, installation, and maintenance data as applicable.
8. Unloading and handling methods, and storage requirements.
9. Proposed changes to the Contract Documents noted and highlighted.
10. Paint or coating submittal showing type of paint or coating and the mils thickness of coating system used.
11. Drawings showing CONTRACTOR field verifications illustrating all field dimensions. CONTRACTOR shall field verify all dimensions and existing materials shown on the Drawings. Any modifications required to structures and/or support systems to accommodate CONTRACTOR submitted equipment and/or systems shall be at the CONTRACTOR's expense.

B. Present in a clear and thorough manner. Each fabrication drawing to have a title block in the lower right hand corner with the PROJECT name and number, OWNER's name, fabricator's and CONTRACTOR's name, fabricator's plant location, drawing number, date, and revision block.

C. Identify field dimensions; show relation to adjacent or critical features of WORK or products.

D. Provide CONTRACTOR's approval stamp on each SHOP DRAWING.

E. Minimum Sheet Size: 8 1/2 x 11 inches.

1.02 PRODUCT DATA

A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to SPECIFICATION section and article number. Show reference standards, performance characteristics, and capacities; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the WORK. Delete information not applicable.

1.03 SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for ENGINEER selection.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the WORK are indicated in the SPECIFICATION section.

D. Label each sample with identification required for transmittal letter.

E. Provide field samples of finishes at PROJECT, at location acceptable to ENGINEER, as required by individual SPECIFICATIONS section. Install each sample complete and finished. Acceptable finishes in place may be retained in complete WORK.

1.04 MANUFACTURER'S INSTRUCTIONS

A. When required in individual SPECIFICATION sections or requested by the ENGINEER, submit manufacturer's printed instructions for delivery, storage, preparation, assembly, installation, startup, adjusting, balancing, and finishing.

B. Comply with the provisions of Section 01400 - Quality Control.

1.05 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of CONTRACT DOCUMENTS.

B. Coordinate submittals with requirements of WORK and of CONTRACT DOCUMENTS.

C. Provide CONTRACTOR's stamp, and sign or initial each SHOP DRAWING and product data submittal, and each sample label to certify compliance with requirements of CONTRACT DOCUMENTS. Notify ENGINEER in writing at time of submittal, of any deviations from requirements of CONTRACT DOCUMENTS.

D. Do not fabricate products or begin work which requires submittals until return of submittal with ENGINEER acceptance.

1.06 SUBMITTAL REQUIREMENTS

A. Transmit submittals in accordance with approved Progress Schedule, and in such sequence to avoid delay in the WORK.

B. Provide blank space on each submittal for ENGINEER's stamp.

C. Apply CONTRACTOR's stamp, signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of WORK and CONTRACT DOCUMENTS.

D. Coordinate submittals into logical groupings to facilitate interrelation of the several items:

1. Finishes which involve ENGINEER selection of colors, textures, or patterns.
2. Associated items which require correlation for efficient function or for installation.

E. Submit number of copies of SHOP DRAWINGS CONTRACTOR requires, plus three (3) which will be retained by ENGINEER.

F. Submit number of copies of product data and manufacturer's instructions CONTRACTOR requires, plus three (3) copies which will be retained by ENGINEER.

G. Submit the number of samples specified in individual SPECIFICATION section; one (1) will be retained by ENGINEER. Reviewed samples which may be used in the WORK are indicated in the SPECIFICATION section.

H. Submit under ENGINEER-accepted transmittal form letter. Identify PROJECT by title and number. Identify WORK and product by SPECIFICATIONS section and article number.

I. Allow ten (10) to twenty-one (21) calendar days for ENGINEER's review.

1.07 RESUBMITTALS

A. Make resubmittals under procedures specified for initial submittals; identify changes made since previous submittal.

1.08 DISTRIBUTION

A. Distribute reproductions of SHOP DRAWINGS, copies of product data, and samples, which bear ENGINEER stamp of approval, to job site file, record documents file, subcontractors, suppliers, and other entities requiring information.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. CONTRACTOR shall submit to the ENGINEER a SCHEDULE OF VALUES allocated to the various portions of the WORK, within 10 days after Award of CONTRACT. Modify SCHEDULE OF VALUES as required to reflect all items of WORK in the CSI format for specifications.

B. Upon request of the ENGINEER, support the values with data which will substantiate their correctness.

C. The SCHEDULE OF VALUES, unless objected to by the ENGINEER, shall be used only as the basis for the CONTRACTOR'S Applications for Payment.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type schedule on 8-1/2 inch by 11-inch white paper; CONTRACTOR'S standard forms and automated printout will be considered for approval by ENGINEER upon CONTRACTOR'S request. Identify schedule with:

1. Title of project and location.
2. Engineer and project number.
3. Name and address of Contractor.
4. Contract designation.
5. Date of submission.

B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing value for progress payments during construction.

C. Follow the table of contents of this CONTRACT as the format for listing component items.

1. Identify each line item with the number and title of the respective major section of the SPECIFICATIONS.

D. For each major line item list subvalues of major products or operations under the item.

E. For the various portions of the WORK:

1. Each item shall include a directly proportional amount of the CONTRACTOR'S overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the values into:
   a. The cost of the materials, delivered and unloaded, with taxes paid.
   b. The total installed value.
3. Submit a subschedule for each separate stage of WORK specified in Section 01310.

F. The sum of all values listed in the schedule shall equal the total contract sum.

1.03 REVIEW AND RESUBMITTAL

A. After review by ENGINEER revise and resubmit schedule as required.

B. Resubmit revised schedules in same manner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. WORK under this Section includes all testing required by the CONTRACT as specified herein and further specified in the technical sections.

1.02 TESTING METHODS

A. All tests shall be made in accordance with commonly recognized standards of national organizations unless alternate specific testing methods are set forth in the technical sections.

1.03 COSTS

A. The OWNER will employ and pay for an independent testing laboratory to perform all testing services as specified in the technical sections, unless otherwise specified.

Additional inspection and tests required because of defective work or ill-timed notices shall be performed at the CONTRACTOR's expense.

1.04 QUALITY ASSURANCE

A. Samples: The CONTRACTOR shall supply samples or test specimens if and when required by the SPECIFICATIONS or the ENGINEER. These samples or test specimens shall be prepared and furnished with information as to their source in such quantities and size as may be required for proper examination and tests, with all freight charges prepaid. All samples shall be submitted before shipment of materials to the site of the WORK and in ample time to permit the making of proper tests, analysis, examination, rejections and resubmissions before the time required to incorporate the materials into the WORK. No such materials shall be used in WORK until they have been accepted in writing by the ENGINEER. Samples of materials will be retained by the ENGINEER for references and comparison purposes.

B. Certification: Producers and associations which have instituted approved systems of quality control and have been approved may submit certifications of compliance in lieu of further testing. Lumber and plywood grademarks by approved associations and materials for equipment bearing Underwriter's Laboratory label require no further plan inspection and testing, unless more restrictive requirements are required, or otherwise specifically required in the SPECIFICATIONS.

1.05 TESTING LABORATORIES

A. The testing laboratories will be provided by the OWNER.

1.06 CONTRACTOR'S RESPONSIBILITY

A. Access: Furnish free access to various parts of the WORK and assist testing inspection personnel in performance of their duties at no additional cost to the OWNER.

B. Concealed Work: When directed by the ENGINEER, the CONTRACTOR shall open for inspection any part of the WORK which has been concealed. Should the CONTRACTOR refuse or neglect such a request, the OWNER may employ any other person to open up the same or do so himself. If any parts of the WORK have been concealed in violation of the ENGINEER's instructions or, if on being opened, it is found not to be in accordance with the terms of the CONTRACT DOCUMENTS, the expense of opening and recovering, whether done by the CONTRACTOR or not, shall be charged to the CONTRACTOR. If the work is found to be in

accordance with the terms of the CONTRACT DOCUMENTS, the actual necessary expense of opening and recovering shall be borne by the OWNER, and if the work of opening and recovering is done by the CONTRACTOR, it shall be considered as extra work and paid for accordingly.

C. Data: Furnish samples, records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with the CONTRACT DOCUMENTS.

D. Notices: The CONTRACTOR shall notify the ENGINEER not less than 48 hours before WORK requiring inspection is started. The CONTRACTOR shall schedule portions of the WORK requiring inspection and testing, so that the ENGINEER's time on the PROJECT is continuous and as brief as possible. Provide notice to the ENGINEER 24 hours prior to concealment.

1.07 RESIDENT PROJECT REPRESENTATIVE

A. Appointment: The OWNER is providing RESIDENT PROJECT REPRESENTATIVE to inspect necessary portions of the WORK. Such inspection may extend to any or all parts of the WORK, and to the preparation or manufacture of materials to be used.

B. Authority of RESIDENT PROJECT REPRESENTATIVE: RESIDENT PROJECT REPRESENTATIVES are not authorized to revoke, alter, enlarge or relax the provisions of the CONTRACT DOCUMENTS, and the RESIDENT PROJECT REPRESENTATIVE is placed on the WORK to keep the ENGINEER informed as to the progress of the WORK and the manner in which it is being done. He may also call the attention of the CONTRACTOR to any deviations from the plans or SPECIFICATIONS. Failure of the RESIDENT PROJECT REPRESENTATIVE or the ENGINEER to call the attention of the CONTRACTOR to faulty WORK or deviation from the CONTRACT DOCUMENTS shall not constitute acceptance of said WORK. A RESIDENT PROJECT REPRESENTATIVE is not authorized to approve or accept any portions of the WORK or to issue instructions contrary to the CONTRACT DOCUMENTS. The RESIDENT PROJECT REPRESENTATIVE will exercise only such additional authority as may be specially delegated to him by the ENGINEER, notice of which will be given in writing to the CONTRACTOR.

C. The CONTRACTOR shall be responsible for ensuring safe working conditions per OSHA to allow inspection of all WORK by the RESIDENT PROJECT REPRESENTATIVE. This shall include providing all necessary monitoring devices and safety equipment for entering any confined spaces made part of the WORK. Payment will not be made for any part of the WORK which cannot be safely inspected by the RESIDENT PROJECT REPRESENTATIVE.

1.08 TEST REPORTS

A. The OWNER's testing laboratory will prepare logs, test reports and certificates applicable to specific tests and inspections. Reports will include description of method of test, identification of samples and portions of the WORK tested. They will state description of location of WORK, time and date of obtaining and testing samples, weather and climatic conditions, and evaluation of results of test, including recommendations for action. As a minimum, copies will be distributed by the testing lab as follows:

OWNER:	1
ENGINEER:	1

1.09 DEFECTIVE WORK

A. Remove and replace any work found defective or not complying with requirements of contract documents, at no additional cost to OWNER.

Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the ENGINEER for final acceptance.

If test cylinders for concrete fail to meet design stresses, make core and load tests as directed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 HOURS OF WORK

A. The CONTRACTOR shall establish his own work hours in accordance with the Construction Schedule submitted in Section 01310. No WORK shall be performed between the hours of 7:00 p.m. and 7:00 a.m., on Saturdays, Sundays or holidays unless written request is made to the ENGINEER and approved by the OWNER and ENGINEER.

1.02 PUBLIC SAFETY AND CONVENIENCE

A. The CONTRACTOR shall comply with all rules and regulations of state and local authorities regarding the closing of public traffic. No roads shall be closed to the public except by express permission of the ENGINEER. The CONTRACTOR shall conduct the WORK so as to ensure the least possible obstruction to traffic and normal commercial pursuits. He shall protect all obstructions within traveled roadways with approved signs, barricades and lights where necessary or where ordered by the ENGINEER for the safety of the public. The convenience of the general public and residents along the WORK, and the protection of persons and property is of prime importance and shall be provided for in an adequate and satisfactory manner.

Whenever the CONTRACTOR's operations create a hazardous condition, he shall furnish flagmen and guards as necessary to give adequate warning to the public of any dangerous condition encountered.

1.03 TRAFFIC CONTROL

A. All traffic control devices shall conform to the current edition of the "Manual of Uniform Traffic Control Devices."

B. The cost for all necessary traffic control by the CONTRACTOR shall be incidental to the entire PROJECT and shall be included in the CONTRACT PRICE.

1.04 CONSTRUCTION UTILITIES AND MISCELLANEOUS FACILITIES

A. General: The CONTRACTOR shall provide the temporary facilities and controls as hereinafter specified and as required by law.

B. Hoists, scaffolds, staging, storage and miscellaneous:

1. Equipment shall be provided with proper guys, bracing and other safety devices as required by local or state codes and regulations.

2. Provide suitable substantial facilities or protection for storing, immediately after delivery, materials which may be damaged by storage in the open.

C. Power: Unless otherwise specified, the CONTRACTOR shall provide all necessary power and special connections to power lines. The CONTRACTOR is responsible for removing any temporary electrical systems installed for construction purposes.

The location of temporary power facilities shall be determined by the CONTRACTOR and approved by the utility agency and the INSPECTOR.

D. Water: Unless otherwise specified, the CONTRACTOR shall provide and pay for all necessary water and special connections to a water supply.

Where applicable, the CONTRACTOR shall provide a backflow preventer device to prevent a direct cross connection between the water supply and wastewater conveying systems.

E. Telephone: The CONTRACTOR shall provide a telephone service at the site. A radio telephone service is not acceptable as a substitute for the required telephone service. A properly operating and continually accessible cellular phone is acceptable.

F. Sanitary Facilities: The CONTRACTOR shall provide adequate toilet facilities for all workmen and OWNER's representatives employed on the WORK. The CONTRACTOR shall maintain the same in a sanitary condition from the beginning of the WORK until completion and shall then remove the facilities and disinfect the premises. All portions of the WORK shall be maintained at all times in a sanitary condition. Temporary sanitary facilities shall be removed upon the completion of the PROJECT.

G. Permanent Facilities: The CONTRACTOR is specifically prohibited from utilizing permanent facilities, such as pumps, heating and ventilation equipment, water, air and power systems, cranes and hoists in the construction of the PROJECT.

H. Parking Facilities: The CONTRACTOR shall provide adequate off-road parking facilities for the automobiles used by his construction employees and the OWNER's representatives.

I. Temporary Heating: The CONTRACTOR shall provide temporary heating, covering and enclosures as necessary to protect all WORK and material against damage by dampness and cold, and to facilitate completion of WORK. The CONTRACTOR shall supply all the fuel, equipment and material required for temporary heating.

J. Construction Signs: No commercial or advertising signs shall be allowed on the site of the WORK.

K. Fencing: Provide temporary fencing around site at all times when it appears that the WORK area could be a hazard to the public.

L. Fire Protection: Provide portable, operable fire extinguishers at the site at all times in accordance with NFPA Standard 10.

1.05 PROTECTION OF EXISTING CONSTRUCTION

A. The CONTRACTOR shall protect existing construction and finishes liable to damage through performance of the WORK.

1.06 BARRIERS

A. The CONTRACTOR shall erect and maintain guard rails or other suitable barriers where required.

1.07 WATER CONTROL

A. The CONTRACTOR shall provide all necessary pumping equipment and temporary swales as required to keep the WORK areas free from water. Water shall be discharged as directed by the ENGINEER.

1.08 FIRE PREVENTION CONTROL

A. General: The CONTRACTOR shall take all precautions necessary and required to prevent fires. Comply with requirements of local authorities having jurisdiction.

B. Fuel for cutting and heating torches shall be gas only, and shall be contained in Underwriter's Laboratory approved containers.

C. The CONTRACTOR shall provide and maintain a 20-pound capacity, dry-chemical type fire extinguisher in the

immediate vicinity of the WORK when welding tools or torches of any type are in use.

D. The CONTRACTOR shall not use volatile liquids for cleaning agents or as fuels for motorized equipment or tools within building, except with the written approval of the ENGINEER.

E. Tarpaulins shall be securely anchored and flame-proofed when attached to any wood scaffolding, and when used to enclose any portion of a building above the first floor.

1.09 POLLUTION CONTROL

A. General: The CONTRACTOR's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

1.10 RUBBISH REMOVAL

A. The CONTRACTOR shall clean up the debris resulting from WORK at least once a day or more often, if it interferes with the work of others or presents a fire hazard. Debris shall be closely piled where directed.

B. The CONTRACTOR shall remove and dispose of all debris when directed.

C. Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the CONTRACTOR. Except for burnable materials, disposal of waste materials shall be by removal from the construction area. Waste materials removed from the construction area shall be disposed of at an approved landfill.

D. The CONTRACTOR shall stockpile all waste material at the waste site in an expeditious manner. Burning of waste material will be permitted.

1.11 DISPOSAL OF MATERIAL BY BURNING

A. The CONTRACTOR shall secure the permission of the City and the necessary burning permits from the state and local authorities. All burning shall be in accordance with state and local laws.

B. All materials to be burned shall be piled in such a manner as will cause the least fire hazards. Burning shall be thorough and complete and all charred pieces remaining after burning, except for scattered small pieces, shall be removed from the construction area and disposed of as otherwise provided in this paragraph.

C. The CONTRACTOR shall, at all times, take special precautions to prevent fire from spreading beyond the areas being burned and shall be liable for any damage caused by the CONTRACTOR's burning operations. The CONTRACTOR shall have available, at all times, suitable equipment and supplies for use in preventing and suppressing fires and shall be subject to all laws and regulations applicable for presuppression, suppression, and prevention of fires.

D. Material to be disposed of by removal from the construction area shall be removed from the area upon completion of the WORK under these CONTRACT DOCUMENTS. All materials removed shall become the property of the CONTRACTOR.

E. Materials to be disposed of by dumping shall be hauled to an approved landfill. It shall be the responsibility of the CONTRACTOR to make any necessary arrangements with private parties and with local officials pertinent to locations and regulations of such dumping. Any fees or charges required to be paid for dumping of materials shall be paid by the CONTRACTOR.

1.12 DISCONTINUANCE, CHANGES AND REMOVAL

A. The CONTRACTOR shall discontinue the temporary services herein specified when their use is no longer required or they impede progress on the WORK, all as directed. The discontinuance of any temporary service herein specified prior to the completion of any or all branches of the WORK shall not render the OWNER liable for any additional cost of the WORK entailed thereby, and the CONTRACTOR shall thereafter furnish under his contract, and at no additional cost to the OWNER, any and all temporary service required by his WORK to replace that discontinued.

B. Should a change in location of any of the temporary facilities be necessary in order to progress the WORK properly, CONTRACTOR shall remove and relocate such items as directed without additional cost to the OWNER.

C. When directed and no longer required, CONTRACTOR shall remove the temporary facilities specified herein. Material used for temporary facilities which are removed shall become the property of the CONTRACTOR and shall be removed from the site by the CONTRACTOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes material and equipment incorporated into the WORK.

1. Material and equipment shall conform to applicable SPECIFICATIONS and standards.

2. Material and equipment shall comply with size, make, type and quality specified, or as specifically approved in writing by the ENGINEER.

3. The CONTRACTOR shall provide manufactured and fabricated products conforming to the following requirements:

   a. Design, fabricate and assemble in accord with the best engineering and shop practices.

   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.

   c. Two or more items of the same kind shall be identical, by the same manufacturer.

   d. Products shall be suitable for service conditions.

   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. The CONTRACTOR shall not use material or equipment for a purpose other than that for which it is designed or is specified.

1.02 MANUFACTURER'S INSTRUCTIONS

A. The CONTRACTOR shall perform WORK in accordance with manufacturer's instructions. No preparatory step or installation procedure shall be omitted unless specifically modified or exempted by CONTRACT DOCUMENTS.

1.03 TRANSPORTATION AND HANDLING

A. The CONTRACTOR shall arrange deliveries on products in accordance with construction schedules. The CONTRACTOR shall coordinate to avoid conflict with WORK and conditions at the site.

1. The CONTRACTOR shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, CONTRACTOR shall inspect shipments to assure compliance with requirements of CONTRACT DOCUMENTS and approved submittals, and that products are properly protected and undamaged.

B. The CONTRACTOR shall provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.04 STORAGE AND PROTECTION

A. The CONTRACTOR shall store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

1. The CONTRACTOR shall store products subject to damage by the elements in weathertight enclosures.

2. The CONTRACTOR shall maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage

1. The CONTRACTOR shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Products which are subject to deterioration shall be covered with impervious sheet coverings, and adequate ventilation shall be provided to avoid condensation.

2. The CONTRACTOR shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

3. The CONTRACTOR shall maintain covers on equipment until the equipment is put into operation.

C. The CONTRACTOR shall arrange storage in a manner to provide easy access for inspection. Periodic inspections of stored products shall be made to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. Protection After Installation

1. The CONTRACTOR shall provide substantial coverings as necessary to protect installed products from damage from traffic, weather and subsequent construction operations, and shall remove when no longer needed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01630 –
PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. CONTRACTOR shall submit proposed options and product substitution data and information for review by ENGINEER on the Substitution Request Form provided herein.

1.02 PROPOSED SUBSTITUTIONS

A. Substitutions will be considered only under the following conditions:

1. Substitutions required for compliance with final interpretations of code requirements or insurance regulations.

2. Unavailability of specified products, through no fault of CONTRACTOR.

3. Subsequent information disclosed inability of specified product to perform properly or to fit in designated space.

4. Manufacturer/fabricator refusal to certify or guarantee performance of specified product as required.

5. When a substitution would be substantially beneficial to OWNER.

1.03 CONTRACTOR OPTIONS

A. Products specified by reference standards or by description only: Any product meeting those standards.

B. Products specified by naming one or more manufacturers with a substitution paragraph or an "or equal" clause: Submit a request for substitution for any manufacturer not specifically named.

C. Products specified by naming several manufacturers but without a substitution paragraph or an "or equal" clause; No options, no substitutions, allowed.

D. Products specified by naming only one manufacturer but without a substitution paragraph or an "or equal" clause: No option; no substitutions allowed.

1.04 LIMITATIONS ON SUBSTITUTIONS

A. Requests for substitutions of products will be considered only within time frame defined in Section 01600 - Material and Equipment. Submittals received after that time will not be considered. Substitutions will be considered in accordance with Paragraph 1.02A and 1.03 above.

B. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.

C. Substitute products shall not be ordered or installed without written acceptance.

D. Only one request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

E. ENGINEER will determine acceptability of substitutions.

1.05 REQUESTS FOR SUBSTITUTIONS

A. Submit request for each substitution. Document each request by submitting a Substitution Request Form for review by ENGINEER.

B. Identify product by SPECIFICATIONS section and article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number.

C. Attach product data to each request form

1.06 CONTRACTOR REPRESENTATION

A. Request for substitution constitutes a representation that CONTRACTOR has investigated propose product and has determined that it is equal to or superior in all respects to specified product or that the cost reduction offered is ample justification for accepting the offered substitution.

B. CONTRACTOR will provide same warranty or bond for substitution as for specified product.

C. CONTRACTOR will coordinate installation of accepted substitute, making such changes as may be required for WORK to be complete in all respects.

D. CONTRACTOR waives claims for additional costs related to substitution which may later become apparent.

1.07 SUBMITTAL PROCEDURES

A. Submit three copies of each separate Substitution Request Form. All items must be completed or marked "no change".

B. ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject requested substitution within fifteen (15) working days.

C. For accepted products, submit shop drawings, product data and samples in accordance with Section 01340.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

SUBSTITUTION REQUEST FORM

TO:_____

PROJECT:_____

We hereby submit for your consideration the following product instead of the specified item for the above project:

Section: Paragraph: Specified Item:

_____ _____ _____

Proposed Substitution: _____

Attach complete technical data, including laboratory tests, if applicable. Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Fill in blanks below:

A. Does the substitution affect dimensions shown on Drawings? _____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? _____

C. What affect does substitution have on construction schedule & other trades?

_____

D. State quality and performance differences between proposed substitutions and specified items.

_____

E. Cost differences between proposed substitution and specified item? (Indicate net change to contract sum) __

_____

F. Manufacturer's guarantees of the proposed and specified items are:
_____ Same _____ Different (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

_____
Signature

_____
Firm

_____
Address

_____

Date _____ Telephone _____

For use by Engineer:

_____Accepted _____Accepted As Noted

_____Not Accepted _____Received Too Late

By_____

Date _____

Remarks_____

_____

END OF SECTION

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PART 1 - GENERAL

1.01 GENERAL

A. The CONTRACTOR shall provide and maintain methods, equipment, and temporary construction as necessary to provide controls over environmental conditions at the construction site and adjacent areas and shall remove physical evidence of the temporary facilities at the completion of WORK.

B. The CONTRACTOR shall, at his own expense, obtain all required permits for environmental controls unless otherwise specified.

1.02 NOISE CONTROL

A. The CONTRACTOR's vehicles and equipment shall be such as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA and local agency standards.

1.03 DUST CONTROL

A. The CONTRACTOR shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatever. The CONTRACTOR shall apply water or use other methods subject to the ENGINEER's approval which will keep dust in the air to a minimum.

B. Dust control measures shall be maintained at all times to the satisfaction of the ENGINEER.

1.04 PEST AND RODENT CONTROL

A. The CONTRACTOR shall provide rodent and pest control as necessary to prevent infestation of construction or storage areas. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

1.05 EROSION PROTECTION

A. CONTRACTOR shall plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

1. Hold the areas of bare soil exposed at any time to a minimum.

2. Provide temporary control measures such as berms, dikes and drains.

B. CONTRACTOR shall construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.

C. CONTRACTOR shall periodically inspect earthwork to detect any evidence of the start of erosion. Apply corrective measures as required to control erosion.

1.06 PAINT AND SOLVENT CONTROL

A. CONTRACTOR shall comply with all requirements of regulatory agencies in use, storage, application, and disposal of paints and solvents, and containers for paints and solvents. All disposal shall be at an approved legal disposal site.

1.07 AIR EMISSIONS

A. CONTRACTOR shall comply with all requirements of regulatory agencies for pollutant emissions from all vehicles and equipment.

1.08 USED HYDROCARBONS

A. Used hydrocarbons shall be disposed of at an approved legal disposal site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01650 –
FACILITY STARTUP AND TESTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide complete startup, testing and operator training services to ensure operability of all equipment supplied.

1.02 FIELD TESTS AND ADJUSTMENTS

A. General: All mechanical and electrical equipment and all operating modes for each such piece of equipment shall be tested by the CONTRACTOR to the satisfaction of the ENGINEER. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the CONTRACTOR as part of the WORK.

1. At least 30 days before the time allowed in his construction schedule for commencing testing and startup procedures, the CONTRACTOR shall submit to the ENGINEER, in duplicate, details of the procedure he proposes to adopt for testing and startup of all mechanical and electrical equipment, except when such procedures have been covered in the SPECIFICATIONS.

2. The CONTRACTOR'S testing and startup procedures shall include detailed descriptions of all preoperational electrical, mechanical and instrumentation testing work. Each control device, item of mechanical, electrical and instrumentation equipment, and all control circuits shall be considered in the testing procedures, which shall be designed, in a stepwise, logical sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation. The CONTRACTOR is advised that failure to observe these precautions may place the acceptability of the subject equipment in question, and he may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the ENGINEER. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operations, and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been accepted by the ENGINEER, the CONTRACTOR shall produce checkout, alignment and adjustment, and calibration signoff forms for each item of equipment, which shall be used in the field by the CONTRACTOR and the ENGINEER jointly, to ensure that each item of electrical, mechanical and instrumentation equipment has been properly installed and tested.

B. Equipment Startup: Before startup, the CONTRACTOR shall properly lubricate all bearings and other items which normally require lubrication, and fill each gear case and oil reservoir to the proper operating level, using the equipment manufacturer's supplied lubricant. The CONTRACTOR shall be responsible for lubrication of equipment throughout the entire equipment "break-in" period and shall include as a minimum the first lubrication charge.

1. The CONTRACTOR shall be responsible for the startup, adjustment, preliminary maintenance and checkout of all equipment and instrumentation. All systems shall be carefully checked for conformance with the design criteria.

2. If any equipment or system does not operate properly, the CONTRACTOR shall immediately replace or repair components until it operates properly.

3. When the equipment startup is complete, the CONTRACTOR shall submit a startup report to the ENGINEER.

1.03 FACILITY STARTUP AND TESTING

A. Adjustments: When a motor, pump, valve, meter, instrument or other items of equipment is found to be in conflict with the stated design criteria, an adjustment shall be made to the item by an experienced representative of the manufacturer.

1. If adjustments fail to correct the operation of a piece of equipment, remove the equipment from the project site and replace it with a workable replacement that will meet the specification requirements.

B. Lubrication: Immediately prior to final acceptance, make a final check of all lubrication requirements, and leave all equipment properly lubricated, ready for OWNER'S use.

1. For consistency throughout the facility, all oil products shall be manufactured by one manufacturer acceptable to the OWNER.

1.04 OWNER PERSONNEL TRAINING

A. On completion of the job, the CONTRACTOR shall completely adjust ready for use, hydraulic, mechanical and electrical systems under this CONTRACT. The CONTRACTOR shall provide a complete instruction manual covering the function and operation of all control components on the job. Copies of this manual shall be furnished to the OWNER'S operating personnel and a competent technician shall be provided for instruction purposes. The OWNER'S operating personnel shall receive instructions on all systems provided under this CONTRACT. This training period shall be scheduled with the ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Conditions of the CONTRACT: Fiscal provisions, legal submittals, and other administrative requirements.

B. Section 01500- Temporary Facilities and Controls

1.02 CLOSEOUT PROCEDURES

A. CONTRACTOR shall comply with procedures stated in GENERAL CONDITIONS of the CONTRACT for issuance of CERTIFICATE OF SUBSTANTIAL COMPLETION.

B. When CONTRACTOR considers WORK has reached final completion, CONTRACTOR shall 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 inspection.

C. In addition to submittals required by the conditions of the CONTRACT, CONTRACTOR shall provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted CONTRACT SUM, previous payments, and sum remaining due.

D. If appropriate, the ENGINEER will issue a final CHANGE ORDER reflecting any approved adjustments to CONTRACT SUM not previously made by CHANGE ORDER.

1.03 FINAL CLEANING

A. CONTRACTOR shall execute prior to final inspection.

B. CONTRACTOR shall clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces.

C. CONTRACTOR shall clean site; sweep paved area; rake clean other surfaces.

D. CONTRACTOR shall remove waste and surplus materials, rubbish, and construction facilities from the PROJECT and from the site.

1.04 WARRANTIES AND BONDS

A. CONTRACTOR shall provide duplicate copies. Execute CONTRACTOR's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers.

B. CONTRACTOR shall submit material prior to final application for payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. CONTRACTOR shall maintain and provide the ENGINEER with the PROJECT record documents as specified below except where otherwise specified or modified in other Divisions of the CONTRACT DOCUMENTS. Current status of RECORD DRAWINGS shall be a condition precedent to progress payments.

1.02 MAINTENANCE OF DOCUMENTS

A. A set of bluelines of the CONTRACT DRAWINGS shall be updated by the CONTRACTOR with record information and reviewed by the ENGINEER prior to each request for payment made by the CONTRACTOR.

1.03 RECORDING

A. CONTRACTOR shall keep record documents current, and updated at least monthly.

B. CONTRACTOR shall not permanently conceal any WORK until required information has been recorded.

C. Contract Drawings: CONTRACTOR shall legibly mark to record actual construction including:

1. Depths of various elements of foundation in relation to datum.
2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
4. Field changes of dimensions and details.
5. Changes made by modification or field change.
6. Details not on original CONTRACT DRAWINGS.

D. Specifications and Addenda: CONTRACTOR shall legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by modification or field change.
3. Other matters not originally specified.

E. Shop Drawings: CONTRACTOR shall maintain as record documents and legibly annotate drawings to record changes made after review.

1.04 RECORD DRAWINGS

A. RECORD DRAWINGS shall be prepared for all the WORK included in the CONTRACT showing the actual in-place installation of the items installed under this CONTRACT. The drawings shall show the WORK in plan and sections as required for clarity with reference dimensions and elevations for complete RECORD DRAWINGS.

B. The CONTRACT DRAWINGS may be used as a starting point in developing these drawings. Subcontractor and manufacturer drawings may be included in this drawing package. The drawing package must be fully integrated and include the necessary cross references between the drawings. The drawing package shall include

interconnection and termination details to equipment furnished under this CONTRACT.

C. The RECORD DRAWINGS of the electrical work shall show one-line diagrams with all conduit and wire sizes shown of the distribution systems and the actual in-place grounding system, lighting arrangement, motor control centers, corrected wiring diagrams, equipment and conduit and cable plans.

1.05 SUBMITTAL

A. No later than 30 days after the completion of the WORK, the CONTRACTOR shall furnish three (3) blueline sets of the RECORD DRAWINGS to the ENGINEER for review and approval. The RECORD DRAWINGS will be reviewed and returned to the CONTRACTOR within 30 days. A set of reproducibles and three (3) blueline sets of the final record documents shall be submitted to the ENGINEER. The final submittal of RECORD DRAWINGS shall be made not later than 30 days after the ENGINEER returns the documents and prior to final payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section includes operations which cannot be specified in detail as separate Items, but can be sufficiently described as to the kind and extent of work involved. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals to complete the WORK under this Section.

B. The WORK of this Section includes, but is not limited to, the following:

1. Restoring servitudes and rights-of-way.

2. Cleaning up.

3. Incidental work.

C. All WORK shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of these SPECIFICATIONS.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials required for this Section shall be of at least the same type and quality as materials that are to be replaced or restored. Where possible, the CONTRACTOR shall reuse existing materials that are removed and then replaced, with the exception of paving.

PART 3 - EXECUTION

3.01 RESTORING OF FENCES AND GUARD RAILS

A. It may be necessary for the CONTRACTOR to remove, store and replace existing fences and guard rails during construction. Only the sections directed by the ENGINEER shall be removed. If any section of fence or guard rail is damaged due to the CONTRACTOR'S negligence, it shall be replaced with fencing or guard rail equal to or better than that damaged, and the WORK shall be satisfactory to the ENGINEER.

3.02 RESTORING SERVITUDES AND RIGHTS-OF-WAY

A. Portions of the construction occur in servitudes through private property. The CONTRACTOR shall be responsible for all damage to private property due to his operations. He shall protect from injury all walls, fences, cultivated shrubbery, pavement, underground facilities such as water pipe, or other utilities which may be encountered. If removal and replacement are required, it shall be done in a workmanlike manner so that the replacement is equivalent to that which existed prior to construction.

B. Existing lawn, pasture or other grassed surfaces damaged by construction shall be regraded and resodded or reseeded. These areas shall be maintained until all WORK under this CONTRACT has been completed and accepted.

3.03 CLEANING UP

The CONTRACTOR shall remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall render the site of the WORK in a neat and orderly condition.

3.04 INCIDENTAL WORK

Perform all incidental work not otherwise specified, but obviously necessary for the proper completion of the CONTRACT as specified and as shown on the DRAWINGS.

END OF SECTION

SECTION 01750 –
SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.01 SCOPE

A. As soon as practicable after approval of the equipment specified in the individual Sections, the CONTRACTOR shall furnish maintenance material data for equipment. The data shall include a complete list of parts and supplies, including any special tools required for equipment, with current unit prices and source of sources of supply.

B. CONTRACTOR shall also furnish a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or are specified to be furnished as part of the CONTRACT, and shall furnish a list of additional items recommended by the manufacturer to assure efficient operation for the particular installation for a period of one year or other guarantee period, whichever is greater.

C. All parts shall be securely boxed and tagged, and clearly marked on the box and individually for identification as to the name of the manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.

D. Parts and materials shall be delivered to the ENGINEER upon completion of the WORK or when the OWNER assumes beneficial occupancy. CONTRACTOR shall then place them in permanent storage rooms or areas approved by the ENGINEER. The turnover procedures shall be developed by the ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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DIVISION 2

SITE CONSTRUCTION

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials, and incidentals required and remove all existing equipment and all pipe, fittings, valves, and appurtenances not required for the proper operation of the new plant. Removal will be consistent with the final configuration of the new systems as indicated on the Drawings, as specified herein or as required by the Engineer. The equipment and piping shall be removed from their present locations and shall be either stored at the plant or removed from the plant site as specified hereinafter.

B. The Owner will keep two recently installed 10" self-priming Gorman Rupp pumps and associated valves and piping along with the existing automatic transfer switch.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall not proceed with the removal of any equipment, piping, or appurtenances without specific approval of the Engineer. Any equipment, piping or appurtenances removed without proper authorization, which are necessary for the operation of the existing plant or of the extended plant, shall be replaced to the satisfaction of the Engineer at the Contractor's expense.

B. All existing tubing, insulation, hangers, and supports shall become the property of the Contractor immediately upon removal from their present locations. The Contractor shall remove such material from the plant site at his own expense and it shall not be reused.

C. All existing valves, and other special line elements, greater than 3-inch diameter, removed shall remain the property of the Owner. The Contractor shall furnish all labor and material to identify, clean, protect, crate, and box and store them at the plant site.

D. Pieces of equipment weighing 150 lbs or more shall be provided with suitable skids before storing.

E. Wherever piping is removed for disposal, adjacent pipe, and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.

F. Equipment to be retained by the Owner shall be carefully removed from the present location, cleaned, and immediately stored onsite as designated by the Owner.

G. The Contractor shall take all necessary precautions against damaging the material and equipment to be stored. The Contractor shall repair any damage resulting from his operations, as directed by and to the satisfaction of the Engineer. Itemized lists of materials removed and stored shall be given to the Engineer daily. A final typed itemized list shall be furnished to the Engineer in 6 copies at the completion of construction. The list shall include items, method of packaging, and place of storage.

3.02 EQUIPMENT TO BE RETAINED

A. The following is a list of items which shall be removed and remain the property of the Owner. Items shall be packaged and stored as specified and/or as directed by the Owner. The list is not intended to be complete, but only to convey the general types of equipment to be retained by the Owner.

TWO SELF-PRIMING GORMAN RUPP PUMPS
TWO GATE VALVES, CHECK VALVES AND ASSOCIATED PIPING
AUTOMATIC TRANSFER SWITCH

B. All equipment removed shall remain the property of the Owner unless designated otherwise by the Owner.

C. If the Owner elects not to retain ownership of a certain item, the item shall become the property of the Contractor and shall be removed from the plant site at the Contractor's expense.

END OF SECTION

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SECTION 02221 - MODIFICATIONS TO EXISTING STRUCTURES, PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals to modify, alter and/or convert existing structures as shown or specified and as required for the installation of new mechanical equipment, piping, structures, and appurtenances.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall cut, repair, excavate, demolish, or otherwise remove parts of the existing structures or appurtenances, as indicated on the Contract Drawings, herein specified, or necessary to permit completion of the work under this Contract. He shall dispose of surplus materials resulting from the above work in an approved manner. The work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.

B. The Contractor shall dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, the Contractor shall cut existing pipelines for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removed shall be cut off one inch below the concrete surface. Surface shall be finished as specified in Division 3.

C. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including a new valve, shall be installed.

D. No existing structure, equipment, or appurtenances shall be shifted, cut, removed, or otherwise altered except with the express approval of and to the extent approved by the Engineer.

E. When removing materials or portions of existing structures and when making openings in walls and portions, the Contractor shall take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work and not to damage the structures or contents by falling or flying debris. Unless otherwise permitted, line drilling will be required in cutting existing concrete.

F. Materials and equipment removed in the course of making alterations and additions shall remain the property of the Owner, except that items not salvageable, as determined by the Engineer and the Owner shall become the property of the Contractor to be disposed of by him off the work site at his own place of disposal. Operating equipment shall be thoroughly cleaned, lubricated, and greased for protection during prolonged storage.

G. All alterations to existing structures shall be done at such time and in such manner as will comply with the approved time schedule. So far as possible before any part of the work is started all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delay.

H. All workmanship and new materials involved in constructing the alterations shall conform to the General Specifications for the classes of work insofar as such specifications are applicable.

I. All cutting of existing concrete or other materials to provide suitable bonding to new work shall be done in a manner to meet the requirements of the respective section of these Specifications covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the Engineer.

J. Surface of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.

K. Non-shrink grout shall be used for setting wall castings, sleeves, leveling pump bases, doweling anchors into existing concrete and elsewhere as shown.

L. Where necessary or required for the purpose of making connections, the Contractor shall cut existing pipelines in a manner to provide an approved joint. Where required, he shall weld beads, flanges, or provide Dresser Couplings, all as required.

M. The Contractor shall provide flumes, hoses, piping, and other related items to divert or provide suitable plugs, bulkheads, or other means to hold back the flow of wastewater, water, or other liquids, all as required in the performance of the work under this Contract.

N. Blasting will not be permitted.

3.02 CLEANING EXISTING STRUCTURES

A. After dewatering by Contractor and before commencing work on any structures, the Contractor shall remove and dispose of the debris and other solids remaining in such structures.

3.03 CONNECTING TO EXISTING PIPING AND EQUIPMENT

A. The Contractor shall verify exact location, material, alignment, joint, etc. of existing piping and equipment prior to making the connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection.

B. The Contractor shall dismantle and remove all existing equipment, piping and other appurtenances required for the completion of the work. Were called for or required, Contractor shall cut existing pipelines for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removed shall be cut off one inch below the concrete surface. Surface shall be finished as specified in Division 3.

C. At the time that a new connection is made to an existing pipeline, additional new piping, extending to and including the most convenient new valve, shall be installed.

END OF SECTION

SECTION 02315 - EXCAVATION, BACKFILLING, AND COMPACTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, grading, and wall protection required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to, excavation, filling and grading under and around precast and cast in place structures to attain the subgrades and grades indicated on the Drawings, trenching operations to install pipe, manholes, vaults, electrical duct conduit, and other structures, including all backfilling, grading, disposal of surplus and unsuitable materials, and all related work such as sheeting, bracing and water handling.

1.02 QUALITY ASSURANCE

A. The CONTRACTOR shall perform excavation work in compliance with applicable requirement codes and standards of governing authorities having jurisdiction.

1.03 JOB CONDITIONS

A. The CONTRACTOR shall examine the site and review all available information prior to submitting his bid, taking into consideration all conditions that may affect his work. The OWNER and ENGINEER will not assume responsibility for subsurface conditions.

B. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

1. The location of pipes, ducts, or underground structures is not warranted to be exact, nor is it warranted that all underground pipes, ducts, or structures are shown. The CONTRACTOR shall contact Louisiana One Call and any other appropriate utility company for location of their underground service a minimum of 48 hours prior to beginning construction in each area. It is the CONTRACTOR's responsibility to verify and locate all utilities in the field at no cost to the OWNER.

2. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility OWNER or make the site available to the utility OWNER for his work crews to make the necessary repairs at no additional cost to the OWNER.

3. Demolish and completely remove from site any existing underground utilities indicated on the Drawings to be removed.

4. Examine the areas and conditions under which excavating, filling, and grading are to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected.

5. Examine existing grades prior to commencement of work and report to ENGINEER if elevations of existing subgrade vary from elevations shown on Drawings.

6. If it is determined that existing utilities are to be relocated by OWNER of those utilities, the CONTRACTOR shall be responsible for that coordination. The CONTRACTOR shall notify the utility OWNER in sufficient time as to avoid any delays to the CONTRACTOR's schedule. The CONTRACTOR is solely responsible for this coordination, and no delay or extension of time will be allowed as a result of or the cause of inaction by the CONTRACTOR or utility OWNER.

1.04 PROTECTION

A. Slope sides of excavations to comply with OSHA regulation and any applicable local codes and ordinances. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

B. Sheeting and Bracing in Excavations:

1. In connection with construction of below grade structures and piping, the CONTRACTOR shall construct, brace, and maintain cofferdams consisting of sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing yard piping and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed they shall be immediately filled and rammed.

2. Trench sheeting for pipes is not to be withdrawn when driven below mid-diameter of any pipe, and no wood sheeting shall be cut off at a level lower then 1 foot above the top of any pipe unless otherwise directed by the ENGINEER. If during the progress of the work the ENGINEER decides that additional wood sheeting should be left in place, he may direct the CONTRACTOR in writing and the CONTRACTOR shall be reimbursed in accordance with the Bid Documents. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.

3. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, existing utilities, existing piping, or personnel and property. Unless otherwise approved or indicated on the Drawings or in the Specifications, all sheeting and bracing may be carefully removed after completion of the substructure. Care shall be taken not to disturb or otherwise injure any finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by hydraulic compaction or otherwise as may be directed.

4. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or on the work occasioned by negligence or other cause, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

5. The CONTRACTOR may construct the cofferdams and sheeting outside the neat lines of the foundation for pipes and manholes, unless indicated otherwise, to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing, and cofferdams shall be adequate to withstand all pressures to which the existing or new structure will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a manner to avoid disturbing any completed construction or personnel injury. Any movement or bulging which may occur shall be corrected by the CONTRACTOR so as to provide the necessary clearances and dimensions.

6. The CONTRACTOR is fully responsible for any sheeting, bracing and cofferdams that are required to perform any of the Work under the contract. As part of his submittal of schedules and other data indicating his planning of the Work, the CONTRACTOR shall provide drawings of the planned supporting system, not for review by the ENGINEER but for informational purposes only and use by the ENGINEER in tracking the progress of the Work. Such drawings shall be of sufficient detail to adequately disclose the method of operation that the CONTRACTOR plans to use for each of the various stages of construction. The Work shall not be started until such drawings are received.

7. Establish requirements for trench shoring and bracing to comply with OSHA regulations and any applicable local codes and ordinances.

8. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry

down shoring and bracing as excavation progresses.

9. As an alternate to sheeting, the CONTRACTOR is authorized to utilize a mechanical trench box, the size and construction of which shall be submitted to the ENGINEER for review.

C. Dewatering, Drainage and Flotation:

1. The CONTRACTOR shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems he proposes for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills.

2. The CONTRACTOR shall construct and place all pipelines, concrete work, structural fill, bedding, and base course, in-the-dry. In addition, the CONTRACTOR shall make the final 24-inches of excavation for this work in-the-dry, and not until the water level is a minimum of twelve (12) inches below proposed bottom of excavation.

3. The CONTRACTOR shall, at all times during construction, provide and maintain proper equipment and facilities to promptly remove and dispose of all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition, until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

4. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

5. Wellpoints may be required for predrainage of the soils prior to final excavation for deeper below ground structures or piping, and for maintaining the lowered groundwater level, until construction has been completed to such an extent that the structure, pipeline, or fill will not be floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided. Correction of any damages caused to the structures being constructed or to any existing structures due to failure of the dewatering equipment shall be the Contractor's full responsibility.

6. If requested by the ENGINEER, the CONTRACTOR's proposed method of dewatering shall include a minimum of two (2) 4-inch, Schedule 40, operating groundwater observation wells at each structure to be used to determine the water level during construction of the structure. Locations of the observations wells shall be at structures and along pipelines as approved by the ENGINEER prior to their installation.

7. Prior to excavation, the CONTRACTOR shall submit his proposed method of dewatering and maintaining dry conditions to the ENGINEER. The CONTRACTOR shall be responsible for the satisfactory performance of the system. The CONTRACTOR shall be responsible for correcting any disturbance or natural bearing of soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.

8. As part of the submittal of his dewatering system, the CONTRACTOR may be required to demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one quart sample.

9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the ENGINEER.

10. Continuous pumping will be required as long as water levels are required to be below natural levels.

11. While dewatering for new construction in the vicinity of the existing structures, depletion of the groundwater level underneath these existing structures may cause settlement. To avoid this settlement, the groundwater level under these structures shall be maintained by appropriate methods of construction.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights in accordance with local requirements. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 REQUIREMENTS INCLUDED

A. Definitions:

1. Select Material - Select fill shall conform to Louisiana DOTD designation TR 423 Classes A-I-a, A-l-b, A-3, A-2-4, A-2-6, A-4 or A-6 having a maximum liquid limit of 35, a maximum plasticity index of 15, a maximum organic content of 2%, and a maximum silt content of 60%. This material is referred to as "selected soils" in the Louisiana DOTD Specifications. Based on an approved geotechnical engineering report, particularly A-6 soils, a higher elasticity index of up to 25 will be considered. These materials can be used for backfill in over-excavated areas, for backfill from 12 inches above the top of the pipe to the top of the subgrade and as structural fill/backfill.

2. Bedding Materials - Bedding materials shall conform to Louisiana DOTD Specifications 1003.08, however, shell will not be allowed as bedding material. These materials shall be used for placement under the pipes in the trench and as a bedding material as defined on the Drawings and shall have a minimum thickness of 6 inches; these materials shall also be used for backfill in over-excavated trench areas and may be used for backfill from above the top of the pipe to the top of subgrade and as structural fill/backfill.

3. Stabilization Materials - Stabilization materials shall be a blended, manufactured aggregate conforming to the requirements for concrete aggregate as stated in ASTM C33 except for gradation which shall be between sizes 78 and 57 (inclusive) as specified in ASTM D448.

4. Granular Materials Granular materials shall conform to Louisiana DOTD Specifications 1003.07. These materials shall be used for backfilling around the pipes from the bedding material up to at least 12 inches above the top of the pipes or to subgrade and in confined areas around structures; these materials may also be used as structural fill/backfill.

5. Usable Excavated Soils - Usable excavated soils, referred to as "usable soils" in Louisiana DOTD specifications, shall conform to Classes A-I-a, A-l-b, A-2-4, A-2-5, A-2-6, A-2-7, A-3, A-4, A-5, A-6, A-7-5, and/or A-7-6, except that soils in Classes A-5, A-6, A-7-5 and A-7-6 which are considered unusable by the ENGINEER and any soil with a plasticity index exceeding 60 will not be accepted in accordance with paragraph 203.06 in the Louisiana DOTD specifications. These materials can be used for backfill from 12 inches above the top of the pipe up to the surface in unimproved areas.

6. Soil classifications used herein are to be in accordance with the AASHTO table for "Classification of Soils and Soil-Aggregate Mixtures (With Suggested Subgroups) " as shown on LADOTD designation TR423.

B. General:

1. Materials for use as fill and backfill shall be as described above. The CONTRACTOR shall notify the ENGINEER of the source of each material and shall furnish to the ENGINEER for testing and approval, a representative sample of each material weighing approximately 50 pounds, at least ten

(10) calendar days prior to the date of anticipated use of such material.

2. Additional materials shall be furnished as required from off-site sources and hauled to the site.

3. Disposal of unsuitable material is specified in this Section, see Paragraph 3.07.

C. Structural Fill:

1. Structural fill shall consist of select fill and shall be used below spread footing foundations, slab-on-grade floors, and other structures and as backfill within three (3) feet of the below grade portions of structures, except that, when stabilization layers of courses are shown on the Drawings, stabilization material shall be placed and compacted over the structural fill material in accordance with the requirements for the structural fill.

2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the ENGINEER, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials.

PART 3 - EXECUTION

3.01 EXCAVATION

A. General:

Excavation consists of removal and disposal of material encountered when establishing required grade elevations and in accordance with the Drawings.

B. Excavation Classifications:

The following classifications of excavation will be made when unclassified excavation is encountered in the work. Do not perform such work until material to be excavated has been cross-sectioned and classified by ENGINEER or specialized geotechnical consultant.

1. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated in soil boring data to be removed, and other materials encountered that are not classified but are to be removed.

2. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by the ENGINEER, shall be at no additional expense to the OWNER. Backfill and compact unauthorized excavations as specified for authorized excavations, except that bedding material as specified above shall be used for backfill under footings, foundations bases, or retaining walls unless otherwise directed by the ENGINEER. The ENGINEER may approve the use of lean concrete fill, reinforced or unreinforced as required by the site conditions and as required by the ENGINEER, if soil conditions allow the extra loading.

C. Additional Structural Excavation:

When excavation has reached required subgrade elevations, notify the ENGINEER who will make an inspection of conditions or contact a geotechnical consultant to do so.

1. If unsuitable, unsatisfactory bearing materials are encountered at the required subgrade elevation, carry excavation deeper and replace the excavated material as directed by the ENGINEER.

2. Removal of unsuitable material and its replacement as directed beyond the authorized limits will be paid on the basis of contract conditions relative to changes in the Work as provided in the General

Conditions.

D. Excavation for Structures:

Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete framework, installation of services, other construction, and for inspection, or as shown on the Drawings.

1. In excavation for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive any required stabilization material or concrete.

2. In the event that excavations subsequent to the placement of the fill are performed by the CONTRACTOR to install piping, conduit, or other appurtenances, any fill placed above the level of the planned excavation shall be fully compacted in accordance with the requirements of this specification prior to beginning the excavation.

3.02 FILL PLACEMENT

A. General:

1. Material placed in fill areas under and around structures or within the pipe trench limits shall be deposited within the lines and to the grades shown on the Drawings or as directed by the ENGINEER, making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved by the ENGINEER. If sufficient fill material is not available from excavation on site, the CONTRACTOR shall provide borrows as may be required.

2. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

3. Fill shall be brought up in substantially level lifts throughout the site, starting in the deepest portion of the fill. The entire surface of the work shall be maintained free from ruts, and in such condition that construction equipment can readily travel over any section. Fill shall not be placed against concrete structures until they have attained sufficient strength.

4. Fill shall be dumped and spread in layers by a bulldozer or other approved method. During the process of dumping and spreading, all roots, debris, and other objectionable material shall be removed from the fill areas, and the CONTRACTOR shall assign a sufficient number of men to this work to insure satisfactory compliance with these requirements.

5. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by an other approved method before the succeeding layer is placed.

6. All fill materials shall be placed and compacted in dry conditions. The CONTRACTOR shall dewater excavated areas and is required to perform the work in such manner as to preserve the undisturbed state of the natural inorganic soils.

3.03 COMPACTION

A. General:

1. CONTRACTOR shall control soil compaction during construction and obtain the minimum required percentage of the total maximum dry densities as specified herein and as shown on the structural or civil drawings. The CONTRACTOR shall maintain the backfill for a period of one (1) year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures which may be damaged as a result of backfill failure. It shall be the CONTRACTOR's responsibility to

notify the ENGINEER in writing that compaction tests of either the nuclear gauge, sand-cone, or other method as required can be performed.

2. The frequency for density tests will be a minimum of one (1) test per lift per 1,000 linear feet under pavements, within street and highway rights-of-way, and under building slabs and one (1) randomly selected test per 2,500 linear feet for open areas (testing of each lift in open areas is not required). If the density tests indicate that the work does not meet specified density requirements, the ENGINEER may require additional density tests to determine the extent of the deficient Work. The CONTRACTOR will not be allowed an extension of contract time as a result of any density testing.

3. It is the CONTRACTOR's responsibility to provide equipment and labor as needed to achieve the required compaction as specified herein. Should the rates of compaction fall below the values specified herein, the ENGINEER has the right to instruct the CONTRACTOR to alter his work to assure that the required backfill quality is consistently achieved. Any decision by the ENGINEER to forgo such instructions shall in no way relieve the CONTRACTOR of his responsibility to provide backfill of the specified quality.

B. Percentage of Maximum Density Requirements:

1. Compact soil to not less than the following percentages of maximum dry density as determined in accordance with AASHTO T-180 (ASTM D1557) or seventy-five percent (75%) relative density as determined by ASTM D2049 as applicable.

a. Building Slabs: Compact top 12-inches of subgrade and each layer of backfill or fill material to a minimum of ninety-five percent (95%) of the maximum dry density.

b. Compaction of Backfill near Highways or Streets: Where the trench limit falls under the roadway pavement or within two (2) feet of the edge of pavement, requiring granular backfill and in other areas designated on the plans where future roadways are to be constructed, backfill for the balance of the trench above a point one (1) foot above the top of the pipe shall be placed in layers of not more than 6-inch compacted thickness and compacted with mechanical tampers or by any satisfactory method or methods that will obtain the density hereinafter specified. The density of compacted material in each layer of backfill shall not be less than ninety-five percent (95%) of the maximum dry density.

c. Walkways: Compact top 6-inches of subgrade to a minimum of ninety-five percent (95%) of the maximum dry density.

d. Pavements and Steps: Compact top 24-inches of subgrade to a minimum of ninety-five percent (95%) of the maximum dry density.

e. Bedding Material: Shall be compacted to a minimum of ninety-two percent (92%) of the maximum dry density.

f. Compaction of all other Backfill: Where a trench is in open ground and the backfill is not influenced by the loading conditions as described in the other listed backfilling requirements, the balance of the trench above a point one (1) foot above the top of the pipe may be filled and compacted in layers of not more than 12 inches to obtain a minimum density of the measured in-situ condition prior to excavation. If the CONTRACTOR has to dry the excavated soil to a moisture content below the insitu moisture content in order to achieve the required rate of compaction, he shall do so at no additional expense to the OWNER. The final surface shall be left in a condition equal to that originally found at the start of the work.

C. Moisture Control: Condition subgrade or layer material correcting moisture content:

1. When the material is too dry to be compacted efficiently, the CONTRACTOR shall uniformly apply water to surface of subgrade or layer of soil material and thoroughly mix the soil to achieve a moisture content near the optimum level to facilitate compaction.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3. Soil material that has been removed because it is too wet to permit compaction but is otherwise satisfactory may be stockpiled or spread and allowed to dry. The CONTRACTOR may assist the drying process by discing, harrowing or pulverizing to reduce the moisture content to a satisfactory value.

D. Structural fill and base course in open areas shall be placed in layers not to exceed the thicknesses specified above. Each layer shall be compacted to the minimum dry density as stated herein. Incidental compaction due to traffic by construction equipment will not be credited toward the required minimum compaction as required for any material.

E. All other fill shall be placed and compacted in a manner similar to that described above for structural fill except that dike or levee fill required below water level in peat excavation areas, may be placed as one lift, in-the-wet, to an elevation one (1) foot above the water level at the time of filling.

F. Areas adjacent to structures and other confined areas inaccessible to roller type equipment shall be compacted with approved hand guided mechanical compaction equipment. The CONTRACTOR shall also conform to additional backfilling requirements at structures as specified elsewhere in these specifications. Compaction of the fill by such means shall be to the same degree of compaction as obtained by roller type equipment and the ENGINEER may make the necessary tests to determine the amount of compactive effort necessary to obtain compaction. Unless such tests indicate that modifications may be made, the fill compacted by mechanical compactors shall be placed in 6-inch layers and thoroughly tamped over the entire surface. Compaction equipment is subject to approval by the ENGINEER.

3.04 PIPE EXCAVATION AND BACKFILLING

A. Excavation for all trenches required for the installation of pipes and electrical ducts shall be made to the depths indicated on the Drawings and in such manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches, for bracing and supporting and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry, and in all respects acceptable to the ENGINEER.

B. Where pipes or ducts are to be laid in bedding or encased in concrete, the trench may be excavated by machinery to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

C. Where the pipes or ducts are to be laid directly on the trench bottom, the lower part of the trenches shall be excavated to grade by machinery. The material being excavated shall be done in such a manner that will give a flat bottom true to grade so that pipe or duct can be evenly supported on undisturbed material. Bell holes shall be made as required.

D. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected and the trench filled with suitable compacted bedding material up to a level even with six-tenths of the outside diameter of the pipe or as otherwise required on the Drawings.

E. Backfilling over ducts shall begin not less than three (3) days after placing concrete encasement.

F. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings and specified herein.

G. Any space remaining between the pipe and sides of the trench shall be packed full by hand shovel with bedding material and thoroughly compacted with a tamper. Material shall be placed in lifts no greater than 6-inches in thickness, up to a level even with six-tenths of the outside diameter of the pipe.

H. The backfilling shall be carried up evenly on both sides of the pipe with at least one man tamping for each man shoveling material into the trench.

I. Granular material shall then be placed and compacted from the top of the bedding material to a minimum depth of one (1) foot above the top of the pipe.

J. The remainder of the trench above the compacted granular material as just described above shall be filled and thoroughly compacted to the required density by rolling, ramming, or puddling to prevent subsequent settling.

3.05 BACKFILLING AROUND STRUCTURES

A. Fill shall be placed in layers having a maximum thickness of eight (8) inches in loose state and shall be compacted sufficiently to prevent settlement. If compaction is by rolling or ramming, material shall be wet down as required. Where material can be suitably compacted by flooding, the CONTRACTOR may use this method.

B. The final finished surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the plans, and no soft spots or uncompacted areas will be allowed in the work.

C. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure, and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

3.06 GRADING

A. General: Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades as are required or shown on the Drawings.

B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum dry density for each area classification.

C. Grading shall be performed at such places as are indicated on the Drawings, to the lines, grades, and elevations shown or as directed by the ENGINEER and shall be made in such a manner that the requirements for formation of embankments can be followed. All unacceptable material encountered, of whatever nature within the limits indicated, shall be removed and disposed of in accordance with Paragraph 3.07. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

D. If at the time of excavation it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use. No additional cost is allowed for the stockpiling or double handling of excavated material

E. The right is reserved to make adjustments or revisions in lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.

F. All fill slopes shall be uniformly dressed to the slope, cross section and alignment shown on the Drawings, or as directed by the ENGINEER.

G. In cuts, all loose material on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross section and alignment shown on the Drawings or as directed by the ENGINEER.

H. No grading is to be done in areas where there are existing pipelines that may be uncovered or damaged until such lines, which must be maintained, are relocated, or where lines are to be abandoned, all required valves are closed and drains plugged at manholes.

3.07 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

A. Unsuitable and surplus excavated materials, unless specified otherwise below, and pavement shall become the property of the CONTRACTOR and shall be removed and disposed of by the CONTRACTOR off the project site.

B. Usable, excavated material may be used for fill or backfill if it meets the specifications and is approved by the ENGINEER. Excavated material so approved may be neatly stockpiled at the site where designated by the ENGINEER provided there is an area available that will not interfere with the OWNER's access nor inconvenience traffic or adjoining property OWNERs.

C. Surplus suitable excavated material may be used to fill depressions as the ENGINEER may direct.

D. In instances where the OWNER can use surplus excavated materials and so desires to retain possession of the material, the CONTRACTOR will be directed to stockpile the material on site.

3.08 SPECIAL FOUNDATIONS

A. The CONTRACTOR shall furnish and install a special foundation for sewer pipe, water pipe, and manholes or other pipes as shown on the Drawings.

B. All piping shall be installed on the special bedding foundation and the prices for laying pipe shall include this cost. This bedding shall be as previously specified and placed in the trench to the proposed elevation prior to any pipe laying. This bedding shall not be used under any circumstances as a drain for groundwater. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing erosion or loosening of this bed.

3.09 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep areas free of trash and debris and repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

END OF SECTION

SECTION 02318 -
TRENCH EXCAVATION AND BACKFILL FOR YARD PIPING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section trenching and backfilling for underground pipelines, other conduits and their appurtenances. Installation procedures are covered in other sections of these specifications.

1.02 PROTECTION

A. An attempt has been made to show all underground pipelines, conduits, and other obstructions along the proposed route of the conduit; however, this does not relieve the Contractor of the responsibility of locating these obstructions for himself nor does it relieve him of the responsibility of locating any obstruction not shown on the Drawings. Any damage done to any pipeline, conduit, or underground utility shall be reported at once to the owner of the utility and will, at the discretion of the owner, be immediately repaired by or at the expense of the Contractor, under the direction or supervision of the owner of the damaged structure or pipeline.

B. The Contractor shall control the banks of all excavated areas as is necessary to prevent movement of soil in areas supporting existing foundations, slabs, utility line poles, pipelines or other structures. If, as a result of the excavation, the earth or ground under or around such foundations, slabs, utility line poles, pipelines or other structures slips or is otherwise disturbed, corrective measures shall be taken at the expense of the Contractor.

C. Sheeting, shoring and bracing shall be furnished and installed in the trench as may be necessary for protection of the work and for the safety of personnel, and in no case less than the prescribed by local, State and Federal regulations. Where in the opinion of the Engineer, damage to the work is liable to result from withdrawing sheeting, the sheeting will be required to be left in place. All grading in the vicinity of trenches and other excavations shall be controlled to prevent surface ground water from flowing into the excavations. Contractor to be totally responsible for determining the need for sheathing, shoring, and bracing.

PART 2 - PRODUCTS

2.01 EMBANKMENT AND BACKFILL MATERIALS

A. Embedment Material
   1. Bedding Material.
   2. Clam Shell - Clam shell for trench foundation shall be washed and have no more than 5% foreign material by dry weight.
   3. Crushed Limestone - Approved 100% crushed limestone shall meet the following gradation requirements:

U.S. Sieve	Percent Passing (By Weight)
1 ½"	100
1"	95 to 100
½"	62 to 90
No. 4	40 to 70
No. 40	12 to 32

B. Granular Material - Non plastic, having clean, hard, durable, siliceous grains such as sand. Material shall be tested in accordance with DOTD TR 112 and TR 113, shall meet the following gradation requirements:

U.S. Sieve	Percent Passing (By Weight)
½"	100
No. 10	75 to 100
No. 200	0 to 15

C. Usable Soil.

PART 3 - EXECUTION

3.01 EXCAVATION

A. The Contractor shall perform all excavation of whatever substance encountered, to the depths indicated on the Drawings or specified herein. If it is necessary to adjust, correct, relocate or change the line and profile shown on the Drawings, the excavation and backfill required by said change shall be performed by the Contractor under the terms of these specifications.

B. Trenches shall be at the widths shown in the Drawings for the various pipe or conduit sizes and wall materials. If not shown, the widths shall only be as wide as necessary to permit proper installation and shall in no case be wider than the following for the various sizes of conduits:

33 inches and smaller outside dimensions - O.D. + 18 inches.
36 inches and larger outside dimensions - O.D. + 24 inches.

C. The width of the trench from 12 inches above the top of the pipe to 6 inches below its bottom shall be no greater than described above. The width of the trench above that level may be as wide as desired for sheeting and bracing and the proper performance of the work at the option of the Contractor.

D. If for any reason, the width of the trench from 12 inches above the top of the pipe to 6 inches below the bottom of the pipe exceeds the width permitted, either pipe of adequate strength, special pipe embedment, or concrete arch encasement, as required by loading conditions and as determined by the Engineer, shall be furnished and installed by and at the expense of the Contractor.

E. The trench walls shall be cut as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to accommodate the embedment and encasement called for, if any, at the pipe elevations and slope shown or indicated.

F. Care shall be taken not to excavate below the depths indicated. Unauthorized excavation shall be backfilled with granular embedment as directed by the Engineer and at the expense of the Contractor. Whenever wet or otherwise unsuitable soil is encountered in the bottom of the trench, which, in the opinion of the Engineer, is incapable of properly supporting the pipe, such soil shall be removed to the depth required and the trench backfilled to the proper grade with granular embedment.

G. Mechanical equipment used for trench excavation shall be of a type that uniform trench widths and vertical sidewalls are obtained from an elevation of at least one foot above the tope of the installed pipe to the bottom of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted. Under no conditions shall sewer pipe be laid against the wall of the trench. The minimum distance from exterior of pipe to trench wall shall be 6 inches. Extra precaution shall be taken to prevent rocks or other large objects from lodging against the pipe during backfill.

H. As soon as each length of pipe has been properly placed and jointed, the spaces between the pipe and sides of the trench shall be carefully backfilled. The backfill shall be compacted as specified in this Section. Each joint shall be checked for line and grade before the next succeeding joint is placed.

I. No pipe shall be placed in a wet trench or on an unstable trench bottom.

J. Rock, boulders, large stones, buried trees or stumps shall be removed at least twelve inches below and on each side of all parts of the pipe, manholes, or other structures. Excavation below subgrade in rock or boulders shall be refilled to subgrade with approved material and thoroughly compacted.

K. Unless specific permission is given by the Engineer, the length of trench excavation, approximately to grade, shall not exceed 100 feet from the end of the pipe being installed. No excavation or pavement removal shall extend more than 300 feet in advance of the pipe being installed.

L. Adequate barricades, construction signs, torches, red lanterns, and guards as required shall be placed and maintained during the progress of the construction work to protect personnel and vehicles in on-site work or until it is safe for traffic when in traveled ways. Whenever required, watchmen and/or flagmen shall be provided to prevent accidents and no extra compensation will be allowed therefor. Rules, regulations, laws and ordinances of local, State and Federal authorities with respect to safety precautions shall be strictly adhered to. Where traffic is to be interfered with in any way, it shall be the Contractor's responsibility to notify the local police and fire departments.

M. Trenching operations shall be conducted so as to cause as little interruption to traffic as is feasible. Where vehicular or pedestrian traffic must cross open trenches, the Contractor shall provide suitable bridges at streets, driveways and walks. Where it is necessary to cross streets, at least half of the roadway shall be left open for traffic at all times. Fire hydrants, valve pit covers, valve boxes, meter boxes, fire or police call boxes or other utility controls shall be left unobstructed and accessible during the construction period.

N. Excavated materials which are suitable for embedment or backfill shall be piled adjacent to the work. Excavated materials which are unsuitable or in excess of that required shall be disposed of by the Contractor in an area designated by the Engineer.

3.02 DEWATERING EXCAVATED TRENCHES

A. The Contractor shall immediately remove all surface or ground water from trench excavation which may accumulate during the excavation and construction work, by providing the necessary underdrains, wellpoints or otherwise, and by doing the necessary pumping, bailing or draining. The Contractor shall have available at all times, sufficient dewatering equipment in proper working order for doing the work herein required. All water removed from the excavation shall be disposed of in an approved manner, so as not to create unsanitary conditions, nor to cause injury to persons or property, or damage to the site or to the work in progress, nor to interfere unduly with the use of streets, private driveways, or entrances.

3.03 BACKFILL

A. Backfilling shall not begin until all requirements of the pipe installation have been complied with and the Engineer has given his approval.

B. After placement and compaction of the embedment or concrete encasement, the trenches shall be carefully backfilled using select, job excavated material free from debris, organic material, and stones. Other backfill materials described in this Section shall be used if the job excavated material is deemed unsuitable by the Engineer. The backfill material shall be deposited in 6 inch layers, (measured before compaction) and carefully and thoroughly compacted to a minimum of 95% maximum density using approved mechanical tamps, until the pipe has a cover of not less than 6 inches or 1/10 the depth of cut above the top of the pipe, whichever is greater. Care shall be taken in the placement and compaction of the backfill material to not disturb the line or

grade of the installed pipe. The remainder of the backfill material shall then be placed in the trench in 1 foot layers (maximum) and tamped to a minimum of 90% maximum density.

C. Settling the backfill by jetting or flooding will only be permitted under certain circumstances when so shown on the Drawings or when approved by the Engineer in writing. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to depth required and then refilled and compacted, with the surface restored to the required grade.

D. Open trenches across roadways to other paved areas shall be backfilled as specified above, except that the entire depth of trench shall be backfilled in 6 inch layers, and each layer shall be moistened and compacted to a minimum of 95% maximum density.

E. The Contractor shall be responsible for all settlement of backfills, fills, and embankments which may occur within one year after final completion of the Contract under which the work was performed. Backfill areas to contours and elevations as indicated in the Drawings.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Embankment.

B. Backfilling of Structures

C. Compaction Requirements

1.02 DEFINITIONS

A. Embankment is defined as the soil deposition required for the construction of levees and dikes, for raising the elevation of existing ground to permit construction of proposed facilities and contouring of the site, and for backfilling of structures.

B. Backfilling of structures is defined as the construction operation for placement of embankment in excavated areas adjacent to structures.

C. Usable soil is defined as soil material whose composition is designated satisfactory for use in embankment construction and backfilling of structures. Moisture content has no bearing upon such determination.

D. Borrow is defined as usable soils required for construction of embankments in excess of usable material available from excavation operations on the site.

1.03 REFERENCES

A. ASTM D1556 - Density of Soil in Place

B. ASTM D1557 - Moisture-Density Relationships Soils

1.04 SAMPLES

A. Frequency for testing will be determined by the Engineer.

B. Samples for testing will be obtained by a laboratory under the provisions of Section 01410.

1.05 SUBMITTALS

A. Notify Engineer in writing, 15 days in advance of borrow operations if required. Notification to include a location sketch of the borrow area.

PART 2 - PRODUCTS

2.01 USABLE SOILS

A. Soil materials for backfill, whether from required excavations or borrow excavation:
   1. Shall meet AASHTO A-4 Specifications.
   2. Shall be free of roots and other deleterious materials.

B. Structural fill (sand) used beneath foundations when called for in the Drawings or Specifications.

1. Shall be free of roots, wood, clay lumps and other deleterious materials with not more than 15 percent (by weight) of material passing a U.S. Standard No. 200 sieve.

2.02 SOURCES

A. Obtain usable soils from site excavations. If quantities generated are not sufficient, obtain borrow from off the site.

B. Obtain structural fill (sand) from approved source.

PART 3 - EXECUTION

3.01 INSPECTION

A. Request testing and classification of soil material for embankment in their original position by the Laboratory.

B. Verify that stockpiled material to be reused is approved.

C. Verify that borrow material to be used is approved.

D. Verify that excavated material to be used is approved.

E. Verify that subgrade to receive embankment has been approved.

F. Notify Testing Laboratory in accordance with the provisions of Section 01410.

3.02 PREPARATION

A. Clearing and grubbing to be complete.

B. Drain and dry surfaces of areas to receive embankment until the material is within reasonable limits of optimum moisture.

C. Scarify embankment area to a depth of approximately 9 inches, and recompact to density requirements for embankment material.

D. Remove unstable materials by undercutting and backfill with usable soils and compact to density requirement for embankment material.

E. For embankments to be constructed on a surface sloping more than 6:1 from the horizontal, the slope of the surface on which the embankment is to be placed shall be cut into steps to facilitate proper placement and compaction of the embankment material.

F. Remove construction debris from excavations.
   1. Verify that concrete structures to be backfilled have cured sufficiently. No concrete structure shall be backfilled until concrete has been in place 14 days, or until test cylinders show a compressive strength of 3000 psi as determined in Section 03300.

   2. Obtain approval from the Engineer prior to commencing backfilling operations.

3.03 EMBANKMENT PLACEMENT

A. Construct embankment to contours and elevations shown in the Drawings.

B. Construct embankment systematically, as early as possible, to allow maximum time for settlement prior to

construction of foundations.

C. Place embankment material in continuous layers not exceeding 8 inches loose depth.

D. Bring to and maintain a uniform moisture content and compact to density requirements.

E. Conduct operations to obtain proper bonding between layers. At the option of the Contractor, the top 2 inches of intermediate layers may be compacted with the succeeding layer. The 2 inch layer of the previous lift shall be brought to optimum moisture before placing the subsequent lift.

F. Compact by any method that will obtain specified density.

G. Separate dumping and rolling areas.

H. Finish to reasonably smooth and uniform surfaces. Make changes in grade gradual. Bend slopes into level areas.

I. In the vicinity of structures and sidewalks, slope grade away a minimum of 6 inches in 10 feet, unless otherwise noted in the Drawings or directed by the Engineer.

J. Conduct in such a manner that pavement and structure surfaces, edges and joints are not damaged.

K. In addition to above requirements, backfilling of structures shall conform to the following requirements:
   1. Commence backfilling as soon as possible after structure has been constructed sufficiently to permit backfilling.
   2. Backfill in an expeditious manner.
   3. Backfill in such a manner to avoid imposing undue and unbalanced loads on the structure.

3.04 TOLERANCES

A. Top Surface of Embankment: Plus or minus one inch at structures and sidewalks; plus or minus 2 inches in open areas.

3.05 FIELD QUALITY CONTROL

A. If tests indicate work does not meet specified requirements, remove work and replace at no cost to the Owner. Retesting will be at no cost to the Owner.

3.06 SCHEDULE OF LOCATIONS

A. The paragraphs below identify location and the minimum compacted density expressed as a percentage of maximum density and optimum moisture in comparison with that determined in accordance with DOTD Designation: TR 418.

B. Levees and Dikes: 95 percent.

C. Non-load Bearing Open Areas: 85 percent.

D. Adjacent to New Structures: 90 percent.

E. Under New Structures: 95 percent.

END OF SECTION

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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install push-on and restrained joint ductile iron pipe, and ductile iron or ductile iron restrained joint fittings for pressure piping systems, complete, as shown on the Drawings and/or as specified herein. Pipe shall have Protecto 401 Ceramic Epoxy Lining.

1.02 QUALIFICATIONS

B. All ductile iron pipe and fittings shall be furnished by manufactures who are fully experienced, reputable, and qualified in the manufacture of the material to be furnished. The pipe and fittings shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.03 SUBMITTALS

A. The Contractor shall submit within thirty (30) days after receipt of Notice to Proceed, a list of materials to be furnished, and the names of the suppliers and the date of delivery of materials to the site.

B. Submit shop drawings to the Engineer for review in accordance with Section 01340, showing the complete laying plan of all pipe, including all fittings, adapters, valves, and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The pipe details shall include a pipe class laying schedule which specifies pipe class, class coding, joints, station limits, and transition stations, and a list of abbreviated terms with their full meaning. The Contractor shall provide details of fittings to be furnished. The above shall be submitted to the Engineer for approval before fabrication and shipment of these items. The locations of all pipes shall conform to the locations indicated on the Drawings. In most cases, a certain amount of flexibility in the positioning of pipes will be allowed. Horizontal and vertical deflections may require beveled, special deflection; or short pipes. The deflections at joints shall not exceed 75 percent of that recommended by the manufacturer.

C. The Contractor shall submit the pipe manufacturer's certification of compliance with the Specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. General Requirements. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible, shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown.

B. Length. All pipe 48 inches and less in diameter shall be furnished in a maximum of 20 foot lengths, unless indicated otherwise.

C. Raised Face Flanges. When carbon steel or stainless steel flanges or flanged valves with raised face will be bolted directly to flat faced FRP, plastic, or cast iron flanged fittings or valves, the raised face shall be removed or spacers approved by the valve or pipe manufacturer shall be installed to allow bearing over 100 percent of the flange area.

D. Joints. All pipes above ground shall have screwed, welded or flanged joints. Welded pipes shall have sufficient

flanges at valves and equipment to permit easy disassembling. All buried pipes shall have restrained joints, unless welded or flanged. Joint restraining devices shall be by Megalug of EBAA Iron Inc. for mechanical joints or equal. In lieu of restrained mechanical joints, the Contractor may use restrained joint pipe equal to Flex-Ring or Lok-Ring by American Cast Iron Pipe Company or TR Flex by U.S. Pipe and Foundry Company or approved equal.

E. Mechanical Couplings and Expansion Joints. Pipe mechanical couplings and expansion joints shall be provided at locations shown on the Drawings at a minimum requirement. An adequate number of mechanical couplings and expansion joints shall be provided to permit easy disassembly and to protect piping and connected equipment from damage due to expansion.

F. All fittings of buried pipe, unless flanged or welded, shall be mechanically restrained.

G. All buried pipelines (4 inches and larger), unless otherwise noted on the Drawings or in these Specifications, the Contractor shall use Ductile Iron as specified herein.

H. All above ground exposed pipelines shall be Ductile Iron with flanged joints unless noted otherwise on the Drawings or in the Specifications.

2.02 DUCTILE IRON PIPE

A. Manufacture. Ductile Iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture for 16" and smaller pipe and tested to 75% of the yield strength for 18" and larger pipe.

B. Design. Ductile Iron Pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50. The design shall include a minimum working pressure of 150 psi plus a 150 psi surge allowance. A two to one safety factor shall be applied to the sum of the working pressure plus the surge allowance. A two to one safety factor shall also be applied to the bending stress and deflection design for a Type 3 to Type 5 laying condition with the depth of cover as required per the plans.

Unless noted otherwise on the plans, the minimum pressure classes for ductile iron pipe shall be as follows: PC 350 for 8" - 12" pipe, PC 250 for 14" - 20" pipe, PC 200 for 24" pipe and PC 150 for 30" and larger pipe.

C. Coating and Lining. Pipe shall have a standard asphaltic coating on the exterior. Pipe shall have a Protecto 401 Ceramic Epoxy Lining.

D. Joints. All in plant ductile iron piping shall be restrained joint. "Fast-Grip", "Flex-Ring", "Field Flex-Ring", "Lok-Ring" or approved equal shall be used.

E. Ductile Iron Fittings. Ductile Iron Fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Linings and coatings for fittings shall be the same as specified for ductile iron pipe.

F. Flanged Pipe. All above ground or exposed pipe shall be ductile iron and shall comply with ANSI/AWWA C115/A21.15. The pipe barrel shall be made in accordance with ANSI/AWWA C151/A21.51, and shall have a thickness of no less than special thickness Class 53. All flanges shall be ductile iron and rated for a working pressure of 250 psi. Flange pipe and fittings shall be cement lined as specified above and shall be shop primed on the outside diameter with either TNEMEC 37H77 Chem Primer for an alkyd-phenolic primer or TNEMEC 140-1211 Pota-1211 Pota-Pox Plus or equal for high solids epoxy primer.

G. Outlets. Welded on outlets may be provided in lieu of tees and crosses. Outlets shall be fabricated from centrifugally cast ductile iron pipe, manufactured and tested in accordance with the latest revision of ANSI/AWWA C151/A21.51, using a high nickel content weld such as NI-Rod #55. Welding shall be performed in the pipe manufacturer's shop only. Outlets shall not be more than 70% of the size of the parent pipe. Minimum walls for the parent and outlet pipes shall be as published by American Ductile Iron Pipe or other approved manufacturer.

2.03 MECHANICAL COUPLINGS

A. Flexible Couplings. Flexible (sleeve) couplings shall be of the full sleeve type, split sleeve type, or flanged adaptor type, as shown on the Drawings, specified herein, or as otherwise permitted by the Engineer. The coupling shall provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust, and shall have the same pressure-rating as the pipe. Couplings shall have all metal bearing surfaces and shall be provided with galvanized steel bolts and nuts. Flexible couplings shall be restrained unless the Engineer has given his approval to omit this feature for specific cases.

1. Full Sleeve Type Couplings shall be properly gasketed and shall be of a diameter to fit the pipe. Each coupling shall consist of a steel middle ring, 2 steel followers, 2 gaskets and the necessary steel bolts and nuts to compress the gaskets. The couplings shall be Dresser Style 38, Smith-Blair Type 411, or equal. Couplings to be installed underground shall have a hot-dipped galvanized sleeve with corrosion resistant bolts conforming to AWWA C-111 (type 316 stainless steel).
2. Split Sleeve Type Couplings shall consist of one gasket, 2 housing clamps, and 2 bolts and nuts to obtain the flexibility for connecting the piping. Steel shoulders shall be provided and welded to the pipe ends to accommodate the couplings. The couplings shall be Kuhns, Ductile Iron Pipe Lock Coupling; M.B. Skinner Seal; or equal.
3. Flexible Flanged Coupling Adaptors shall be of the sleeve type, consisting of steel middle ring, steel followers, gaskets, and steel bolts and nuts to compress the gaskets. The couplings shall contain anchor studs of strength adequate to hold the pipe together under a pull equal to the longitudinal strength of the pipe at a tensile stress of 20,000 psi, and shall be Smith-Blair No. 913, Dresser Style 128, or equal. Couplings to be installed underground shall have a hot-dipped galvanized sleeve with corrosion resistant bolts conforming to AWWA C-111 (type 316 stainless steel).

2.04 EXPANSION JOINTS

A. Expansion joints for ductile iron, and steel pipe shall be provided in accordance with the pipe manufacturer's recommendation. The expansion joints shall be Dresser Style 63, Type 2, double end expansion joint, the comparable product of Smith-Blair, or equal. The expansion joints shall have a deep packing chamber to provide for full and ample packing space. The followers shall be three-fourths as long as the packing chamber to afford a wide margin of take-up should future re-tightening of the expansion joint be necessary. The expansion joint packing chamber shall be accessible at all times with sufficient room available to pull out the followers and repack the joint.. Standard packing shall consist of alternate split rubber-compound rings for sealing purposes and split jute rings for lubrication and shall be designed to operate at temperatures up to 2.12 degrees F. Special asbestos-type packings shall be furnished where temperatures exceed 212 degrees F. Expansion joints shall be of welded steel construction.

2.05 WALL SLEEVES

A. Wall sleeves shall be used in dry interior walls and shall be Schedule-40 galvanized steel pipe and shall conform to the detail shown on the Drawings.

B. Wall sleeves where shown on the Drawings to be installed in external walls shall be fabricated from Schedule 40 steel pipe and shall have a steel annular ring welded to the middle of the pipe. The ring shall be 1/4 inch thick by 1 inch wide for 3-inch pipe or smaller and 3/8 inch thick by 2 inches wide for 4-inch pipe or larger. The ring shall be secured to the barrel by continuous welds on both sides of the ring. After fabrication the sleeve and ring shall be hot-dip galvanized.

2.06 WALL PIPES

A. Wall pipes shall be used in all new wet wall penetration applications and shall be either cast iron, ductile iron, with integral waterstop/thrust collar or centrifugally cast ductile iron with a continuously welded waterstop/thrust collar. The welded-on collar shall be attached to the pipe by the manufacturer. The collar shall be capable of withstanding a thrust force caused by a 250 psi dead end load from either direction on that size pipe. Wall pipes shall be cement lined on the inside. Unless specified or shown otherwise, wall pipes shall be flange end type. In the case of corrosive or special piping systems, wall pipe shall match material of piping or

approved equal.

2.07 IDENTIFICATION

A. Each length of pipe and each fitting shall be marked with the name of the manufacturer, size, and class. All gaskets shall be marked with the name of the manufacturer, size, and proper insertion directions.

2.08 STRUCTURE AND MANHOLE CONNECTIONS

A. Pipe stubs for all manhole connections shall not exceed 24-inches in length. Caps shall be furnished where required.

PART 3 - EXECUTION

3.01 INSTALLING DUCTILE IRON PIPE AND FITTING

A. All piping shall be installed in accordance with recommendations of the pipe manufacturer and as a specified herein.

B. Care shall be taken in the handling, storage, and installation of pipe and fittings to prevent injury to the pipe or coating. All pipe and fittings shall be examined before installing, and no pipe shall be installed which is found to be defective. All damage to the pipe coatings shall be repaired according to the coating manufacturer's recommendations.

C. All pipe and fittings shall be kept clean and shall be thoroughly cleaned before installation.

D. Pipe shall be laid to the lines and grades shown on the Drawings with bedding and backfill as shown on the Drawings and as specified in Section 02200. Blocking under the pipe will not be permitted.

E. When installation is not in progress, or the potential exists for dirt or debris to enter the pipe, the open ends of the pipe shall be closed with a plug or other approved means.

F. Under no circumstances shall the pipe or accessories be dropped into the trench.

3.02 PRESSURE PIPING SYSTEM FIELD TESTING

A. All pressure piping shall be field tested. The Contractor shall supply all labor, equipment, material, gages, pumps, and incidentals required for testing.

B. The test pressure shall be 125 psi for PC 350 and thicker pipe or 100 psi, unless noted otherwise. The test pressure shall be measured at the highest point along the test Section by a recording type pressure gauge and a copy of the readout shall be submitted to the Engineer upon completion of the test.

C. Testing shall be conducted after backfilling has been completed and before placement of permanent surface.

D. Testing procedure shall be as follows:

1. Fill line slowly with water. Maintain flow velocity less than 2.0 feet per second.

2. Air shall be expelled through connections for air release valves installed at points of highest elevation where shown on the Drawings. Tapping of lined ductile iron pipe or fittings will not be permitted.

3. Apply test pressure. Measure the quality of water that must be pumped into the line to maintain

pressure within 5 psi of the test pressure for a period of 2 hours. This quality is defined as leakage.

4. Carefully examine all exposed pipe, fittings, and joints during the test.

5. Upon completion of the test, the pressure shall be bled off from a location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the resident project representative and the pressure read-out shall be submitted to the Engineer.

E. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipe tested; D is the nominal diameter in inches; and P is the test pressure, in psig.

F. If any test of pipe installed discloses leakage greater than that allowed, the Contractor shall, at no additional cost to the Owner, locate and repair the cause of leakage and retest the line.

G. All visible leaks are to repaired regardless of the amount of leakage.

3.03 CLEANING FORCE MAINS

A. At the conclusion of the work the Contractor shall thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. Debris cleaned from lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall furnish all labor, material and equipment required to provide and install all valves and gates as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with the General Conditions of the Contract and Section 01340.

B. Product Data: Complete literature of the manufacturer describing in full the characteristics of each item and shall include calculations as required. Include requirements for storage, handling and installation instructions.

C. Shop Drawings: Submit drawings showing complete dimensions, weights, and materials of construction. Special mounting requirements shall be identified.

1.03 MANUFACTURERS

A. Manufacturers shall be of established good reputation, regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current modifications which have been in successful regular operation under comparable conditions.

PART 2 - PRODUCTS

2.01 GENERAL

A. All valves shall be manufacturer's standard design unless otherwise specified and shall be furnished with operating wheel, wrench nut or lever. Unless otherwise indicated, the direction of rotation of the wheel, wrench nut or lever to open the valve shall be to the left (counter-clockwise). Each valve body or operator shall have cast thereon the word OPEN and an arrow indicated the direction to open. A union flanged, grooved or shouldered type connection shall be provided within 2 feet of each threaded end valve unless the valve can be otherwise easily removed and such technique of removal is approved by the Engineer.

B. All valves of the same type shall be from a single manufacturer.

2.02 CHECK VALVES

A. Swing check valve shall be lever and weight type conforming to ANSI/AWWA C508 Standard. Valves shall be epoxy coated interior and exterior with rubber seat facing. Valve shall be Mueller Company Series 8001 or equal by Golden Anderson or M&H Valve.

2.03 GATE VALVES (2-IN AND LARGER)

A. General Requirements:

1. Unless otherwise specified below, these requirements shall apply to all gate valves.

2. Gate valves shall meet the requirements of AWWA C500 and AWWA C509 as applicable to the type of valve specified.

3. Buried and submerged valves shall be furnished with mechanical joints and stainless steel hardware; non-rising stem design.

4. Exposed valves shall be furnished with Class 125 flanged ends;

5. Valves shall have ductile body and shall have epoxy coated interior and exterior.

6. Valves shall have non rising stems.

7. Valves shall have a triple O-ring seal.

8. Valves shall be Mueller Co. Model A-2361 D.I. Resilient Wedge or equal by American or M&H.

B. Valve Requirements:

1. Resilient Seated.

a. Conform to AWWA C509. Also UF and FM approved.

b. Internal and external epoxy coating of valve body, including bonnet, per AWWA C550.

c. Gate shall be encapsulated with synthetic rubber. It shall be bonded and vulcanized in accordance with ASTM B429, Method B.

d. No recesses in valve body.

2.04 AIR RELEASE COMBINATION VALVES

A. General

1. Valve shall be a short bodied combination air valve.

2. Valve shall come complete with all flushing accessories.

3. Valve body shall be made of either stainless steel or non corrosive composite materials.

4. Float rod and spring shall be stainless steel.

5. Valve shall be Model D-025 Combination Air Valve as manufactured by A.R.I. U.S.A. Inc. or equal by Val Matic.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All valves and gates shall be installed in accordance with AWWA Standards or in accordance with the manufacturer's recommendations. Alignment and adjustments shall be verified after installation. Tee wrenches and operators shall perform freely, without binding or other interferences.

3.02 TESTING

A. The Contractor shall furnish all equipment, material and labor to perform the required tests. Any defects which become evident during the tests shall be corrected by the Contractor at his own expense. The Contractor shall notify the Engineer prior to performing any tests.

1. Valves shall be tested and proven satisfactory with the pipeline they are attached to and at the pipeline pressure specified in the respective pipe sections herein. In addition to the pressure test, all valves shall be given an operational test by completely opening and closing the valve satisfactorily a minimum of 4 cycles against the maximum differential of pipeline test pressure required on one side and 0 pressure on the other side of the valve.

2. Records shall be maintained by the Contractor of all tests indicating date of test, item tested, test pressure passed, and inspector's name. Test reports shall be promptly submitted to the Engineer.

3.03 PAINTING

A. All exposed ferrous surfaces shall be shop primed and finish painted in accordance with Section 09900.

END OF SECTION

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SECTION 02951

WET WELL REHABILITATION AND LINING

1. GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall line wet well as shown and specified within the Contract Documents using either an Epoxy Lining System, 100% Solids Epoxy System or a Multi-Component Stress Panel Lining System.

B. This section covers all workmanship, materials and quality requirements for rehabilitation and lining work on the interior surfaces of wet wells. CONTRACTOR shall provide and apply resurfacing and lining materials as specified and as indicated on drawings and per Manufacturer's instructions design details.

C. It is the intent of this portion of the Work to provide for all aspects of sewer wet well rehabilitation including type of repair, methods of repair, materials, and equipment as may be appropriate for each wet well scheduled for rehabilitation.

D. The work described within details a complete program for wet wells. This section details the methods, procedures, materials and equipment as required to produce "A Total System for Wet wells". The completed system will provide a corrosion resistant liner that restores walls to original surface levels and eliminates water infiltration and exfiltration. Sealing and coating of the wet well walls and bases shall include the top slab to the full depth.

E. Wet well Structural Repair where specified on the plans will consist of filling a major void in the wet well wall. The repair will be made utilizing fast setting grout as specified in Section 2.2 (E).

F. The Contractor shall be required to provide bypass pumping where ever needed to complete the work. The maximum time allowed for a plugged wet well under normal flow conditions shall be 2 hours, with approval from the Utilities Department. A plan for bypass method must be submitted to the Engineer for approval prior commencing work.

G. Any damage to property as a result of the wet well rehabilitation work shall be the responsibility of the Contractor. This includes any damage from backflow due to wet well plugs.

1.2 REFERENCE STANDARDS

A. This section contains references to the documents listed below. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

C. Referenced publications found within this specification shall be the latest revision unless otherwise specified; and applicable parts of the referenced publications shall become a part of this specification as if fully included.

D. References:

- ASTM C920- Specification for Elastomeric Joint Sealants
- ASTM D3960- Practice for Determining Volitile Organic Compound (VOC) Content of Paints and Related Coatings
- ASTM D4259- Practice for Abrading Concrete
- ASTM E 337- Standard Practice Test Method for Measuring Humidity with a Psychrometer.
- ASTM F 710 - Practice for Preparing Concrete Floors and Other Monolithic Surfaces to Receive Resilient Flooring
- ASTM 4541 - Adhesion
- ASTM D 412 - Tensile Strength
- ASTM D 412 - Elongation
- ASTM D 2240 - Tear Strength
- ASTM D 1737 - Hardness
- ASTM 460 -Taber Abrasion
- F 595 B - Federal Standard Colors
- ICRI Guideline No. 03732 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
- NACE Pub. 6D-173 - A Manual for Painter Safety
- NACE Pub. 6G-164 - Surface Preparation Abrasives for Industrial Maintenance Painting
- NACE Pub. 6G-164 - Surface Preparation Abrasives for Industrial Maintenance Painting
- NACE Pub. TPC2 - Coatings and Linings for Immersion Service: Chapter 1 Safety, Chapter Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
- NACE Pub. 6F-163 - Surface Preparation of Steel or Concrete Tank Interiors
- NACE RP0892-92 - Standard Recommended Practice, Lining over Concrete in Immersion Service
- NACE RP0288-88 - Standard Recommended Practice, Inspection of Linings on Steel and Concrete
- SSPC-SP12 -Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultrahigh Pressure Water Jetting Prior to Recoating
- SSPC-SP13 -Surface Preparation of Concrete
- SSPC-PA-3 - A Guide to Safety in Paint Application
- SSPC-Guide 12 - Guide for Illumination of Industrial Painting Project
- OSHA 1915.35 - Standards – 29 CFR – Painting
- ANSI/ASC 29.4 Exhaust Systems- Abrasive Blasting Operations, Ventilation and Safe Practice

1.3 QUALITY ASSURANCE

Requirements:

A. Do not use or retain contaminated, outdated, or diluted materials for resurfacing. Do not use materials from previously opened containers.

B. Use only products of the approved Manufacturer. Use products of one manufacturer in any one resurfacing system with compatible materials. Provide same material product for touch-up as for original material.

C. If any requirements of this specification conflict with a referenced standard, the more stringent requirement shall apply.

D. Make available all locations and phases of the work for access by the Engineer or other personnel designated by the Engineer. The Contractor shall provide ventilation and egress to safely access the coating work areas for inspection.

E. Conduct work so that the resurfacing system is installed as specified herein. Inspect work continually to ensure that the resurfacing system is installed as specified herein. The Contractor shall inspect the work to determine conformance with the specifications and referenced documents. The Contractor shall inform the Engineer of the progress and the quality of the work through daily reports as specified below. Any nonconforming coating system work shall be corrected as specified herein or as recommended by the Manufacturer.

F. Summarize test data, work progress, areas covered, ambient conditions, quality control inspection test findings, and other information pertinent to the resurfacing system installation in daily reports to be submitted to the Engineer or the Engineer's Representative.

G. The methods of construction shall be in accordance with all requirements of this specification.

H. Lining installers shall have at least **five years** of experience performing resurfacing work of similar size and complexity as the work specified in this Section. Submittals to verify these qualifications are to be made within thirty (30) days of the Notice-to-Proceed and are subject to approval by the Engineer

1.4 CONTRACTOR SUBMITTALS

Furnish submittals in accordance with Section 01300 – Contractor Submittals.

Submit the following prior to commencing with any phase of the work covered by this Section:

A. Manufacturer's current printed recommendations and product data sheets for all coating system products supplied under this section including performance criteria, surface preparation and applications, volatile organic compound (V.O.C.) data, and safety requirements.

B. System materials, solvents, and abrasive blast media.

C. Storage requirements including temperature, humidity, and ventilation for resurfacing system Material Safety Data Sheets (MSDS) for any materials brought on-site including all resurfacing materials.

D. Manufacturer's requirements, including application procedures for resurfacing materials shall be in writing and shall be followed in detail. All safety precautions recommended by the Manufacturer shall be strictly adhered to at all times when work is in progress.

E. Submit applicators' certification that resurfacing materials comply with Federal, State, and Local regulations for VOC (Volatile Organic Compounds).

F. Submit daily reports that contain the following information: Substrate conditions, ambient conditions, application procedures, work completed and location thereof. Mark-up drawings that show location of work.

G. Submit letter(s) with associated product data signed by Manufacturer certifying that submitted products are suitable for application on the surfaces to be resurfaced and for the service conditions.

1.5 DELIVERY AND STORAGE

A. Materials shall be stored in accordance with Manufacturer's recommendations in enclosed structures and shall be protected from weather and adverse temperature conditions. Flammable

materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site.

B. Store all materials only in area or areas designated by the Engineer solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of materials-related debris before authorized disposal, to these areas. All materials are to be stored on pallets or similar storage/handling skids off the ground in sheltered areas in which the temperature is maintained between 50°F and 90°F.

C. Mix all resurfacing materials in an enclosed mixing area designated by the Engineer. This enclosed area must protect the mixing operation and materials from direct sunlight, inclement weather, freezing, or other means of damage or contamination. Protect all other concrete and metallic surfaces and finishes from any spillage of material(s) within the mixing area.

D. Do not use floor drains, dikes or storm drains for disposal of resurfacing system materials.

E. The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with the resurfacing system materials as described on the pertinent Material Safety Data Sheets or container labels.

F. Deliver all materials to the job site in their original, unopened containers. Each container shall bear the Manufacturer's name and label.

G. Labels on all material containers must show the following information:

- Name or title of product.
- Federal Specification Number if applicable.
- Manufacturer's batch number and date of manufacture.
- Manufacturer's name.
- Generic type of material.
- Application and mixing instructions.
- Hazardous material identification label.
- Shelf life date.
- Storage requirements.

H. All containers shall be clearly marked indicating any personnel safety hazards associated with the use of or exposure to the materials.

I. All materials shall be handled and stored to prevent damage or loss of label.

J. Resurfacing material storage and mixing areas shall be designated by the Engineer.

K. Do not use or retain contaminated, outdated, prematurely opened, diluted materials, or materials which have exceeded their shelf life.

1.6 COORDINATION OF WORK

A. Work Areas: The work areas on the job site will be designated by the Engineer. The Contractor's personnel shall not be permitted in any area other than those expressly designated by the Engineer.

B. Coordination: The contractor shall coordinate with the Engineer regarding availability of work areas, completion times, safety, access and other factors which can impact plant operations.

C. Safety:

1. The Contractor's work forces should comply with the provisions outlined in the following documents: SSPC-PA-3 - "A Guide to Safety in Paint Application" and NACE Pub. 6D-173 - "A Manual for Painter Safety"

2. The Contractor shall provide personnel with all safety equipment necessary to protect them during any phase of the work. This shall include, but not be limited to safety glasses, goggles, earplugs, hard hats, steel toed work shoes, appropriate personal protective clothing, gloves, and plant approved escape respirators (where required).
3. No work shall be performed until the appropriate Work Requests and lock-outs are approved by the Engineer. The Work Request system provides a mechanism to advise plant staff of a contractor's work activities. The Lockout system is a safety procedure to prevent unintended equipment activation.
4. Keep any flammable materials such as cleaning solvents, thinners, or resurfacing materials away from open flames, sparks or temperatures higher than 150°F. Drums containing flammable materials will be grounded. No solvent in any quantity shall be allowed inside containment enclosures or permitted confined spaces at any time during resurfacing work.
5. Power tools are to be in good working order to avoid open sparking. No spark producing tools shall be utilized in restricted areas as indicated herein.
6. The Contractor shall fireproof all work areas by maintaining a clean work area and having Underwriter's Laboratories approved fire extinguishers on-hand. The Contractor shall furnish these fire extinguishers.
7. Workers doing abrasive blasting operations shall wear a fresh air supplied protective helmet and hood and personal protective clothing acceptable to industry standards and all government regulations.
8. Dispose of rags used for wiping up resurfacing materials, solvents, and thinners by drenching them with water and placing in a metal container with a tight fitting metal cover. Complete this disposal process at the end of each day. Final disposal of these materials is the Contractor's responsibility.
9. Matches, smoking, flames, or sparks resulting from any source including welding, must be remote from the work area during coating work. Smoking is permitted only in designated areas of the site.

1.7 SITE CONDITIONS

A. Environmental:

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with Manufacturer's instructions.
2. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with Manufacturer's instructions.
3. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
4. Wind: Do not spray coatings if wind velocity causes overspray of the coating materials.

2. PRODUCTS

2.1 MANUFACTURERS

A. Products shall be as manufactured by Tnemec Company, Inc. CCI Spectrum, Inc., Warren Environmental Systems or equal.

B. Requests for substitution shall include manufacturer's literature for each product giving name, product number, and generic type, descriptive information, solids by volume, recommended dry film thickness and certified lab test reports showing results to equal the performance criteria of the products specified herein. In addition, a list of five projects shall be submitted in which each product has been used and rendered satisfactory service.

2.2 MATERIALS

A. EPOXY LINING SYSTEM

1. The following list specifies the material requirements for resurfacing systems (or equal):
   a. Shotcrete: **Master Builders EMACO S88 CI; Sikacem 103**; or equal:
   b. Shall be a Portland Type I or Type II cement based material with no polymer additives and with the following minimum performance properties:
      Compressive Strength: ASTM C-109 - Minimum 7000 psi at 7 days
      Freeze Thaw: ASTM C 666 - After 300 cycles, Minimum 95%
      Splitting Tensile Strength: ASTM C-496 - Minimum 500 psi at 7 days
      Flexural Strength: ASTM C 348 - Minimum 1000 psi after 7 days
      Direct Bond Strength: ACI 503.R - Minimum 290 psi after 28 days

   c. Calcium-Aluminate based materials will not be approved for use on this project.
   d. Lining Coat: **Tnemec Perma-Shield Series 434**, or "an equal"
      Minimum Performance Requirements:
      i. Autoclave: Lining materials must be tested in a controlled autoclave containing 536 ppm H_2S, 10% H_2SO4, 4,000 ppm NaCl @ 150°F for 28 days.
         The autoclave testing must be performed by an independent laboratory.
         The lining materials must exhibit the following when tested using Electrical
      ii. Impedance Spectroscopy (EIS):
         Initial EIS impedance of 10 Log Z (Z in ohms cm^2 @ 0.1 Hz)
         Final EIS impedance greater than 9 Log Z after 28 days exposure
         No blistering cracking, checking, or loss of adhesion after 28 days exposure to the H_2S autoclave.
      iii. Chemical Resistance (ASTM C 868):
         Requirement : No blistering, cracking, erosion, softening, swelling, loss of adhesion or gloss after 98 day continuous immersion at 100F and 25% Sulfuric Acid

   e. Glaze Coat: **Tnemec Perma-Glaze Series 435**, or equal
      Minimum Performance Requirements:
      i. Autoclave: Lining materials must be tested in a controlled autoclave containing 536 ppm H_2S, 10% H_2SO4, 4,000 ppm NaCl @ 150°F for 28 days.
         The autoclave testing must be performed by an independent laboratory.

      ii. The lining materials must exhibit the following when tested using Electrical Impedance Spectroscopy (EIS):
         Initial EIS impedance of 10 Log Z (Z in ohms cm^2 @ 0.1 Hz)
         No drop in EIS impedance after 28 days exposure
         No blistering cracking, checking, or loss of adhesion after 28 days exposure to the H_2S autoclave.
      iii. Chemical Resistance (ASTM C 868):
         Requirement : No blistering, cracking, erosion, softening, swelling, loss of adhesion or gloss after 98 day continuous immersion at 100F and 25% Sulfuric Acid

B. SEALANTS TO BE USED WITH EPOXY LINING SYSTEM
   a. Primer: **PolySpec TPR 415** "or equal".
   b. Sealant: **PolySpec Thiokol 2235 M** or equal. Two component, polysulfide, elastomeric sealant having a minimum polymer content of 35%, used for sealing expansion joints.

Percent Solids	100%
Hardness, Shore A	25-30

Percent Elongation	500-550
Tensile Strength	150-200 psi

C. MULTI-COMPONENT STRESS PANEL LINER SYSTEM

a. The following list specifies the material requirements for liner systems (or equal):

i. Moisture Barrier and Final Corrosion Barrier: **Spectrashield**, or equal modified polymer with the following typical chemical analysis:

"A" Component

Viscosity, 77° F, cps., ASTM D-1638	300-400
Physical State	Liquid
Color	Clear to amber
Hygroscopicity	Reacts with water

"B" Component

Viscosity, 160° F, cps., ASTM D-1638	400-600
Physical State	Liquid
Color	Flamingo Pink
Non-Volatile	100%

REACTION PROFILE (100 grams, 175° F sample)

Gel Time, seconds	1-2
Tack Free Time, seconds	15
Cure Time, seconds	30
A System / B System, volume ratio	1.00 / 1.00

TYPICAL PHYSICAL PROPERTIES

Tensile Strength (PSI)	ASTM D412	4280
Elongation (%)	ASTM D412	200
100% Modulus	ASTM D412	2200
300 % Modulus	ASTM D412	2600
Tear Strength (PLI)	ASTM D2240	350
Hardness (shore D)	ASTM D1737	60D
Flexibility (1/ 8 "Mandrel)	ASTM D1737	Pass
Flashpoint (°F)	ASTM Pensky-Martin	>200
Taber Abrasion (mg loss)	ASTM D4060	52

ii. Surfacer: **Spectrashield**, or equal, Polyurethane Rigid Structure Foam with the following typical chemical analysis:

"A" Component

Viscosity, 77° F, cps., ASTM D-1638	200
Physical State	Liquid
Color	Dark Brown
Hygroscopicity	Reacts with water and evolves CO2 gas

"B" Component

Viscosity, 77° F, cps., ASTM D-1638	600-1000
Physical State	Liquid
Color	Tan
Hygroscopicity	Absorbs water rapidly thus changing ratio

Reaction Profile (100 grams, 77° F sample)

Cream Time, seconds	1-4
Tack Free time, seconds	5-8
Rise Time, seconds	6-10

Processing	
A System / B System, volume ratio	1.00 / 1.00

D. 100% SOLIDS EPOXY SYSTEM

a. The following list specifies the material requirements for liner systems (or equal): The coating system shall be a spray-applied 100% solids epoxy monolithic surfacing system for use in coating wet wells. The product shall be **S-301 by Warren Environmental, Inc.** or equal.

The 100% solids epoxy system shall have the following minimum characteristics:

Minimum Compressive Strength 12,000 p.s.i.
Minimum Tensile Strength 7,000 p.s.i.
Minimum Flexural Strength 11,000 p.s.i.
Minimum Bond Strength 500 p.s.i.
Minimum Corrosion resistance suitable for environments pH of 0.5 or higher

E. GROUTING MIX FOR REPAIR

1. Strong-Seal Grout, Concresive 1250, or equal, shall be used for stopping very active infiltration and filling voids according to the manufacturer's recommendations. The grout shall be volume stable, formulated with ASTM C150 Type I or Type III cement and shall exhibit the following physical properties:

a.	Density at placement	65 PCF (min.)
b.	Compressive strength (ASTM C495)	1 day - 50 psi 28 days - 250 psi
c.	Shrinkage (ASTM C596)	0%

F. WATER

Water shall be clean and potable.

G. ABRASIVE BLAST MEDIA

If dry or wet abrasive blast cleaning is the selected method of surface preparation, provide slag grit of a sieve size, gradation, and quality necessary to produce the degree of cleanliness and surface profile required herein.

3. EXECUTION

3.1 GENERAL

A. Hoisting, Scaffolding, Staging, and Planking: Provide, set-up, and maintain all required hoists, scaffolds, and staging and planking, and perform all access related hoisting work required to complete the work of this section as indicated and specified. Scaffolds shall have solid backs and floors to prevent dropping materials from there to the floors or ground below.

B. Environmental Requirements:

- Comply with the Manufacturer's recommendations as to environmental conditions under which materials can be applied.

- Do not apply materials when dust is in work site.

- The Contractor shall provide all temporary lighting during the work.

C. Protection:

- Cover or otherwise protect finish work or other surfaces not being resurfaced.

- Erect and maintain protective tarps, enclosures and/or maskings to contain debris (such as dust or airborne particles resulting from surface preparation) generated during any and all work activities. This includes, but is not limited to, the use of dust/debris collection apparatus as required.

D. Initial Inspection of Surfaces to be Coated:

- It is the responsibility of the Contractor to inspect and report unacceptable concrete substrate surface conditions to the Engineer prior to the commencement of surface preparation activities.

- Unacceptable concrete surface conditions are defined as the presence of water infiltration/inflow, cracked surfaces or concrete deteriorated to a depth of greater than 1" or otherwise unable to withstand surface preparation as specified herein.

- Verify that the pH of the cleaned concrete surfaces to be coated is within a range acceptable to the lining manufacturer. Application of coating materials outside this range will not be permitted without written approval from the ENGINEER.

- Unacceptable steel or ductile/cast iron surface conditions are defined as severely corroded and/or perforated metals and are unable to withstand surface preparation as specified herein.

E. Thinners and Solvents: The Contractor shall use only solvents and thinners as recommended by the Manufacturer.

3.2 SURFACE PREPARATION REQUIREMENTS FOR EPOXY LINING SYSTEM

A. All specified surface preparation shall be performed in accordance with the latest version of the SSPC, NACE, ICRI and other standards referenced in this section.

B. Allow new concrete to cure a minimum of 28 days. Contractor may verify dryness by testing for moisture with a "plastic film tape down test." (Reference ASTM D 4263). If necessary for testing horizontal surfaces, Calcium Chloride test in accordance with ASTM F 1869. If test results indicate moisture levels outside the acceptable range of the manufacturer, contact the manufacturer. Do not proceed with the coating application.

C. Prior to applying shotcrete, all existing areas that are scheduled to receive the chemical resistant lining shall be steam cleaned with minimum 210°F water with alkaline –based detergent to remove all loose materials, acid constituents, grease, oil, and other contaminants. Oil and grease shall be removed before mechanical cleaning is started.

D. Mechanically abrade all surfaces to be coated to remove laitance, curing compounds sealer and other contaminants and to produce a minimum surface profile equal to ICRI CSP 5. Reference

SSPC-SP13. This preparation will be followed by vacuum cleaning to remove all dust, dirt or friable substances leaving clean, dust free surfaces for resurfacing.

E. Prior to applying shotcrete, identify and stop all active cracks from leaking using either a hydraulic cement or a chemical grout such as **DeNeef Flex LV** or equal. The set time of the Hydraulic Cement shall be approximately 1 minute to 90 seconds per ASTM C 403. The compressive strength of the hydraulic cement shall be approximately 1000 psi after 1 hours per ASTM C 109. All products are to be applied in accordance with manufacturer's instructions.

F. For all areas one foot below the low water line and above (except new concrete surfaces), apply shotcrete to bring surfaces out to ½" beyond original grade. The application shall result in a finish that covers all exposed aggregate and results in no surface voids, discontinuities or irregularities. Cure in accordance with manufacturer's instructions and in accordance with ACI 308.1-98.

G. For all areas one foot below the low water line and new concrete surfaces, apply a full skim coat of **Tnemec Series 218**, or equal at a nominal thickness of 1/16" to fill all voids and bugholes.

H. All shotcreted surfaces shall be abrasive blasted to remove all laitance from release agents, curing compounds sealers and other contaminants and to produce a minimum surface profile of ICRI CSP 5. This preparation will be followed by vacuum cleaning to remove all dust, dirt or friable substances leaving clean, dust free surfaces for resurfacing. The air used for blast cleaning shall be free of oil and moisture to not cause contamination of the surfaces to be resurfaced.

I. The air used for blast cleaning shall be free of oil and moisture to not cause contamination of the surfaces to be resurfaced.

J. Cleaning and resurfacing shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly resurfaced areas.

K. Prepare concrete joint and install sealant following resurfacing material installation per the Manufacturer's written instructions and requirements.

L. Initial Cleaning / Decontamination:

- All existing areas to be resurfaced shall be pressure washed with alkaline –based detergent to remove all loose materials, acid constituents, grease, oil, and other contaminants.

- Verify that the pH of the cleaned concrete surfaces to be coated is within the range of 9 to 11. Application of coating materials outside this range will not be permitted without written approval from the Engineer.

M. Abrasive Blast Cleaning:

- Used or spent blast abrasive shall not be reused on work covered by this section.
- The compressed air used for blast cleaning will be filtered free of condensed water or oil. Moisture traps will be cleaned at least once every four hours or more frequently as is appropriate.
- Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. Oil separators shall be cleaned at least once every four hours or more frequently as is appropriate.

- A paper blotter test shall be performed by the Contractor when requested by the Engineer or the Engineer's representative to determine if the air is sufficiently free of oil and moisture.
- Regulators, gauges, filters, and separators will be in good working order for all of the compressor air lines to blasting nozzles at all times during this work.
- An air dryer or drying unit shall be installed which dries the compressed air prior to blast connections. This dryer shall be used and maintained for the duration of surface preparation work.
- The quality, volume, and velocity of life support and ventilation air used during surface preparation shall be in accordance with applicable safety standards and as required to ensure adequate visibility and proper dissipation of volatiles without impacting the prepared surface or the health of the public or personnel working for the Contractor, Subcontractors, Engineer, Engineer's Representatives, or anyone who may be affected by on-site maintenance coating work activities.
- The abrasive blast nozzles used shall be the venturi or other high velocity type supplied with a minimum of 100 psig air pressure and the necessary volume to obtain the required blast cleaning production rates and specified degree of cleanliness.
- The Contractor must provide adequate ventilation for airborne particulate evacuation and lighting (meeting all pertinent safety standards) to optimize visibility for both blast cleaning and observation of the substrate during surface preparation work.
- All phases of surface preparation work specified herein must be inspected by the Engineer before the Contractor proceeds with the subsequent phase of surface preparation.
- If between final surface preparation work and coating application, contamination of the prepared and cleaned substrate occurs, or if the prepared steel's appearance darkens or changes color, reblasting will be required until the specified degree of cleanliness is established.

3.3 SPECIFIC SURFACE PREPARATION REQUIREMENTS FOR EPOXY LINING SYSTEM

- In addition to the Section 3.2 requirements, the Contractor will follow the requirements of this section.
- Where the coating is specified to be terminated, the Contractor shall prepare and apply materials as outlined in Tnemec Drawing TLS-02.
- For applications around penetrations and/or drains, the contractor shall prepare and apply coatings as detailed on Tnemec Drawing TLS-01.
- The Contractor shall notify the Engineer should jobsite conditions prevent the above operations and/or applications.
- Where the coating is specified over control or construction joints, the CONTRACTOR shall prepare and apply coatings as detailed on Tnemec Drawing TLS-04, Termination at Control or Construction Joints for Cracks.
- Where the coating is specified over expansion joints, the CONTRACTOR shall prepare and apply coatings as detailed on Tnemec Drawing TLS-05, Expansion Joint Treatment Detail.
- When encountered, the CONTRACTOR shall prepare the surfaces exposing rebar as detailed on Tnemec Drawing TLS-09, Exposed Rebar Repair.
- The CONTRACTOR shall notify the ENGINEER should jobsite conditions prevent the above operations and/or applications.

3.4 APPLICATION REQUIREMENTS FOR EPOXY LINING SYSTEM

A. General:

1. Areas not to be resurfaced shall be masked using duct tape or other protection materials to prevent these surfaces from being resurfaced.
2. Ensure straight even termination of resurfacing/topcoat materials on wall edges and flush with embedded steel.
3. The Contractor must follow the minimum and maximum recoat limitation times and related temperature range restrictions between successive lifts for all products specified herein per Manufacturer's stated requirements.
4. All equipment and procedures used for resurfacing system application shall be as recommended by the Manufacturer.
5. Unless specified elsewhere herein, the Contractor shall comply with the Manufacturer's most recent written instructions with respect to the following:

- Mixing of All Materials.
- Protection and Handling of All Materials.
- Recoat Limitation and Cure Times.
- Minimum Ambient and Substrate Temperatures, Substrate's Degree of Dryness, Relative Humidity, and Dew Point of Air.
- Application.
- Final Curing.
- Use of Proper Application Equipment.

6. Curing of Resurfacing System:

The applied resurfacing system shall be protected from damage during curing and shall be cured as recommended by the Manufacturer. Ambient conditions shall be controlled by the Contractor during curing to ensure the minimum air temperature and minimum relative humidity as required by the Manufacturer is maintained.

3.5 INSTALLATION OF EPOXY LINING SYSTEM

A. General Note: The Contractor is advised that with all thick-film, quick curing materials applied to concrete surfaces, outgassing of the concrete can occur. Possible remedies include applying materials when the temperature of the concrete surfaces are descending, or applying a thin (1/8") layer of the specified surfacing material. Other remedies may exist, and may be submitted for the Engineer's approval.

B. Apply shotcrete (**Master Builders EMACO S88 CI**; **Sikacem 103**; or equal) and **Tnemec Series 218**, or equal as outlined in Paragraph 3.2. After shotcreting, prepare surfaces as described in Paragraph 3.2.

C. Apply lining coat (**Tnemec Series 434 Permashield**, or equal chemical resistant mortar) to all surfaces scheduled to be coated at a nominal thickness of **125 mils**. Application shall be either by trowel or spray. If spray-applied, material shall be finish-troweled to a hard, dense film.

D. Apply glaze coat (**Tnemec Series 435 Perma-Glaze**, or equal chemical resistant lining) to all surfaces scheduled to be coated at a nominal thickness of **15 mils** in accordance with manufacturer's instructions.

3.6 SURFACE PREPARATION REQUIREMENTS FOR MULTI-COMPONENT STRESS PANEL LINER SYSTEM

A. All specified surface preparation shall be performed in accordance with the latest version of the SSPC, NACE, ICRI and other standards referenced in this section.
B. Allow new concrete to cure a minimum of 28 days. Contractor may verify dryness by testing for moisture with a "plastic film tape down test." (Reference ASTM D 4263). If necessary for testing horizontal surfaces, Calcium Chloride test in accordance with ASTM F 1869. If test results indicate moisture levels outside the acceptable range of the manufacturer, contact the manufacturer. Do not proceed with the coating application.
C. Prior to applying first layer, all existing areas that are scheduled to receive the chemical resistant lining shall be hydro-blasted using a minimum of 20,000 psi.
D. Mechanically abrade all surfaces to be coated to remove laitance, curing compounds sealer and other contaminants and to produce a minimum surface profile equal to ICRI CSP 5. Reference SSPC-SP13.
E. For all areas one foot below the low water line and above, apply lining system to bring surfaces out to ½" beyond original grade. The application shall result in a finish that covers all exposed aggregate and results in no surface voids, discontinuities or irregularities. Cure in accordance with manufacturer's instructions.
F. Cleaning and resurfacing shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly resurfaced areas.
G. Cleaning / Surface Preparation: All existing areas to be resurfaced shall be hydro-blasted with at least 20,000 psi to remove all loose materials, acid constituents, grease, oil, and other contaminants.

3.7 APPLICATION REQUIREMENTS FOR MULTI-COMPONENT STRESS PANEL LINER SYSTEM

A. Areas not to be resurfaced shall be masked using duct tape or other protection materials to prevent these surfaces from being resurfaced.

B. Ensure straight even termination of resurfacing/topcoat materials on wall edges and flush with embedded steel.

C. The Contractor must follow the minimum and maximum recoat limitation times and related temperature range restrictions between successive lifts for all products specified herein per Manufacturer's stated requirements.

D. All equipment and procedures used for resurfacing system application shall be as recommended by the Manufacturer.

E. Unless specified elsewhere herein, the Contractor shall comply with the Manufacturer's most recent written instructions with respect to the following:

- Mixing of All Materials.
- Protection and Handling of All Materials.
- Recoat Limitation and Cure Times.
- Minimum Ambient and Substrate Temperatures, Substrate's Degree of Dryness, Relative Humidity, and Dew Point of Air.
- Application.
- Final Curing.
- Use of Proper Application Equipment.

F. Curing of Resurfacing System: The applied resurfacing system shall be protected from damage during curing and shall be cured as recommended by the Manufacturer. Ambient conditions shall be controlled by the Contractor during curing to ensure the minimum air temperature and minimum relative humidity as required by the Manufacturer is maintained.

3.8 INSTALLATION OF MULTI-COMPONENT STRESS PANEL LINER SYSTEM

A. Apply Moisture Barrier (**Spectrashield,** or equal) This layer of polyurea shall be spray applied per the manufacturers recommendations to all surfaces one foot below the low flow line .

B. Apply Surfacer (**Spectrashield,** or equal) This layer of polyurethane rigid structure foam shall be spray applied to all surfaces previously lined with the moisture barrier. This layer shall be applied a nominal thickness of **500 mils.** This layer may be thicker depending on the condition of the substrate.

C. Apply Final Corrosion Barrier (**Spectrashield,** or equal) to all surfaces lined with the Moisture Barrier and the Surfacing layer in accordance with manufacturer's instructions.

3.9 SURFACE PREPARATION REQUIREMENTS FOR 100% SOLIDS EPOXY SYSTEM

A. Clean all surfaces with high pressure water to remove all loose contaminated debris. Other methods may be required to remove unsound material.

B. When all loose, contaminated and unsound debris has been removed, the surface shall be etched with a solution of 20% muratic acid to clean and open the pores of the substrate.

C. The surface shall be washed again and the wash water shall contain a dilute solution of chlorine to diminish microbiological bacteria growth.

D. The surface shall be tested with litmus paper at various points troughout the structure to ensure the the pH is within acceptable limits.

E. Active water infiltration shall be stopped by using cementitious water plug that is compatible and suitable for top coating with the specified monolithic surfacing.

3.10 INSTALLATION OF 100% SOLIDS EPOXY SYSTEM

A. The interior surfacing system shall be applied to the chimney, walls, bench and invert of all wet wells.

B. The interior surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside the wet well according to ASTM C882 testing and therefore shall be designed for hydrostatic loading.

C. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in conformance with the recommendations of the monolithic surfacing system manufacturer.

D. The specified materials must be applied by an approved installer of the monolithic surfacing system.

E. The walls, bench and invert of the structure shall be lined with a monolithic surfacing system to provide a thickness of 350 mills on all wet wells.

3.11 SAFETY AND VENTILATION REQUIREMENTS:

A. Requirements for safety and ventilation shall be in accordance with SSPC Paint Application Guide No. 3.

3.12 FIELD QUALITY CONTROL INSPECTION

A. Inspection by the Engineer or others does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

B. Perform the quality control procedures listed below in conjunction with the requirements of this Section.

C. Inspect all materials upon receipt to ensure that all are supplied by the Manufacturer.

D. Provide specified storage conditions for the resurfacing system materials, solvents, and abrasives.

E. If using the Epoxy Lining System, inspect and record findings for the degree of cleanliness of substrates using. The pH of the concrete substrate will be measured using pH indicating papers. pH testing is to be performed once every 50 sq. ft. Acceptable pH values shall be between 9.0 and 11.0 as measured by a full-range (1-12) color indicating pH paper with readable color calibrations and a scale at whole numbers (minimum). Use Hydrion Insta-Check Jumbo 0-13 or 1-12 or equal. The paper shall be touched to the surface once using moderate gloved finger pressure. The surface shall not be wiped or moved laterally to disturb the surface during pH testing. Following the one touch, lift the paper vertically to not "wipe" the surface. Compare the color indicated with the scale provided and record the pH.

F. Inspect and record substrate profile (anchor pattern). Surfaces shall be abraded, as a minimum, equal to the roughness of 40 grit sand paper.

G. Measure and record ambient air temperature once every two hours of each shift using a thermometer and measure and record substrate temperature once every two hours using a surface thermometer.

H. Measure and record relative humidity every two hours of each shift using a sling psychrometer in accordance with ASTM E337.

I. Provide correct mixing of resurfacing materials in accordance with the Manufacturer's instructions.

J. Inspect and record that the "pot life" of resurfacing materials are not exceeded during installation.

K. Verify curing of the resurfacing materials in accordance with the Manufacturer's instructions.

L. Upon full cure of Epoxy Lining System, the installed lining system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface. Voltage shall be set at 11,000 volts. Areas which do not pass the spark detection test shall be corrected at no cost to the Owner and rechecked. High voltage spark detection shall be conducted on the chemical resistant mortar before the installation of the gel coat.

M. Upon completion of the lining system installation the lined area shall be cleaned and prepared to permit close visual inspection by the Engineer or the Engineer's Representative. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked for repair or removal/replacement by the Contractor at no additional cost to the Owner.

3.13 ACCEPTANCE CRITERIA

After the wet well sealing and restoration operation has been completed, the wet well shall be visually inspected for the elimination of excessive infiltration by the Contractor in the presence of the Project Engineer and the work shall be satisfactory to the Engineer. The interiors shall be free of voids or pinholes and thickness shall be as specified. In addition, at

the Owner's request, the Contractor may be required within one year to visually inspect the wet wells that were sealed. Any sealing work that has become defective shall be resealed by the Contractor at no additional expense to the Owner.

A. Acceptance Criteria for Surface Preparation Work: All surfaces shall be prepared in accordance with the specification, referenced standards and manufacturer's requirements therein.

B. Acceptance Criteria for Coating System Application Work: Acceptable coating work will be based upon the following:

- No pock-marks, trowel marks, depressions, unconsolidated areas, pinholes or holidays in either size or frequency.
- No intercoat bond failures between lifts.
- Proper curing of coatings.
- Resurfaced areas shall pitch to drains.
- There shall be no areas that puddle when flood tested.

C. The Engineer or Engineer's Representative shall, at their discretion, inspect the following:

- Profile and degree of cleanliness of substrate.
- Thickness of materials/coverage rate confirmation.
- Ambient temperature and humidity requirements and substrate temperature.
- Curing and recoat times.
- Proper curing of the resurfacing materials.

D. Rework required on any holidays or any other inadequacies found by the Engineer or the Engineer's representative in the quality of the coating work shall be marked. Such areas shall be recleaned and reworked by the Contractor according to these specifications and the manufacturer's recommendations at no additional cost to the Owner.

E. The Contractor is responsible for keeping the Engineer informed of all progress so that inspection for quality can be achieved.

F. The Contractor is ultimately responsible for the quality performance of the applied materials and workmanship. Inspections by the Engineer or the Engineer's Representative do not limit this responsibility.

3.14 FINAL INSPECTION

A. Perform a final inspection to determine whether the resurfacing system work meets the requirements of the specifications. The Engineer and the Engineer's Representative will conduct final inspection with the Contractor.

3.15 CLEANUP

A. Upon completion of work, the Contractor shall remove surplus materials, equipment, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any work-related damage. The surrounding surface areas including roadways and all other surfaces shall be restored to their pre-project condition.

3.16 QUALITY ASSURANCE AND WARRANTIES

A. The manufacturer and/or applicator of the total linear system of wet wells shall be a company that specializes in the design, manufacture or installation of corrosion protection systems for wastewater. Applicator shall be completely trained in leak repair, surface preparation and corrosion materials application on wet wells. Corrosion materials/products shall be suitable for installation in a severe hydrogen sulfide environment without any deterioration to the liner.

B. To ensure total unit responsibility, all materials and installation thereof shall be furnished and coordinated with/by one supplier/applicator who turnkeys the work and assumes full responsibility for the entire operation.

C. The manufacturer and applicator shall warrant the liner system against failure for a period of 10 years. "Failure" will be deemed to have occurred if the protective lining fails to (a) prevent the internal damage or corrosion of the structure (b) protect the substrate and environment from contamination by effluent. If any such failure occurs within 10 years of initial completion of work on a structure, the damage will be repaired to restore the lining at no cost to the Owner within 60 days after written notification of the failure. "Failure" does not include damage resulting from mechanical or chemical abuse or act of God. Mechanical or chemical abuse means exposing the lined surfaces of the structure to any mechanical force or chemical substance not customarily present or used in connection with structures of the type involved. Liability is limited to and shall not exceed the purchase price paid.

- END OF SECTION -

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide a proposed bypass plan for review and approval.

B. No separate payment shall be made for sewer flow control

PART 2 – MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 PLUGGING OR BLOCKING

A. A sewer line plug shall be inserted into the line upstream of the pipe segment being inspected or repaired. After the Work has been completed, flow shall be restored to normal.

3.02 PUMPING AND BYPASSING

A. Bypass pumping shall be required whenever pump station is shut down or flow in gravity sewer lines is restricted or blocked. The Contractor shall supply the necessary pumps, conduits, and other equipment to divert the flow of wastewater around the pump station, restriction, blockage, or other structure in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of a rainstorm. Trailer-mounted electric pumps shall be used. No other type of pump will be acceptable without prior approval of the Owner and the Engineer.

B. The Contractor shall be responsible for furnishing the necessary equipment, power, labor, and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, all equipment shall be operated in a manner to keep the pump noise at a minimum.

C. Bypassing of wastewater to storm drainage systems shall not be allowed.

D. Bypass pumping system capacity shall be 2,200 gallons per minute at 1350 RPM and meet head requirements of 40 feet.

3.03 FLOW CONTROL PRECAUTIONS

A. Whenever flows in a sewer line are blocked, plugged, or bypassed, sufficient precautions shall be taken to protect the sewer lines from damage that might be inflicted by excessive sewer surcharging. Further, precautions shall be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

END OF SECTION

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DIVISION 3

CONCRETE

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Formwork for cast-in-place concrete, complete with shoring, bracing, and anchorage.

B. Coordinate installation of items supplied by other sections of work.

1.02 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement

B. Section 03250 – Concrete Accessories

B. Section 03300 - Cast-in-Place Concrete

D. Section 03350 – Concrete Finishing

1.03 QUALITY ASSURANCE

A. Design, construct and erect concrete formwork in accordance with ACI 318 and ACI 347, and applicable construction safety regulations for place of work.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 - Specification for Structural Concrete for Buildings.

2. ACI 318 - Building Code Requirements for Reinforced Concrete.

3. ACI 347 - Recommended Practice for Concrete Formwork.

1.05 FALSEWORK, FORM, AND RELATED DRAWINGS

A. Indicate pertinent dimensioning, methods of construction; materials; arrangement of joints, ties, and shores; location of bracing and temporary supports; schedule of erection; and stripping.

B. When required by the Engineer, submit drawings and calculations for review. Such review shall not relieve the Contractor of his sole responsibility for form design and any damage due to insufficiency.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Class I: For permanently exposed concrete surfaces, Class I forms shall be constructed with particular care to assure a high quality type of Engineerural finish of uniform texture free from visible irregularities, patch marks and discolorations and shall be of waterproof synthetic resin bonded plywood, 3/4-inch minimum thickness, specially made for concrete work. The entire surface shall be lightly sanded, if necessary. Face and edges of

forms shall be coated with a two-coat system of catalyzed polyurethane resin. Coating shall be applied by roller at the rate of 500 to 550 square feet per unit. Class I forms will be required for all exterior exposed concrete surfaces. Steel forms meeting the surface requirements are acceptable.

B. Class II: Formed surfaces not exposed to view such as footings and back-filled walls shall comply with ACI 10.2.1 rough form finish. These forms may be of metal or of smooth planed boards in good condition free from large or loose knots.

C. Form Ties:

1. Concealed Locations Where Concrete Is To Be Concealed With Subsequent Work: Snap ties with 1/2-minimum breakback.

2. Exposed Locations Where Concrete Is To Remain Exposed On Exterior Or Interior Spaces: Cone type snap ties with cone about 1-inch in diameter and 1 to 1-1/2 inches deep.

   a. Ties shall not be pull out type which can be completely removed from the concrete leaving a hole thorough the concrete.

3. Submit details of proposed tie system to the Engineer for review prior to construction.

D. Miscellaneous:

1. Form Release Agent: Chemical agent guaranteed by manufacturer to be non-staining and not to impair bond of paint or other finish to be applied to concrete surface.

2. Chamfer Strip:

   a. Wood: Clear with planed, 45 degree bevel; no defects on bevel surface.

   b. Plastic or Rubber: Manufacturer's standard.

PART 3 - EXECUTION

3.01 FORMWORK ERECTION

A. Verify, levels, and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

B. Construct formwork, shoring, and bracing to meet design and code requirements, sot that resultant finished concrete conforms to required shapes, lines, and dimensions. The sole responsibility for form design and for any resulting structural damage due to form failure rests with the Contractor.

C. Arrange and assemble formwork to permit dismantling and stripping so that concrete is not damaged during its removal.

D. Align joints and make watertight, to prevent leakage of mortar or disfigured appearance of concrete. Keep form joints to minimum.

E. Arrange forms to allow stripping without removal of principal shores, where and when these are required to remain in place.

F. Prior to framing structural members, obtain Engineer's review before framing any openings not indicated on the drawings.

G. Apply form release agent on formwork in accordance with manufacturer's recommendations. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

H. At construction joints, provide shear keys as shown on the drawings.

I. Earth Forms: Side forms of footing may be omitted and concrete placed directly against excavations. When this is done, provide an additional 1-inch thickness on each side of the minimum design profiles and dimensions shown.

3.02 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for pipes, conduits, sleeves, and other work to be embedded in and passing through concrete members.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate work of other sections and cooperate with trade involved in forming and setting opening, recesses, bolts, anchors, and other inserts. Do not perform work unless specifically indicated on drawings or reviewed prior to installation.

D. Install embedded items and concrete accessories in accordance with manufacturer's recommendations; straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close temporary ports or openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.03 TOLERANCES

A. Tolerances for uniformity and plumbness are extremely critical to efficient flow control. Maximum variation from plumb shall conform to ACI 301 4.3.

3.04 FIELD QUALITY CONTROL

A. Inspect and check completed formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastening, wedges, ties, and parts are secure.

B. Inform Engineer when formwork is complete and has been cleaned to allow for inspection. Obtain review prior to placing reinforcing.

3.05 CLEANING

A. Clean forms of foreign matter. Remove cuttings, shavings, and debris from within forms. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

B. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out completed forms, except when temperatures will remain above 40 degrees F during placing.

3.06 FORM REMOVAL

A. Notify Engineer prior to removing formwork.

B. Do not remove forms, shores, and bracing until concrete has gained sufficient strength to carry its own weight and construction and design loads which are likely to be imposed upon it. Verify strength of concrete by test cylinder results. Forms shall remain in place for a minimum of 48 hours.

C. Remove formwork progressively and in accordance with code requirements and so that no shock loads or

unbalanced loads are imposed on structure.

D. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.

E. Leave forms loosely in place, against vertical surfaces, for protection until complete removal is reviewed by Engineer.

F. Store removed forms in manner that surfaces of forms which are to be in contact with fresh concrete will not be damages. Marked or scored forms will be rejected.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all concrete reinforcement including reinforcing steel bars, welded steel wire fabric, support chairs, bolsters, bar supports and spacers as shown on the Drawings and specified herein.

1.02 REFERENCE STANDARDS

A. CRSI Document 63 – Recommended Practice for Placing Reinforcement Bars.

B. CRSI Document 65 – Recommended Practice for Placing Bar Supports

C. ASTM A 185 – Welded Steel Wire Fabric for Concrete Reinforcement

D. ASTM A 615 – Deformed and Plain Billet – Steel Bars for Concrete Reinforcement

E. ACI 315 – Manual of Standard Practice for Detailing Reinforced Concrete Structures.

1.03 QUALITY ASSURANCE

A. All concrete reinforcement work shall be performed in accordance with Concrete Reinforcement Steel Institute (CRSI) Manual of Standard Practice, CRSI Document 63 – Recommended Practice for Placing Reinforcing Bars, and CRSI Document 65 – Recommended Practice for Placing Bar Supports.

1.04 SUBMITTALS

A. Submit copies of a reinforcing steel placement plan for all structures where reinforcing steel is involved.

B. Prepare placement plans in accordance with ACI 315.

C. Indicate reinforcement sizes, spacings, locations, quantities of reinforcing steel, bending schedules, splicing, supporting and spacing devices.

D. Before placing reinforcing steel, copies of a list of all reinforcing steel showing the location, mark number, size and type bend shall be furnished to the Engineer at the site for his use in administering the contract. Furnishing such lists to the Engineer shall not be construed to mean that the lists will be reviewed for accuracy. The Contractor shall be responsible for the accuracy of the lists and for furnishing and placing all bar reinforcing steel in accordance with the details shown on the Drawings and as specified.

E. A certified copy of the mill test on each heat number of reinforcing steel used for fabrication showing physical and chemical analysis shall be submitted to the Engineer at the time of shipment.

1.05 PRODUCT DELIVERY AND HANDLING

A. Reinforcing shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.

B. Reinforcement shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same designations as shown on the submitted placing drawings. All in accordance with the Code of Standard Practice of the Concrete Reinforcement Steel Institute (CRSI).

C. Reinforcing steel shall be stored off the ground and shall be protected from moisture and kept free from dirt, oil, or other injurious contaminants.

D. Coated reinforcing steel shall be stored on padded wooden or steel cribbing. Coatings damaged by fabrication, handling or installation shall be repaired to conform to the applicable coating specification.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall be new, be of domestic manufacture and shall conform to the following material specifications.

1. Deformed concrete reinforcing bars: ASTM A 615, Grade 60 or ASTM A 615 Grade 60 supplementary requirement S1 deformed bars as required.

2. Concrete reinforcing bars required on the Drawings to be welded: ASTM A 706.

3. Spiral reinforcement for columns: ASTM A 82 or ASTM A 615, Grade 60.

4. Welded steel wire fabric: ASTM A 185.

5. Welded deformed steel wire fabric: ASTM A 497.

6. Welded plain bar mats: ASTM A 704, Grade 60.

7. Fabricated deformed steel bar mats: ASTM A 184 and ASTM A 615, Grade 60 deformed bars.

8. Galvanized reinforcing bars: ASTM A 767 and ASTM A 615, Grade 60.

9. Plastic protected bar supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.

10. Stainless steel protected bar supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.

11. Precast concrete block bar supports: CRSI Bar Support Specifications, precast Blocks with Wires.

12. Tie wires for reinforcement: 16-gauge or heavier, black annealed wire.

13. Ferrous supports and ties for galvanized reinforcing steel shall be zinc coated.

B. The following alternate materials are allowed:

1. ASTM A 616 (Rail-steel), Grade 60 deformed bars for ASTM A 615 (Billet-steel), Grade 60 deformed bars.

2. ASTM A 617 (Axle-steel) Grade 60 deformed bars for ASTM A 615 (Billet-steel), Grade 60 deformed bars.

3. Selected heats of ASTM A 615, Grade 60 including supplementary requirement S1 deformed bars with a carbon equivalency (C.E.) of 0.55 or less for ASTM A 706.

C. Mechanical reinforcing steel butt splices if approved by the Engineer shall be positive connecting taper threaded type employing a hexagonal coupler. They shall meet all ACI 318 Building Code requirements. Bar ends must be taper threaded with coupler manufacturer's bar threader to ensure proper taper and thread engagement. Bars shall be to required to manufacturer's recommended value.

Approved connectors are Lenton rebar splices as manufactured by Erico Products, Inc., 34600 Solon Road, Solon, Ohio 44139, (216) 248-0100.

1. Mechanical tension splices shall be designed to produce a splice strength of not less than one hundred twenty-five percent (125%) of the AST MJ specified minimum yield strength of the reinforcing.

2. Compression type mechanical splices shall provide concentric bearing from one bar to the other bar and shall be capable of developing the ultimate strength of the reinforcement in compression.

2.02 FABRICATION OF REINFORCEMENT

A. Fabrication tolerances shall be in accordance with the CRSI, Code of Standard Practice-Fabrication.

B. Bars shall be cold bent.

C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI, Code of Standard Practice-Detailing. Hooks shall conform to the same Code.

D. Bars that are to be butt spliced, placed through limited diameter holes in metal or have a threaded end shall have the applicable end(s) saw-cut.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Surface condition, bending, spacing, and tolerances of placement of reinforcement shall conform to the CRSI, Code of Standard Practice-Field Erection.

B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:

1. Concrete cast against and permanently exposed to earth; 3-in.

2. Concrete surfaces in contact with soil, water, sewage, sludge or exposed to the weather; 2-in.

3. Concrete surfaces not in contact with soil, water, sewage, sludge or exposed to the weather:

   a. Beams, girders, columns: principal reinforcement, ties, stirrups or spirals - 1-1/2-inches

   b. Walls and bottom steel of slabs - 1-inch

   c. Shells and top steel of slabs - 3/4-inch

C. Reinforcement which is to be exposed for a considerable length of time after being placed shall be painted with a heavy coat of neat cement slurry, if required by the Engineer.

D. No reinforcing bars shall be welded either during fabrication or erection unless specifically called for on the Drawings, specified herein, or approved in writing by the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall conform to the AWS Structural welding Code-Reinforcing Steel, AWS D1.4.

3.02 REINFORCEMENT AROUND OPENINGS

A. Place an equivalent area of steel to that interrupted by an opening, pipe penetration, electrical conduit group or duct penetration around the opening or penetration. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

A. Except as otherwise indicated on the Drawings, compression embedment and lap splices shall be minimum 30 diameters, but not less than 12 inches. The lap splice length for column vertical bars shall be based on the smaller bar size.

B. Except as otherwise indicated on the Drawings, tension lap splices shall be in accordance with the applicable tables in the ACI 315 Detailing Manual. Class B splices shall be used when fifty percent (50%) or less of the bars are spliced within the required lap length, otherwise Class C splices shall be used.

C. Except as otherwise indicated on the Drawings, splices in circumferential reinforcement in circular walls shall be Class C splices. Adjacent bars shall not be spliced within the required lap length.

D. Splices in reinforcement for tension tie members and hangers shall be welded to develop, in tension, at least one-hundred-twenty-five percent (125%) of the specified yield strength of the bar. Splices in adjacent bars shall be offset the distance of a Class C splice. Splicing of bars in tension tie members and hangers shall be avoided whenever possible.

E. Compression type mechanical connectors may be used for No. 9 or larger reinforcing bars in compression if approved in writing by the Engineer. The splice shall include concentric bearing from one bar to the other bar and shall be capable of developing one-hundred-twenty-five percent (125%) of specified yield strength . Splices in adjacent bars shall be offset at least 30 bar diameters.

F. Splices in welded wire fabric shall be lapped not less than 1-1/2 courses or 12-inches. The spliced fabrics shall be tied together with wire ties at least 24-inches on center.

3.04 ACCESSORIES

A. The Contractor is solely responsible for determining, providing and installing accessories such as chairs, chair bars, and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the steel and the placement of concrete and to provide spacings of bars with adequate cover as shown on the Drawings or specified herein.

B. Precast concrete blocks with wires shall be used where the reinforcing steel is to be supported over soil.

C. Stainless steel protected bar supports shall be used to firmly hold vertical reinforcement in position.

D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if accepted by the Engineer.

3.05 INSPECTION

A. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcement has been observed by the Engineer and his permission given to proceed with placement of the concrete. The Engineer shall be given ample prior notice of the availability of set reinforcement for his review.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to make all joints tight in the concrete as detailed on the Drawings and as specified herein.

1.02 RELATED SECTIONS

A. Section 03100 – Formwork

B. Section 03200 – Concrete Reinforcement

C. Section 03300 – Cast-in-place Concrete

D. Section 03350 – Concrete Finishing

1.03 SUBMITTALS

A. Manufacturer's product data for all materials required to establish compliance with these Specifications shall be submitted for review and approval of the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Waterstops shall be of the highest grade virgin polyvinyl chloride (PVC) meeting the latest revision of Corps of Engineers' Specification CRD-C-572. No scrap or reclaimed PVC shall be used in the compound. Waterstops required for expansion joints shall be 9 inches in width, 3/8-inch in web thickness dumbbell type with 3/4-inch I.D. center bulb, capable of withstanding a hydrostatic pressure of 150 feet. Waterstops required for all other joint conditions shall be 6-inches in width, 3/8-inch in web thickness, dumbbell type capable of withstanding a hydrostatic pressure of 125 feet. Manufacturers meeting the geometry and specifications are: Greenstreak Plastic Products, Box 7139, St. Louis, Missouri 63177, (314) 225-9400, Style No. 748 for the 6-inch by 3/8-inch and style 753 for the 9-inch by 3/8-inch; Vinylex Corporation, P.O. Box 7187, Knoxville, Tennessee 37921, (615) 690-2211, Catalog No. D6-38 for the 6-inch by 3/8-inch and DB9-38 for the 9-inch by 3/8-inch. Other products shall not be used without prior review and acceptance by the Engineer. Rubber waterstops meeting the latest revision of Corps of Engineers' Specification CRD-C-513 will be considered equal.

B. Premolded joint filler (PJF) for interior expansion joints shall be self-expanding cork consisting of preformed strips that have been formed from clean granulated cork particles securely bound together by a synthetic resin of an insoluble nature. The PJF shall be capable of expanding 140 percent of its original thickness, which shall be 3/4-inch unless shown otherwise on the Drawings. The PJF shall meet the specification requirements of the latest revision of Corps of Engineers' Specification CRD-C-509, Type III and ASTM D 1752 Type III. Manufacturers meeting the specification requirements are: Sealtight Projects by W. R. Meadows, Inc., P.O. Box 543, Elgin, Illinois 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas Texas 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

C. Premolded joint filler (PJF) for exterior expansion joints between concrete slabs and structural walls, where specifically shown on the Drawings shall be asphalt impregnated fiberboard conforming to the latest revision of ASTM D 1751. Thickness of the PJF shall be 3/4-inch unless otherwise shown on the Drawings.

Manufacturers meeting the specification requirements are: Sealtight Products by W. R. Meadows, Inc., P.O. Box 543, Elgin, Illinois 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas Texas 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

D. Backer-rod shall be high-grade extruded closed-cell polyethylene foam that is completely compatible with polysulfide and urethane type sealants. Backer-rod shall also be ultraviolet stable, resistant to oils, chemicals, ozone and weathering. The size of the rod shall be 1-inch diameter for 3/4-inch wide joints. To the extent possible only full length rods shall be used; splices shall be minimized. Acceptable manufacturers are: Sonofoam by Sonneborn Building Products, 7711 Computer Avenue, Minneapolis, Minnesota 55435, (612) 835-3434 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, Texas 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

E. Mastic used to prevent bond at joints indicated on the Drawings shall be by Sika Corporation, Box 297, Lyndhurst, New Jersey 07071, (201) 933-8801, or approved equal. Primer shall be as recommended by the manufacturer.

F. Materials for forming joints and load transfer devices for installation in street and roadway pavement slabs shall be in accordance with LADOTD Specifications, Section 601.10.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install waterstops for all joints indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Splices shall be made by welding in accordance with the manufacturer's recommendations, subject to acceptance of the Engineer. The finished splices shall provide a cross-section that is dense and free of porosity. If rubber waterstops are used, provide factory formed corners, intersection pieces, splicing unions and approved joint cementing compounds.

B. To properly secure waterstops before concrete is poured, drill holes in waterstops just below the bulb and center the waterstop in the joint. Tie to reinforcing steel with 16 gauge black annealed steel tying wire as specified in Section 03200 and secure in place so that the waterstop will be normal to the joint.

C. The spacing of the ties shall match the spacing of the reinforcing, but need not be spaced less than 12 inches on center. The ties shall be secured to the reinforcing such that the waterstops will remain in the required position during concrete placement.

D. Premolded joint fillers shall be installed at all locations shown on the Drawings. Exterior asphalt impregnated fiberboard expansion joints do not require a joint sealer, but shall stop 3/4-inch from the concrete surface. Interior expansion joints shall be sealed.

E. All control joints shall be coated with mastic to prevent bond. Mastic shall be applied in strict compliance with the manufacturer's instructions.

F. Joints, joint forming devices, and load transfer devices for street and roadway pavement shall be installed in accordance with the requirements of LADOTD Specifications, Section 601.10, and the typical details required in the LADOTD Standard Plans.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to place all cast-in-place concrete, reinforcing steel, forms, waterstops and miscellaneous related items, including sleeves, reglets, anchor bolts, inserts and embedded items, as shown on the Drawings and as specified.

1.02 GENERAL DESCRIPTION

A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be ready-mixed concrete produced by a plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the central batch plant.

B. All work shall comply with the latest edition of ACI Specifications 301, 318 and 350.

C. All testing and inspection services required shall be provided by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid for by the Owner. Methods of testing shall comply in detail with the latest applicable ASTM Methods.

D. Samples of constituents and of concrete as-placed will be subjected to laboratory tests. All materials incorporated in the Work shall conform to accepted samples.

E. Under special circumstances, the Engineer may allow minor deviations from the material requirements specified, provided that the resulting concrete quality is not adversely affected or that a suitable adjustment in cement content is made to compensate for such deviations

1.03 REFERENCED STANDARDS

A. ACI 301 – Structural Concrete for Buildings

B. ACI 318 – Building Code Requirements for Reinforced Concrete

C. ACI 350R – Environmental Engineering Structures

D. ASTM C33 – Concrete Aggregates

E. ASTM C150 – Portland Cement

F. ASTM C260 – Air Entraining Admixtures for Concrete

1.04 SUBMITTALS

A. The Contractor shall submit to the Engineer for approval a proposed design mix for each concrete strength and type required by these specifications. Information to be submitted for each type and strength shall include the following items:

1. Sources of concrete mix design components including coarse aggregate, fine aggregate, cement, water, admixtures, and pozzolans where included.
2. Concrete mix design

    a. Constituent quantities per cubic yard.

b. Water content: gallons/100 pounds cementitious materials.

c. Cement: type, manufacturer, and chemical analysis.

d. Mix design slump.

e. Average laboratory cylinder strength test results at 28-days for concrete mix design (include standard deviation). Provide results of seven and 14 day tests if available.

3. Laboratory sieve analysis and mechanical properties for coarse and fine aggregate.

4. Admixture types and chemical compositions. (Include certification of compliance with ASTM reference standards and confirmation of any supplementary requirements included in these Specifications.)

B. An additional mix design for each type and strength of concrete to be placed by pumping shall be submitted to the Engineer for approval.

C. Failure to include any item of information noted in Article 1.04 A for a given concrete strength or type shall be cause for requirement of a resubmittal by the Engineer.

D. The Contractor shall submit to the Engineer for acceptance, as provided in Section 01340, shop drawings showing placement of all joints of plywood forms, and rustications.

E. Concrete mix designs including fly-ash will not be acceptable.

1.05 QUALITY ASSURANCE

A. The actual acceptance of aggregates and development of mix proportions to produce concrete complying with the specific requirements of this Section shall be determined by means of prior laboratory tests made with the constituents to be used on the Work.

B. Well in advance of placing concrete, the Contractor shall discuss with the Engineer the proposed source of materials and concrete mixture which he proposes to use. He shall furnish samples of aggregate and cement for testing, deliver them to the laboratory designated by the Engineer, and permit ample time for the laboratory to develop a proposed design mix or to modify the design of the mix within the limits of these Specifications.

C. The following limiting strengths, water contents and cement factors shall apply.

Table 03300-1

Minimum Compressive Strength, f'c (psi at 28 days)	Maximum Water Content* (gals./100 lbs.)	Net Minimum Cement Factor** (100 lbs./c.y.)
2500	7.4	4.30
3000	6.2	5.64
4000	5.9	5.64
4000 @ 7 days	4.5	6.58

* Maximum: decrease if possible. This represents total water in mix at time of mixing, including free water on aggregates and water in admixture solutions.

** Minimum: increase as necessary to meet other requirements. These cement factors apply to "controlled" concrete subject to specific inspection.

1. Minimum cement content shall be as shown in Table 03300-1. The Contractor shall increase cement content as required to meet strength requirements.

2. When high early-strength Portland cement is permitted, the same strength requirements shall apply except that the indicated strengths shall be attained at seven days instead of 28 days.

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made by the Contractor.

E. If, during the progress of the work, the Contractor desires to use materials other than those originally accepted or if the materials from the sources originally accepted change in characteristics, the Contractor shall make new acceptance tests of aggregates and establish new design mixes. Such testing and design shall be accomplished with the assistance of a testing laboratory acceptable to the Engineer.

F. Consistency of the concrete as measured by the ASTM C 143, shall be as shown in Table 03300-2.

Table 03300-2

Portion of Structure	Slump (inches) Recommended	Slump (inches) Range
Pavement and slabs on ground	2	1-3
Plain footings, gravity walls, slabs and beams	2-3	1-4
Heavy reinforced foundation walls and footings	3-4	2-5
Thin reinforced walls and columns	4	3-5

Concrete shall be of a consistency which can be readily worked into the corners and angles of the forms and around the reinforcement, inserts, and wall castings without permitting materials to segregate or free water to collect on the surface. Consideration shall be given to the proposed methods of placing and compacting in establishing the consistency of the concrete.

G. Entrained air as measured by ASTM C 231 shall be as indicated in Table 03300-3.

Table 03300-3

Concrete Placement	Total Air Measured at Discharge from Truck (%)
Finished slabs	3.0 maximum
All other	3.5 - 5.0

If the air entraining agent proposed for use in the mix requires testing methods other than ASTM C 231 to accurately determine air content, make special note of this requirement in the admixture submittal required under Article 1.04.

1.06 ACCEPTANCE TESTS

A. The actual proportioning of cement, aggregates, and water necessary to produce concrete complying with the requirements of Table 03300-1, shall be determined by tests made with representative samples of the materials to be used for the Work. Tests shall be made by a testing laboratory selected by the Owner and approved by the Engineer. Testing shall comply with ASTM C 39.

B. Cement shall be tested to certify compliance with the requirements of this Specification. Methods of testing shall comply with the appropriate Specifications, but the place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular need.

C. Samples of fine and coarse aggregates shall be furnished for examination and testing at least three weeks before the Contractor proposes to use them in the work.

D. Water content of the concrete shall be based on a curve showing the relation between water content and seven and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age, and shall have a range of values sufficient to yield the desired data, including all the compressive strengths called for on the Drawings, without extrapolation. The water content of the concrete to be used, as determined from the curve, shall correspond to the following test strengths of the laboratory trial mixtures:

Table 03300-4

Design strength**	7 Days*	Min. Lab. Strength 28 Days
2500 psi	2000 psi	2900 psi
3000 psi	2500 psi	3400 psi
4000 psi	3500 psi	4600 psi
4000 psi @ 7 days	4000 psi	5600 psi

* May be employed for preliminary designs
** To be used for final designs

E. In no case, however, shall the resulting mix conflict with the limiting values for maximum water content and net minimum cement factor as specified in Table 03300-1.

F. Testing under Section 1.05 to establish conformity of the various concrete mix components and the mix design with the provisions of this Specification shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall comply with these Specifications and any State or local specification requirements.

B. Cement for all cast-in-place concrete shall be domestic Portland cement (ASTM C 150, Type II) or high early strength Portland cement (ASTM C 150, Type III). Air entraining cements shall not be used. Cement brands shall be subject to approval by the Engineer.

1. For all hydraulic and below grade structures use Type II cement.

2. High early strength cement shall be used only after obtaining written approval from the Engineer.

3. Use only Portland cement produced at locations approved and listed in the Qualified Products List of LADOTD.

C. Aggregates

1. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of LADOTD Specifications, Section 1003.02, and the following detailed requirements:

a. Gradation:

Sieve (ASTM Specification Ell)	Percentage Passing
3/8 inch	100%
No. 4	95 - 100%
No. 16	45 - 90%
No. 50	7 - 30%
No. 100	0 - 7%
No. 200	0 - 3%
Fineness Modulus	2.60 - 3.00
Organic	See ASTM C 33
Silt	2.0% maximum
Mortar Strength Section 10	95% minimum as per ASTM C 87
Soundness	8% maximum loss, using magnesium sulfate, subjected to 5 cycles

2. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of LADOTD Specifications Section 1003.02, and the following detailed requirements.

Organic	See ASTM C 33
Silt	1.0% maximum
Soundness	8% maximum loss, using magnesium sulfate, subjected to 5 cycles

3. Maximum coarse aggregate size shall be:

2-inch for mass concrete
1-inch for reinforced section 10-inches and over in thickness
3/4-inch for reinforced sections less than 10-inch thickness

The "Designated Size" and the corresponding gradations shown represent the end or combined gradation of the coarse aggregate to be used in the final concrete.

D. Water

1. Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

2. Mortar specimens made with the water under examination and normal Portland cement shall have at least one-hundred percent (100%) of the strength of similar specimens made with distilled water when tested for 28-day strength in accordance with ASTM C 87.

3. Potable tap water will normally fulfill the requirements noted. Water from all other sources shall be

tested and approved before use and shall not contain impurities in excess of the following limits:

a. Acidity or alkalinity calculated in terms of calcium carbonate: 0.05%

b. Total organic solids: 0.05%

c. Total inorganic solids: 0.08%

d. Total chlorides as sodium chloride: 0.05%

E. Admixtures

1. A water reducing agent such as Pozzolith, WRDA or approved equal shall be used in all concrete. The admixture shall comply with ASTM Specification C 494, Type A or Type D, shall contain no chlorides, shall be non-toxic after thirty (30) days, and shall be compatible with the air entraining admixtures. Proportioning and mixing shall be as recommended by the manufacturer.

2. Admixtures causing accelerated setting of cement in concrete shall not be used.

3. Air entraining admixtures compatible with the concrete mix shall be used in moderation along with the water reducing agent to obtain the specified percent air in the resultant concrete.

F. Non-Shrink Cement Grout: Non-shrink cement grout shall consist of cement, aggregate and additives formulated to meet the following volume change requirements. Early volume change (within 24 hours) as tested by ASTM C 827 shall be limited to zero percent (0%) shrinkage and four percent (4%) maximum expansion. Long term volume change of hardened non-shrink cement grout (after 1 day of cure) shall conform to the Corps of Engineers' Specification for Non-Shrink Grout, CRD-C621-82B. Shrinkage shall be zero percent (0%) and expansion limited to a maximum of 0.4 percent volume change. Cement additives required to meet this specification shall be recommended by the grout manufacturer, but shall be non-staining and non-metallic. Grout shall be equal to "Five Star" products by the U.S. Grout Corporation.

G. Non-Shrink Epoxy Grout: Non-shrink epoxy grout shall meet plastic volume changes within the first four hours of zero percent (O%) shrinkage and four percent (4%) maximum expansion as tested by ASTM C 827. Restrained hardened epoxy grout shall have O percent shrinkage as tested by ASTM C 531. Epoxy grout shall have zero percent (O%) expansion in volume change after set under constant temperature conditions. Epoxy grout shall be one-hundred percent (100%) solids formulated with resin, hardener and aggregate as recommended by the manufacturer. Epoxy grout shall be equal to "Five Star" Epoxy products manufactured by the U.S. Grout Corporation.

H. Bonding agents shall conform to ASTM C881, 2-component, 100% solids, moisture insensitive structural epoxy adhesive. Poly sulfide type epoxies are not acceptable. Acceptable products include "Sikadur 32 Hi-Mod" by Sika Corp or equal.

PART 3 - EXECUTION

3.01 MEASURING MATERIALS

A. Measure materials by weighing except as otherwise specified or where other methods are specifically authorized by the Engineer. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. Scales shall have been certified by the local Sealer of Weights and Measures within one year of use and a copy of the certification shall be delivered to the Engineer prior to beginning of placement of concrete. The accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent (1%) of the desired amount.

B. Cement and each type of aggregate shall be weighed separately. Cement in standard packages (sacks) need not be weighed, but bulk cement and fractional packages shall be weighed.

C. Water shall be measured by volume or by weight. The water-measuring devices shall be capable of control to one-half (2%) percent accuracy. All measuring devices shall be subject to approval by the Engineer.

D. Admixtures shall be dispensed either manually with use of calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.

3.02 MIXING

A. Concrete shall be ready-mixed concrete by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of the Engineer and under his direction. The amount of water added shall be shown on each delivery invoice.

B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the name plate. Discharge at the site shall be within 1-1/2 hours after water was first introduced to the mix.

C. Fill central plant and rolling stock equipment and methods shall comply with the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI Standard 318 Section 5.2, and ASTM C 94.

D. Retempering of concrete or mortar which has partially hardened (that is, mixing with or without additional cement, aggregate, or water) will not be permitted.

E. Attention is called to the importance of dispatching trucks from the batching plant so they arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

3.03 FIELD TESTS

A. Sets of three (3) field control cylinder specimens will be taken at random by the Engineer during the progress of the Work, in compliance with ASTM C 31; the total number of specimens taken on the project shall average one (1) set per 100 cubic yards, and not less than one (1) set of specimens shall be taken on any one day. When average 28-day compressive strength of control cylinders in any set falls below the required compressive strength or below proportional minimum seven-day strengths (where proper relation between seven and 28-day strengths have been established by tests), proportions , water content , or temperature conditions shall be changed to achieve the required strengths.

B. The Contractor shall cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through his operations, and furnishing material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner. Curing boxes shall be acceptable to the Engineer.

C. Slump tests and concrete cylinders will be made in the field by the Owner's laboratory technician.

D. Air entrainment shall be measured by the Owner's laboratory technician at the time of concrete deposit in compliance with ASTM C 231.

3.04 INSPECTION AND CONTROL

A. The preparation of forms, placing of reinforcing steel, conduits, pipes, and sleeves, batching, mixing, transporting, placing, and ring of concrete shall be all times under the inspection of the Engineer.

B. The Contractor shall advise the Engineer of his readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

3.05 CONCRETE APPEARANCE

A. Concrete for the Work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance.

B. Formwork , mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing.

C. When concrete forms are stripped, the concrete surface when viewed in good lighting from 10-feet away shall be pleasing in appearance, and at 20-feet shall show no visible defects.

3.06 FORMS

A. Forms shall be used for all cast-in-place concrete, including footings. Forms shall be constructed and placed so the resulting hardened concrete will conform to the shape, lines, dimensions, appearance, and elevations indicated on the Drawings. The Engineer shall have the right to approve or reject material for use in the construction or fabrication of formwork.

B. Forms for all exposed exterior and interior concrete walls shall be Type A-C exterior grade plywood with the "A" veneer turned to the casting side. Rustications shall be as located and detailed on the Drawings. Moldings for chamfers and rustications shall be milled and planed smooth.

C. Forms for all other cast-in-place concrete shall be made of wood, metal, or other acceptable material. Wood forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots. where used for exposed surfaces, boards shall be dressed and matched. Plywood shall be sanded smooth and fitted with tight joints between panels. Metal forms shall be of an acceptable type for the class of work involved and of the thickness and design required for rigid construction.

D. Edges of all form panels in contact with concrete shall be flush within 1/32-inch and forms for plane surfaces shall be such that the concrete will be plane within 1/16-inch in four (4) feet. Forms shall be tight to prevent the passage of mortar, water and grout.

E. Forms for walls shall have removable panels at the bottom for cleaning, inspecting, and scrubbing-in of bonding paste. Forms for walls of considerable height shall be arranged with tremies and hoppers for placing concrete in a manner that will prevent segregation and accumulation of hardened concrete on the forms or reinforcing above the fresh concrete.

F. Molding or bevels shall be placed to produce a 3/4-inch chamfer on all exposed projecting corners, unless otherwise noted on the Drawings. Provide similar chamfer strips at horizontal and vertical extremities of all wall placements to produce "clean" separation between successive placements as called for on the Drawings.

G. Forms shall be sufficiently rigid to withstand vibration and to prevent displacement or sagging between supports. Forms shall be constructed so that the concrete will not be damaged by their removal. The Contractor

shall be entirely responsible for the adequacy of the forming system.

H. Forms, including new pre-oiled forms, shall be oiled before reinforcement is placed, with an approved nonstaining oil or liquid form coating not having a paraffin base.

I. Before form material is reused, all surfaces in contact with concrete shall be thoroughly cleaned; all damaged places repaired; all projecting nails withdrawn; and all protrusions smoothed. Wood forms shall be pre-oiled before reuse.

J. Form ties encased in concrete other than those specified in the following paragraph shall be designed so that after removal of the projecting part, no metal shall be within one-inch of the face of the concrete. That part of the tie to be removed shall be at least 2-inch diameter or be provided with a wood or metal cone at least 2-inch diameter and one inch long. Form ties in concrete exposed to view shall be the cone-washer type equal to the Richmond "Tyscru". Throughbolts or common wire shall not be used for form ties.

K. Form ties for exposed exterior and interior walls shall be as specified in the preceding paragraph except that the cones shall be of approved wood or plastic conforming with the preceding dimensions or as otherwise shown on the Drawings.

3.07 PLACING AND COMPACTING

A. Unless otherwise permitted, concrete placement begun on any day shall be completed, including finishing, in daylight of the same day.

B. Place no concrete until reinforcing steel, pipes, conduits, sleeves, hangers, anchors, and other work required to be built into concrete have been inspected and approved by the Engineer. Remove water and foreign matter from forms and excavation. Place no concrete on frozen soil, and provide adequate protection against frost action during freezing weather. All soil preparation below slabs and footings shall be approved by the Engineer before placing concrete.

C. Transport concrete from mixer to place of final deposit as rapidly as possible by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete.

D. "Cold joints" are to be avoided unless called for on the Drawings. If they occur, they are to be treated as bonded construction joints.

E. At construction joints, the surfaces of the concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials, laitance, and weak concrete and roughened with suitable tools to expose a fresh face. At least two hours before and again shortly before the new concrete is deposited, the joints shall be saturated with water. After glistening water disappears, the joints shall be given a thorough coating of neat cement slurry mixed to the consistency of very heavy paste. The surfaces shall receive a coating at least 1/8-inch thick, well scrubbed-in by means of stiff bristle brushes whenever possible. New concrete shall be deposited before the neat cement dries.

F. Deposit concrete to maintain a horizontal plastic surface. Vertical lifts shall not exceed 24-inches. Vertical lifts of 18 inches are preferable.

G. Chutes for conveying concrete shall be of U-shaped design sized to insure a continuous flow of concrete. Do not use flat (coal) chutes. Chutes shall be metal or metal-lined and each section shall have approximately the same slope. The slope shall be not less than 25 nor more than 45 degrees and shall be such as to prevent the segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than five (5) feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable.

When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each delivery or separate, continuous pour. Debris and any water generated by the cleaning of chutes shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally over distances exceeding five (5) feet.

H. Pumping of concrete is an acceptable method of placement. The proposed pumping equipment and concrete mix shall be submitted to the Engineer prior to usage for approval.

I. In thin sections of considerable height, concrete shall be placed using suitable hoppers, spouts with restricted outlets, or other approved methods.

J. Concrete shall be thoroughly compacted during and immediately after placement using suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. vibration shall be done by experienced operators under close supervision and shall be of the duration required to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spades to prevent puddling adjacent to forms and to remove bubbles and honeycomb, especially for the top lifts of walls. All vibrators shall operate at minimum 10,000 rpm. At least one vibrator shall be used for every 10 cubic yards of concrete placed per hour. In addition, one spare vibrator in operating condition shall be on the site.

K. Concrete slabs on the ground shall be well-tamped into place. Foundation materials shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

L. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has sufficiently hardened to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the Drawings or as acceptable to the Engineer.

3.08 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. All concrete shall be treated immediately after concrete placing or finishing is completed to provide continuous moist curing above 50° F for at least seven (7) days (fourteen (14) days minimum for water-retaining structures), regardless of the ambient air temperature. Absorptive wood forms remaining in place will not be considered as a satisfactory means of curing. Forms and vertical surfaces shall be covered and kept moist with three layers of continuously saturated burlap, or by other approved means. Horizontal surfaces, slabs, etc. shall be ponded to a depth of 2-inch or kept continuously wet by use of sprinklers. Street pavement, driveways, and sidewalks shall be cured by application of a white pigmented liquid-membrane forming compound applied in strict conformance with LADOTD Specifications , Section 601.12. Liquid-membrane forming compounds shall conform to LADOTD Specifications Section 1011.01.

C. Cured surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing until the concrete is 28 days old.

D. Cold Weather Concreting:

1. Concrete placed at air temperature below 40 ° F shall have a minimum temperature of 60 ° F. When the air temperature is below 40 ° F or near 40 ° F and falling, the water and aggregates shall be heated before mixing. Concrete shall be protected so the temperature at the surface will not fall below 50 ° F for at least seven (7) days after placing. No salt, manure, or other chemicals shall be used for protection. Overheating or non-uniformity of heating shall be prevented. The surface temperature of the concrete shall not exceed 95 ° F during heating operations.

2. In cold weather, continuous warm curing (with supplementary heat when required) shall provide a total of 350 day-degrees (i.e., 5 days at 70 ° F, etc.) of heat.

3. The Contractor shall submit for acceptance by the Engineer a Work Plan describing the methods and procedures he proposes to use for concrete placement and curing during periods with temperatures below 40 ° F.

E. Hot Weather Concreting

1. For this Specification, "hot weather" is defined as any combination of high air temperatures, low relative humidity, and wind velocity which produces a rate of evaporation as estimated by Figure 2.1.5 of ACI 305R approaching or exceeding 0.2 Ib/ft /hr.

2. Concrete placed during hot weather shall be batched, delivered, placed, cured and protected in compliance with the recommendations of the latest ACI Committee 305 Report and the additional requirements of this Specification.

   a. Temperature of concrete being placed shall not exceed 90 ° F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.

   b. All necessary precautions shall be taken to promptly deliver and place the concrete upon its arrival at the job and to provide vibration immediately after placement.

   c. The Engineer may direct the Contractor to immediately cover plastic concrete with polyethylene.

3. The Contractor shall submit for acceptance by the Engineer a work Plan describing the methods and procedures he proposes to use for concrete mixing, including cooling or addition of ice to the aggregates, placement, finishing and curing during hot weather periods.

3.09 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has cured as specified above in subparagraph 3.08.C and the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design, and not before reaching the following number of day-degrees (whichever is the longer):

Forms For:	Day Degree*
Beams and slabs (spanning or self supporting)	500
walls and vertical surfaces (non-water retaining)	100
walls and vertical surfaces (water retaining)	150
Beams and slabs on grade	50

*Day-Degree : Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60° F equal 300 day-degrees. Temperatures below 50° F not to be included.

B. Shores shall not be removed until the concrete has attained at least seventy-five percent (75%) of the specified strength and also sufficient strength to support safely its own weight and any construction live loads that may be placed upon it.

3.10 FAILURE TO MEET REQUIREMENTS

A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 03300-1, the Engineer shall have the right to require changes in proportions outlined to apply on the remainder of the Work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements, the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections 15 and 17 of ASTM C 94.

B. When the tests on control specimens of concrete fall below the required strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C 42 and C 39. In case of failure of the latter, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Test need not be made until concrete has aged 60 days.

C. Slabs or beams, under load test, shall be loaded with their own weights plus a superimposed load of 2 times design live load. The load shall be applied uniformly over portion being tested in an acceptable manner, and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period does not exceed value: $D = 0.001\ L^2\backslash t$ in which "L" is span in feet, "t" is depth of slab or beam in inches.

D. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, slab or beam under test recovers at least seventy-five percent (75%) of observed deflection.

E. Should the strength of test cylinders fall below sixty percent (60%) of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

3.11 PATCHING AND REPAIRS

A. It is the intent of these Specification to require forms, mixture of concrete and workmanship so concrete surfaces, when exposed, will require no patching.

B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed, recesses left by the removal of form ties shall be filled, and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.

C. Immediately after removal of forms remove plugs and break off metal ties as required by Article 3.06. Holes are then to be promptly filled upon stripping as follows: Moisten the hole with water, followed by a 1/16-inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1-1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

D. When patching or repairing exposed surfaces, the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of one to five days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash

thoroughly to remove all rubbed matter.

E. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least I-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 3/8-inch wide all around the steel. For areas less than 1-1/2-inch deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs will require build-up in successive 1-1/2-inch layers on successive days, each layer being applied (with slurry, etc.) as described above. To aid strength and bonding of the multiple layer repairs, the Engineer may order the use of non-shrink, non-metallic grout as specified.

F. Non-Shrink Grout (see material specification Article 2.01-F)

1. For small repairs and patching, the grout shall consist of the following minimum cement/sand proportions plus the manufacturer's recommended additives.

Material	Volumes	Weights
Cement	1.0	1.0
Sand	1.5	1.5

2. For very heavy (generally formed) patches, the Engineer may order the addition of pea gravel to the mixture and the proportions modified as follows: (Non-shrink additives by manufacturer)

Material	Volumes	Weights
Cement	1.0	1.0
Sand	1.0	1.0
Pea Gravel	1.5	1.5

3.12 MODIFICATION AND REPAIR TO EXISTING CONCRETE

A. Cut, repair, reuse, demolish, excavate or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified, or necessary to permit completion of the work. Finishes, joints, reinforcements, sealants, etc. are specified in respective sections of Specification. All work shall conform with other requirements of this Section and as shown on the Drawings.

B. Mix proportions of patching or filling grout materials used in the modifications and repair to existing concrete as indicated on the Drawings shall be:

1. Then new grout other than non-shrink grout is shown to be connected to existing concrete, add the following cement mixtures depending on the depths called for or shown on the Drawings

a. Equal to or less than 2-inches in dept

Material	Volume
Cement	1.0
Sand	2.0
Water = 5 gals/200 Ibs. cement	

b. Greater than 2-inches to 12-inches in depth

Material	Volume
Cement	1.0
Pea Gravel	2.5
Sand	2.0

Water = 5 gals/100 lbs. cement

c. Greater than 12-inch in depth

Material

Concrete as specified under
2.01 MATERIALS in this Section

2. Non-shrink Cement Grout - As specified in Articles 2.01 F and 3.11 F in this Section.

3. Epoxy Bonding Agent

a. Epoxy bonding agent shall be a two component epoxy adhesive specifically formulated for bonding old concrete to new (plastic) concrete. Component A shall be an epoxy resin and Component B shall be epoxy hardener. The epoxy bonding agent shall be "Sikdadur 32, Hi-Mod", by Sika Corporation, Lyndhurst, NJ; "Pro Bond 821 or 822" by Protex Industries, Denver CO; "Concresive 1170" by Adhesive Engineering Company, San Carlos, CA; or equal.

b. The mixing ratio shall be as recommended by the manufacturer for the ambient temperature when placed. Furnish manufacturer's specific instruction for specific job application and obtain Engineer's review prior to purchase.

c. Epoxy bonding agent shall conform to ASTM C 881 and corresponding tests for bond strength and shrinkage as specified in ASTM C 882, C 883, and C 884.

d. The properties of the cured material shall meet the following:

Compressive Strength (ASTM D-695)
48 hour - 1000 psi
28 day - 7000 psi

Tensile Strength (ASTM D-638)
7 day - 4000 psi

Bond Strength (ASTM C-882 or C-884) - 1500 psi

e. Approval requirements The Contractor must furnish notarized certification that the material proposed for use meets all of the above requirements and that the material has been previously used successfully for the purpose describe.

4. Non-shrink epoxy grout, when specifically called for on the Drawings, shall be as specified in Article 2.01 F. Proportions of aggregate shall be as recommended by the grout manufacturer for the specific installation.

C. Demolition of Existing Concrete

Concrete shown to be removed on the Drawings shall be done by line drilling at limits followed by jack-hammering in areas where concrete is to be taken out. The Contractor shall be responsible for removing concrete in such a manner that surrounding concrete or existing reinforcing to be left in place and existing in place equipment is not damaged. Sawcutting at limits of concrete to be removed shall be done where indicated on the Drawings.

D. Connection to Existing Concrete

1. Roughen surface of existing concrete to be connected to new materials by sand-blasting, chipping, or scarifying. Thoroughly clean area of concrete to receive new materials of loose particles and dust or other contaminating objects.

2. Existing reinforcing to be left in place as shown on the Drawings shall be wire brushed to remove rust or concrete. The existing reinforcing shall be cut, bent, or lapped to new reinforcing as shown on the Drawings and provided with a minimum of one inch of cover all around and at ends of the bar. The reinforcing shall be thoroughly cleaned of loose particles and dust before incorporating in new materials.

3. Connection Methods

a. Method A. After existing concrete surface at connection has been roughened and cleaned as specified above, thoroughly saturate and maintain saturation for a period of at least 12 hours. Brush on a 1/16-inch layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or group mixture as detailed on the Drawings.

b. Method B. After existing concrete surface has been roughened and cleaned as specified above, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or non-shrink grout to limits shown on the Drawings within time constraints recommended by the manufacturer.

c. Method C for Dowels. Drill hole 1-1/2 times the diameter of the dowel. The drilled hole shall first be filled with non-shrink epoxy grout, then dowels shall be inserted by tapping. These holes shall be blown clear of loose particles and dust prior to installing epoxy. Place new epoxy grout mixture to depth shown on the Drawings.

d. Method D for Dowels. Dowels and anchor bolts shall be set in existing concrete by the use of non-shrink cement grout in drilled holes. The diameter of the drilled hole shall be two inches larger than the diameter of the dowel or anchor bolt. The hole shall be thoroughly cleaned and non-shrink cement grout shall be placed in the bottom of hole. The dowel or anchor bolt is then inserted into place and the remaining void is filled by ramming in non-shrink cement grout. The dowel or anchor bolt shall have a minimum of 3/4-inches of grout between it and the drilled side of the hole. If the surface of the grout is to be exposed, the non-shrink grout shall be discontinued 2-inches from the surface and the remaining void filled with mortar matching the existing concrete as near as practical.

e. Method E. Non-expanding polyester resin/aggregate glass capsule anchor system shall be set in existing concrete by drilling holes to the required depth to develop the full tensile and shear strengths of the anchor material being used. The anchor bolts system shall be installed per the manufacturer's recommendation in holes sized as required. The capsule anchor system shall be equal to Molly Parabond two part stud and capsule system by Emhart, 504 Mt. Laurel Avenue, Temple, PA, or the HVA Adhesive Anchoring System by Ave . Hilti Fastening Systems, Tulsa, OK. The capsule shall consist of a sealed glass capsule containing premeasured amounts of a polyester or vinylester resin, quartz sand aggregate, and a hardener contained in a separate vial within the capsule. The anchor stud bolt, rebar or other

embedment item shall be tipped with a double 45 degree chamfered point, securely fastened into the chuck of a rotary percussion hammer drill, and drilled into the capsule filled hole. The anchor may be installed in horizontal, vertical and overhead positions.

E. Waterstops Set into Existing Concrete

Where waterstops are required to be set into existing concrete, reglets shall be cut as shown on the Drawings. The surface shall be thoroughly cleaned of all debris. The roughened surface shall be kept wet for at least 12 hours in an acceptable manner before pouring new concrete. All free water shall be removed and a layer of cement and water mixed to the consistency of a heavy paste shall be placed to coat the existing concrete. The waterstop shall be bedded in the reglet with non-shrink cement grout prior to placing the new concrete. Where waterstops are called to be placed laying flat against existing concrete, the concrete surface shall be thoroughly cleaned of all debris and the waterstop bonded to the concrete using the epoxy bonding compound specified in Method B above.

F. Where existing reinforcing is exposed due to saw cutting and removal of existing concrete, a coating or surface treatment of epoxy protectant shall be applied to the entire cut surface. The epoxy manufacturer shall submit to the Engineer for review specifications for the epoxy mortar material to be used. The epoxy protectant shall be formulated for the intended application.

3.13 INSTALLATION SCHEDULE

A. Concrete for structures shall have minimum 28 day compressive strength of 4,000 psi unless noted otherwise on the Drawings or in these specifications.

B. Concrete fill and duct encasement shall have a minimum compressive strength at twenty-eight (28) days of 2,500 psi.

C. Concrete for street or roadway pavement replacement shall have a minimum compressive strength at seven (7) days of 4,000 psi.

D. Concrete for sidewalks and miscellaneous slabs shall have a minimum compressive 28 day strength of 3,000 psi.

3.14 FINISHING OF FORMED SURFACES

A. General:

1. After removal of forms, the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the contract documents.

2. When finishing is required to match a small sample furnished to the contractor, the sample finish shall be reproduced on an area at least 100 sq.ft. in an inconspicuous location designated by the architect/engineer before proceeding with the finish in the specified location.

B. As-Cast Finishes:

1. Rough Form Finish - No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4 inch in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

2. Smooth Form Finish - The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other approved material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be

supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

C. Rubbed Finishes:

1. General - The following finishes shall be produced on concrete with a smooth form finish. Where smooth rubbed finish is to be applied, the forms shall have been removed and necessary patching completed as soon after placement as possible without jeopardizing the structure.

2. Smooth Rubbed Finish - Smooth rubbed finish shall be produced on newly hardened concrete no later than the day following form removal. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.

3. Grout Cleaned Finish - No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted. Mix 1 part portland cement and 1½ parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White portland cement shall be substituted for a part of the gray portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means. After the surface whitens from drying (about thirty minutes at normal temperatures), rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

D. Unspecified Finish:

1. General - If the finish is not designated in the contract documents, the following finishes shall be used as applicable.

2. Rough Form Finish - For all concrete surfaces not exposed to public view.

3. Smooth Form Finish - For all concrete surfaces exposed to public view.

E. Related Unformed Surfaces:

1. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

3.15 FINISH OF FLOORS AND SLABS

A. Scratched Finish - After the concrete has been placed, consolidated, struck off, and leveled, the surface shall be roughened with stiff brushes or rakes before final set.

B. Floated Finish - After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating with a hand float or with a bladed power trowel equipped with float shoes, or with a powered disc float shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked with a 10 foot straightedge applied at not less than two different angles. All high spots shall be

cut down and all low spots filled during this procedure. The slab shall then be refloated immediately to a uniform sandy texture.

C. Troweled Finish - The surface shall first be float-finished as specified. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface which is relative free of defects by which may still show some trowel marks. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly Consolidated by the hand troweling operations. The finished surface shall be essentially free of trowel marks and uniform in texture and appearance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

D. Broom or Belt Finish - Immediately after the concrete has received a float finish, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

E. Unspecified Finish:

1. When type of finish is not specified in the contract documents, the following finishes shall be used as applicable:
   a. Scratched Finish - For surfaces intended to receive bonded applied cementitious applications.
   b. Floated Finish - For surfaces intended to receive roofing, waterproofing membranes, or sand bed terrazzo.
   c. Troweled Finish - For floors intended as walking surfaces or for reception of floor coverings.
   d. Broom or Belt Finish - For sidewalks and garage floors and ramps.

3.16 SCHEDULE OF FINISHES

A. Concrete not exposed to view arid not scheduled to receive additional applied finish: Rough Form Finish.

B. Exterior vertical concrete exposed to view: Smooth Rubbed Finish.

C. Interior vertical concrete exposed to view except water containment structures: Smooth Rubbed Finish.

D. Interior vertical concrete in water containment structures: Smooth Form Finish.

E. Interior and exterior underside of concrete exposed to view: Smooth Rubbed Finish.

F. Surface of exterior walkways and miscellaneous slabs: Broom Finish.

0. Surface of water containment slabs which will receive grout topping: Scratched Finish.

H. Interior concrete floors of sludge dewatering building and office/storage building: Troweled Finish with a light broom texture.

3.17 FIELD CONTROL

A. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, ejection or determining the continuation of concrete work.

B. The Contractor shall cooperate in obtaining cores by allowing free access to the Work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. The Contractor shall repair all core

holes. The work of cutting and testing the cores will be at the expense of the Owner, if the cores show that the concrete meets the specified requirements, and at the expense of the Contractor, if the cores show the concrete to be substandard.

3.18 LEAKAGE TESTING OF WATER-RETAINING STRUCTURES

A. The Contractor will be allowed to use plant effluent water for leakage testing and shall make necessary provisions for routing the water for testing from the chlorine contact basin to the structure being tested.

B. Testing shall not begin until the structure has been cleaned, all concrete components have attained full design strength, and in no case less than 14 days after all concrete pouring operations for the structure are complete.

C. Fill structure to maximum operating level and maintain this water surface elevation for a period of 3 days prior to testing. The rate of filling shall be approved by the Engineer.

D. Delay backfilling of the structure until testing is complete.

E. Water-Retaining Structures are considered acceptable if:

1. There are no visible leakage or visible damp areas.
2. The volume of leakage rate does not exceed 0.1 percent of tank volume in any 24 hour period.

F. Structures which fail the leakage test shall be repaired as approved by the Engineer prior to retesting. Repairs and retesting shall be at no additional cost to the Owner.

END OF SECTION

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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to finish cast-in-place concrete surfaces as specified herein.

1.02 RELATED SECTIONS

A. Section 03100 – Concrete Formwork

B. Section 03200 – Concrete Reinforcement

C. Section 03250 – Concrete Accessories

D. Section 03300 – Cast-In-Place Concrete

1.03 REFERENCED STANDARDS

A. ACI 301 – Structural Concrete for Building

B. ACI 318 – Building Code Requirements for Concrete

1.04 SCHEDULE OF FINISHES

A. Concrete for the project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another section.

B. The base concrete for the following conditions shall be finished as noted and as further specified herein:

1. Concrete to receive dampproofing - Off-form finish, See Article 3.01.D.

2. Concrete where not exposed in the finished work and not scheduled to receive an additional applied finish or material - Off-form finish. See Article 3.01.D.

3. Exposed exterior vertical concrete including above grade tank walls and beams - Rubbed finish. See Article 3.01.E.

4. Interior or exterior horizontal concrete not requiring floor hardener or sealer - Floated finish. See Article 3.02.A.

5. Concrete for exterior walks, interior and exterior stairs - Broomed finish perpendicular to direction of traffic. See Article 3.02.B.

6. Concrete on which process liquids flow or in contact with sludge - Steel trowel finish. See Article 3.02.C.

7. Concrete to receive roofing Steel trowel finish. See Article 3.02.C.

8. Concrete to receive hardener - Wood float finish, non-slip. See Article 3.02.D.

9. Interior horizontal concrete to receive floor sealer - Wood float finish. See Article 3.02.E.

10. Streets and Roadway pavement concrete to receive a drag finish in accordance with LADOTD specifications, Section 601.11, Paragraph G.

1.05 RESPONSIBILITY FOR CHANGING FINISHES

A. The surface finishes specified for concrete to receive additional applied finishes or materials are the finishes required for the proper application of the actual products specified. Where, different products are approved for use, it shall be the Contractor's responsibility to determine if changes in finishes are required and to provide the proper finishes to receive these products.

B. Changes in finishes made to accommodate products different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for acceptance.

1.06 MANUFACTURER'S SUPERVISION

The manufacturer of curing compound, sealer or hardener shall make available at no extra cost, upon 72 hours notification, the services of a qualified field representative to make clear to the user the application of the product under prevailing job conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

Floor hardener shall be Frictex H aluminum oxide abrasive aggregate by Sonneborn, Minneapolis, Minnesota or equal as accepted by the Engineer. Floor sealer shall be Kure-N-Seal, acrylic-based, transparent polymer by Sonneborn, Minneapolis, Minnesota or approved equal by W.R. Grace or others.

PART 3 - EXECUTION

3.01 FORMED SURFACES

A. Forms shall not be removed before the requirements of Section 03300, Article 3.09.A have been met.

B. Care shall be exercised to prevent damaging edges or obliterating the lines of chambers, rustications or corners when removing the forms or doing any other work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Engineer.

D. Concrete to receive dampproofing, tank interiors, and concrete not exposed in the finished work shall have off-form finish with fins and other projections removed and tie cones and defects filled as specified under Section 03300.

E. Rubbed Finish

1. Immediately upon stripping forms and before concrete has changed in color, all fins shall be carefully removed with a hammer. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete; avoid coating large areas of the finished surface with this slurry.

2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout consisting of one part by volume cement to 1-1/2 parts by volume of clean masonry sand having a fineness modules of approximately 225 and complying with the gradation requirements of the ASTM C-404. Grout shall be

uniformly applied by means of damp (neither dripping wet nor dry) pads of coarse burlap approximately, 6-inch square, used as a float. Grout shall be well scrubbed into the pits and air holes to provide a dense mortar in the imperfections to be patched.

3. Allow the mortar to partially harden for one or two hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray. when the grout has hardened sufficiently so it can be scraped from the surface with the perpendicular edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. Grout allowed to remain on the wall too long will get too hard and will be difficult to remove.

4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout should remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cut with the trowel so it can be wiped off clean with the burlap.

5. On the day following the repair of pits, air holes and blemishes, the walls again shall be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, such is present, a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without working up a lather or mortar or change the texture of the concrete.

6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation in order that no extraneous materials remain on the surface of the wall. The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least three (3) days after the application of the repair grout.

3.02 FLOORS AND SLABS (EXCEPTING STREET PAVEMENT)

A. Floated Finish:

1. Machine Floating:

Screed floors and slabs with straightedges to the established grades shown on the plans. Immediately after final screening, a dry cement/sand shake in the proportion of two (2) sacks of Portland cement to 350 pounds of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 pounds per 1,000 square feet of floor. Neat, dry cement shall not be sprinkled on the surface. When the concrete has hardened sufficiently to support the weight of the power float used without digging in or disrupting the level surface, the shake shall be thoroughly floated into the surface with a heavy revolving disc type power compacting machine capable of providing a 200 pound compaction force distributed over a 24-inch diameter disc. This compacting machine shall be the "Kelly Power Float with Compaction Control" as manufactured by Kelley Industries of SSP Construction Equipment, Inc.; P.O. Box 2038, Pomona, CA 91766; (714) 623-6184, or equal acceptable to the Engineer. Troweling machines equipped with float (shoe) blades that are slipped over the trowel blades may be used for floating. Floating with a troweling machine equipped with normal trowel blades shall not be permitted. The use of any floating or troweling machine which has a water attachment for wetting the concrete surface during finishing of a floor shall act as a mild abrasive. After this treatment, there shall be no not be permitted. Floating should start along walls and around columns and then move systematically across the surface leaving a matte finish.

NOTE: This operation (application of the cement/sand shake) may be eliminated at the discretion of the Engineer if the base slab concrete exhibits adequate fattiness and homogeneity, and the need is not indicated.

2. Hand Floating:

In lieu of power floating, small areas as defined by the Engineer may be compacted by hand floating. The dry cement/sand shake specified in Subparagraph 1 above shall be used unless eliminated by the Engineer. Screed the floors and slabs with straightedges to the established grades shown on the plans. While the concrete is still green, but sufficiently hardened to support a finisher and kneeboards with no more than 1/4-inch indentation, wood float to a true, even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface.

3. Finishing Tolerances:

Floors and slabs shall be level with a tolerance of 1/8-inch when checked with a 10-foot straightedge placed anywhere on the slab in any direction, except where drains occur, in which case floors shall be pitched to drains such that there are no high spots left undrained. Failure to meet either of the above requirements shall be cause for removal, grinding, or other correction as directed by the Engineer.

B. Broom Finish:

Finish concrete as specified in Article 3.02A and, if required, 3.02D. Then draw a stiff bristle broom lightly across the surface in the direction of drainage, or in the case of walks and stairs, perpendicular to the direction of traffic to provide a non-slip surface.

C. Steel Trowel Finish:

Finish concrete as specified in Article 3.02A and, if required, 3.02D. Then hand steel trowel to a smooth hard even finish free from high or low spots or other defects.

3.03 STREET AND ROTARY PAVEMENT SLABS

Final strike-off, consolidation and finishing of street and roadway pavement slabs shall be performed in accordance with LADOTD specifications, Section 601.11.

3.04 APPROVAL OF FINISHES

A. All concrete surfaces, when finished, will be inspected by the Engineer.

B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked until accepted by the Engineer.

C. After finishing horizontal surfaces, regardless of the finishing procedure specified, the concrete shall be cured in accordance with Section 03300, unless otherwise directed by the Engineer.

END OF SECTION

DIVISION 5

METALS

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish, fabricate, mark for erection identification, pack crate or otherwise properly prepare for shipment, ship to the site and erect all structural steel indicated on the Drawings, described in these Specifications, or otherwise required for proper completion of the Work.

B. Structural steel shall include but not limited to structural steel framing members, structural steel support members with required bracing, welds, and fasteners, base plates, and anchor bolts.

1.02 RELATED SECTIONS

A. Section 05500 - Metal Fabrications

B. Section 05590 – Miscellaneous Metals

C. Section 09900 - Painting

1.03 QUALITY ASURANCE

A. Standards: Comply with the provisions of the following standards:

1. The American Institute of Steel Construction, Inc.'s (AISC) Manual of Steel Construction, latest edition, including all specifications and codes.

2. The American Welding Society's (AWS) D1.1 "Structural Welding Code."

3. The American Society for Testing and Materials (ASTM) Standards.

B. Qualifications Of Welders: Qualify all welding processes and welding operators in accordance with AWS "Standard Qualification Procedures".

1.04 REFERENCE STANDARDS

A. ASTM A36 – Structural Steel.

B. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

C. ASTM A123 – Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.

D. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A307 – Carbon Steel Externally Threaded Standard Fasteners.

F. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. ASTM A588 – High Strength Low Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 in. Thick.

I. AWS D1.1 – Structural Welding Code.

J. AISC – Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

1.05 SUBMITTALS

A. General: Comply with provisions of Section 01340.

B. Shop Drawings

1. Submit shop drawings showing complete details and schedules for fabrication and shop assembly of members including stair structures and above ground piping supports. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by AWS symbols, and show size, length, and type of weld. Indicate profiles, sizes, spacing, and locations of structural members, connections and attachments. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages. Identify details by reference to sheet and detail number of the Drawings.

2. Prepare shop drawings under the close supervision of a structural engineer, licensed to do business in the State of Louisiana. Along with the submittal of shop drawing enclose a letter signed by the Engineer, that this provision has been complied with.

1.06 PRODUCT HANDLING

A. Delivery and Storage: Deliver all materials to the jobsite properly marked to identify the structure for which it is intended. Markings shall correspond to marking indicated on the Shop Drawings. Keep steel off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary for acceptance by the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rolled Steel Plates and Bars: Comply with ASTM A 36.

B. Cold Formed Steel Tubing: Comply with ASTM A 500, Grade B, with a minimum yield stress of 46,000 psi.

C. Steel Pipe: Comply with ASTM A 53, Type E or S, Grade B.

D. Round Tubing, Exposed To View: Comply with ASTM A 500, Grade C, with a minimum yield stress of 46,000 psi.

E. Anchor Bolts and Nuts: Comply with ASTM A 307, nonheaded type with heavy hexagonal nuts unless otherwise indicated.

F. Unfinished Threaded Fasteners: Comply with ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide either hexagonal or square heads or nuts, except use only hexagonal units for exposed connections.

G. Electrodes For Field Welding: Comply with AWS Code, using series and type of electrodes recommended.

H. Structural Steel Primer Paint: Furnish fabricator's standard iron oxide primer paint.

I. Non-metallic, Non-shrink Grout: Provide pre-mixed, non-metallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, placticizing and water reducing agents.

Comply with Corps of Engineers Specification GRD C 588.

2.02 FABRICATION

A. Shop Fabrication And Assembly

1. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the approved Shop Drawings. Provide camber in structural members, as required.

2. Properly mark and match-mark materials for field assembly and for identification as to location in the structure. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

3. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in the final structure free of markings, burrs and other defects.

B. Connections

1. Provide all bolts and washers of all types and sizes as required for the completion of all field erection.

2. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welded work.

3. Assembly and weld built-up sections by methods which will produce true alignment of axes without warp.

C. Holes For Other Work

1. Provide holes required for securing other work to structural steel framing, and for the passage of other work through steel framing members, as shown on the final Shop Drawings. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing places.

D. Anchor Bolts: Provide anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

E. Bases and bearing plates shall be shop welded to columns and members attached to concrete and masonry, unless otherwise indicated.

F. Splicing: Splice members only where indicated unless, with the Architects' approval, splices not indicated would result in lower costs due to reduced shipping costs. Submit structural calculations, signed by a structural engineer licensed where the fabricator is located, for all splices not indicated.

G. Gas-cutting: Do not use gas cutting torches for correcting fabrication errors in the structural framing. Cutting will be permitted only on secondary members as acceptable to the Engineer. Finish gas-cut sections equal to a sheared appearance when gas cutting is permitted.

2.03 SHOP PAINTING

A. General:

1. Clean, prepare, shop prime and paint structural steel work as required in Section 09900, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed, on the exposed portions and the initial 2 inches of embedded areas only.

2. Do not paint surfaces which are to be welded.

3. Apply two coats of paint over primer coat to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and splatter, slag, and flux deposits. Clean steel in accordance with the Steel Structures Painting Council recommendations.

C. Painting: Immediately after surface preparation, apply structural steel primer in accordance with the manufacturer's recommendations and at a rate to achieve a dry film thickness between 2.0 mils and 3.5 mils. Use painting methods which will result in full coverage of all joints, corners, edges, and all exposed surfaces.

D. Galvanize bolts, nuts, washers and steel hardware in accordance with ASTM A153 as required.

E. Galvanize structural steel members, fabrications and assemblies in accordance with ASTM A123.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions of the work of this Section. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until satisfactory conditions have been corrected.

3.02 ERECTION

A. General: Comply with AISC Specifications and Code of Standard Practice, and as specified herein.

B. Surveys: Establish permanent bench marks necessary for the accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar items, before erection proceeds.

C. Temporary Shoring And Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads, including wind. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds. Remove temporary connections and members when permanent members are in place and final connections are made.

D. Anchor bolts: Install anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices as needed for the presetting of bolts and other anchors to accurate locations.

E. Setting Bases And Bearing Plates:

1. Clean concrete and masonry bearing surfaces free from bond-reducing materials, and then roughen to improve bond to surface. Clean the bottom surface of base and bearing plates.

2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

3. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.

4. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's instructions.

F. Field Assembly:

1. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of the structure before fastening permanently.

2. Before assembly clean the bearing surfaces and other surfaces which will be in permanent contact.

3. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

4. Level and plumb individual members of the structure within specified AISC tolerances. Establish required leveling and plumbing measurements on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.

5. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.

G. Gas Cutting: Do not use gas cutting torches in the field for correcting fabricating errors in the structural framing. Cutting will be permitted only on secondary members which are not under stress, and with written approval by Engineer. When gas-cutting is permitted, finish the sections equal to the sheared appearance.

H. Welded Construction: Comply with the AWS Code for procedures, appearance, and quality of welds, and for methods used in correcting welded work. Assemble and weld built-up sections by methods which will product true alignment of axes without warp.

I. Hole For Other Work: Where holes are required in addition to those provided, provide all such holes and strengthen the area as required. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates as required.

3.03 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections and abraded areas of the shop paint, and paint all exposed areas with the same materials as used for shop painting. Apply by brush or spay to provide a minimum dry-film thickness of 2.0 mils.

END OF SECTION

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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Work consists of furnishing all labor, material and equipment for all miscellaneous metal and metal fabrications, complete, in place, as shown on the Drawings, specified herein, or needed for a complete and proper installation and not specifically called for under other Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Standards: Comply with the provisions of the following standards:

1. American Welding Society (AWS) "Structural Welding Code".

2. American Iron and Steel Institute's "Specification for the Design of Cold-Formed Steel Structural Members".

3. American Institute of Steel Construction (AISC) (latest edition for all specifications and codes) "Specification for Architecturally Exposed Structural Steel."

4. American Society for Testing and Materials (ASTM).

5. Steel Structures Painting Council (SSPC).

6. The Aluminum Association - "Specifications For Aluminum Structures"

B. Welding: Perform all shop and field welding required in connection with the work of this Section, adhering strictly to the current pertinent recommendations of the American Welding Society.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01340.

B. Submit product data including the following:

1. Complete materials list of all items proposed to be furnished and installed under this Section.

2. Shop Drawings of all items proposed to be furnished and installed under this Section. Include plans, sections, elevations, and details as needed including welded connections using standards AWS welding symbols; indicate net weld lengths.

3. Templates for anchor bolt installations by other trades.

C. Shop Drawings

1. Submit shop drawings showing complete details and schedules for fabrication and shop assembly of members. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by AWS symbols, and show size, length, and type of weld. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages. Identify details by reference to sheet and detail number of the Drawings.

2. Prepare shop drawings under the close supervision of a structural engineer, licensed to do business in the State of Louisiana. Along with the submittal of shop drawing enclose a letter signed by the

Engineer, that this provision has been complied with.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the Work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary for acceptance by the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Metal Surfaces, General: For fabrication of the work of this Section which will be exposed to view, use only those materials which are smooth and free from surface blemishes including pitting, seam marks, rollers marks, rolled trade names, and roughness.

B. Standards: All materials shall comply with the following standards:

1. Steel plates, shapes and bars: ASTM A 36.

2. Steel plates to be bent or cold formed: ASTM A 283, Grade C.

3. Steel Tubing, hot-formed, welded or seamless: ASTM A 501.

4. Cold Formed Steel Tubing: Comply with ASTM A 500, Grade B, with a minimum yield stress of 46,000 psi.

5. Steel Bars And Bar-size Shapes: ASTM A 663, Grade 65 or ASTM A 36.

6. Cold-Finished Steel Bars: ASTM A 108, grade as selected by fabricator.

7. Cold-Rolled Carbon Steel Sheets: ASTM A 366.

8. Galvanized Carbon Steel Sheets: ASTM A 526, with ASTM A 525, G90 Zinc Coating.

9. Gary Iron Casting: ASTM A 48, Class 30.

10. Malleable Iron Castings: ASTM A 47, grade as selected by the fabricator.

11. Steel Pipe: ASTM A 53, type as selected, black finish unless galvanizing is required, standard weight (Schedule 40) unless otherwise indicated.

12. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron, ASTM A 47 or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dipped galvanized, ASTM A 153.

13. Nonshrink Nonferrous Grout: CE CRD C588.

14. Aluminum Gratings: ASTM B 308 Type 6061 T6.

15. Stainless Steel Grating: Type 304 AISI.

16. Round Tubing, Exposed To View: Comply with ASTM A 500, Grade C, with a minimum yield stress of 46,000 psi.

17. Anchor Bolts: Comply with ASTM A 307, nonheaded type with heavy hexagonal nuts unless otherwise indicated.

18. Aluminum Tubing, Shapes and Sheeting - ASTM B209, B210, B211, B221, B241, B247, B308 and B429. Also refer to the Aluminum Association Specification For Aluminum Structures.

2.02 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use and where built into exterior walls. Select fasteners for the type, grade and class required.

B. Standards: All fasteners shall comply with the following:

1. Bolts And Nuts: Regular hexagon-headed type, ASTM A 307, Grade A.

2. Lag Bolts: Square-headed type, Fed. Spec. FF-B-561.

3. Machine Screws: Cadmium plated steel, Fed. Spec. FF-S-92.

4. Wood Screws: Flat-headed carbon steel, Fed. Spec. FF-S-111.

5. Plain Washers: Round, carbon steel, Fed. Spec. FF-W-92.

6. Masonry Anchorage Devices: Expansion shields, Fed. Spec. FF-S-325.

7. Toggle Bolts: Tumble-wing type, Fed. Spec. FF-B-588, type, class and style as required.

8. Lock Washers: Helical spring type carbon steel, Fed. Spec. FF-W-84.

2.03 PAINT

A. Metal primer pain shall be as specified in Section 09900.

B. Galvanizing Repair Paint: Use a high zinc dust content paint for regalvanizing welds in galvanized steel, complying with MIL SPEC MIL-P-21035.

2.04 FABRICATION

A. Workmanship

1. Use materials of the type, size and thickness shown or, if not shown, of required type, size and thickness to produce strength and durability in the finished product.

2. Work to dimensions shown or accepted on the Shop Drawings, using proven details of fabrication and support. Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges.

3. East the exposed edges to a radius of approximately 1/32-inch unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

4. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush and match and blend with adjoining surfaces.

5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, use Phillips flat-head (countersunk) screws or bolts.

6. Provide for anchorage of the type shown. Coordinate with supporting structure. Fabricate and space the anchoring devices to provide adequate support for intended use.

7. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strip 1/8-inch thick and heavier.

3. ASTM A 386 for galvanizing assembled steel products.

C. Shop Painting

1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, or surfaces and edges to be field welded, or galvanized surfaces.

2. Remove scale, rust, oil, grease and other deleterious materials before applying shop primer. Immediately after surface preparation, brush or spray on primer in accordance with the manufacturer's recommendations, and at a rate to provide the recommended dry film thickness. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

2.05 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware: Provide bent bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring and securing woodwork to concrete and other structures. Manufacture or fabricate items of sizes, shapes and dimensions required.

B. Loose Bearing And Leveling Plates

1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.

2. Drill plates to receive anchor bolts and otherwise equip plates with integrally welded anchors for casting into concrete or building into masonry, and furnish inserts if plates must be installed aster concrete or masonry is placed.

C. Miscellaneous Framing And Supports

1. Provide miscellaneous steel framing and supports which are not part of structural steel framework, as required to complete the work.

2. Fabricate miscellaneous units to sizes, shapes and profiles shown; or, if not shown, fabricate of required dimensions to receive adjacent other work to be retained by the framing. Fabricate the miscellaneous units from structural steel shapes, plates, and steel bars of welded construction with mitered joints and field connections, unless otherwise shown.

3. Cut, drill, and tap units to receive hardware. Equip units with integrally welded anchors for casting into concrete or building into masonry, and furnish inserts if units must be installed after concrete is placed.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed, and correct conditions detrimental to the proper and timely completion of the work.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION

A. Setting Loose Plates

1. Cast plates in place where required or, where plates are to be set and leveled, clean concrete bearing surfaces free from bond-reducing materials and roughen to improve bond to surfaces . Clean the bottom surface of bearing plates, as well.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices.

3. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims; but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

B. Fastening To In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

C. Cutting, Fitting, And Placement

1. Perform cutting, drilling, and fittings required for installation of miscellaneous metal fabrications.

2. Set work accurately in location, alignment, and elevation, and make plumb, level, true, and free from rack, as measured from established lines and levels.

3. Provide temporary bracing or anchors in formwork for items which are to built into concrete or similar construction.

4. Fit exposed connections accurately together to form tight hairline joints.

5. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

6. Grind exposed joints smooth, and touch up shop paint coat. Do not weld, cut or abrade the surface of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of weld made, and methods in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same materials as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.

3.04 PROTECTION OF ALUMINUM

A. Aluminum In Contact With Masonry Materials:

1. Paint aluminum surfaces in contact with lime mortar, concrete or other masonry material with paint system as specified in Section 09900.

B. Aluminum In Contact With Dissimilar Metals:

1. Where aluminum surfaces are in contact with metals other than stainless steel zinc or small areas of white bronze keep aluminum surfaces from direct contact with incompatible metals by any of the following methods:

   a. Paint the dissimilar metal as specified in Section 09900.

   b. Apply a good quality caulking material between the aluminum and the dissimilar metal.

   c. Use a non-absorptive tape or gasket.

2. Dissimilar metals shall be coated when used in locations where drainage from them passes over aluminum.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install covers, grates, frames, catch basin castings, and other miscellaneous metals as shown on the Drawings and specified herein. The miscellaneous metal items include but are not limited to the following:

1. All metal frames, ladders, stair rails, floor opening frames including gratings, and supports.
2. Pre-fabricated access hatches and frames.
3. Anchors or anchor bolts except those specified to be furnished with all equipment.
4. Handrails, posts, and supports.
5. Cast iron frames, covers, grates, drain leaders, and drains.
6. Structural steel for hoist and steel beam supports.
7. Drain leaders.
8. Stair nosings, steel plates, angle frames, plates, and miscellaneous angles and channels as shown on the Drawings.

1.02 COORDINATION

A. The work of this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.03 SUBMITTALS

A. Shop drawings, working drawings and product data, as provided for in Section 01340, showing at least sizes of members, method of assembly, materials, anchorage, and connection to other members shall be submitted to the Engineer for review before fabrication.

B. Submit drawings and data for column covers including details, gaskets, fasteners, thickeners, dimensions and any other pertinent descriptive literature.

C. Submit two (2) samples of column material of sufficient size to indicate connection and gasketing detail along with the finish.

D. Submit complete operation and maintenance data for the floor and roadway hatches.

1.04 FIELD MEASUREMENTS

Field measurements shall be taken at the site to verify or supplement indicated dimensions and to ensure proper fitting of all items.

1.05 REFERENCE SPECIFICATIONS

A. Aluminum Association

1. AA 5052 Aluminum Sheet and Plate, Rolled Rod and Bar and Drawn Tube.

2. AA 6061 T6 Aluminum Sheet and Plate.

3. AA 6063 T5 Aluminum Extruded Shapes.

4. AA 6063 T6 Aluminum Extruded Pipe.

5. AA M31 C22 A41

   a. M31 Mechanical Finish, Fine Satin

   b. C22 Chemical Finish, Medium Matte

   c. A41 Clear Anodic coating, Class 1

B. American National Standards Institute (ANSI)

ANSI A14.3 Safety Requirement for Fixed Ladders

C. American Society for Testing and Materials (ASTM)

1. ASTM A36 Specification for Structural Steel

2. ASTM A48 Specification for Gray Iron Castings, Class 30

3. ASTM A53 Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless

4. ASTM A123 Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

5. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

6. ASTM A307 Specification for Carbon Steel Externally Threaded Standard Fasteners.

7. ASTM A325 Specification for High-Strength Bolts for Structural Steel Joints.

8. ASTM A386 Specification for Zinc-Coated (Hot-Dip) on Assembled Steel Products.

9. ASTM A446 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

10. ASTM A525 Specifications for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.

11. ASTM A611 Specification for Steel, Cold-Rolled Sheet, Carbon, Structural.

12. ASTM B209 Specification for Aluminum-Alloy Sheet and Plate, Alloy 6061, T-6.

13. ASTM B221 Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Alloy 6063, T-5.

14. ASTM B429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube, Alloy 6063, T-6.

D. American Iron and Steel Institute (AISI)

1. AISI, Type 302 Stainless Steel Bolts, Bars and Shapes.

2. AISI, Type 304 and 316 Stainless Steel Plate and Sheet.

E. American Welding Society (AWS)

AWS Specification for Arc Welding (Type E70XX) Welding Rods for Steel

F. Occupational Safety and Health Standards

PART 2 - PRODUCTS

2.01 ANCHORS, BOLTS, AND FASTENING DEVICES

A. Anchors, bolts, etc. shall be furnished as necessary for installation of the work of this Section.

B. Compound masonry anchors shall be of the type shown or required and shall be equal to Star Slugin compounded masonry anchors manufactured by Star Expansion Industries, equal by Phillips Drill Co., Rahlplug, or equal. Anchors shall be minimum "two unit" type.

C. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Aluminum and stainless steel shall be attached to concrete or masonry by means of stainless steel machine bolts and iron or steel shall be attached with steel machine bolts unless otherwise specifically noted.

D. For structural purposes, unless otherwise noted, expansion bolts shall be Phillips Drill Co. "Wedge Anchors," Hilti AKwik-Bolt," or equal. When length of bolt is not called for on the Drawings, the length of bolt provided shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the reinforcing steel within the concrete. Material shall be as noted on the Drawings. If not noted, provide in galvanized steel. Bolts shall be supplied with nuts, flat washers, and lock washers as required and shall be of the same material as the bolt.

E. Bolts and nuts shall conform to Federal Specification FF-B-575. Bolts and nuts shall be hexagon type. Stainless steel bolts, nuts, screws, washers, and related appurtenances shall be equal to AISI Type 302. All exposed portions of anchor bolts installed in concrete shall be greased, wrapped in burlap or plastic sleeve, and tied.

F. Toggle bolts shall be Diamond, Keystone, Star, or equal.

2.02 ALUMINUM ITEMS

A. Aluminum grating shall be of the depths and thickness shown on Drawings and shall be Borden Metal Products Co.; IKG Industries; or equal. All openings 2-inches and greater in diameter shall be banded with a bar of the same depth and thickness as the main bearing bars of the grating. Each cut bar shall be welded to the band. The ends of all grating sections shall be likewise banded. Clamps and bolts used for attaching grating to supporting member shall be stainless steel. All grating shall be clamped unless noted otherwise. Clamps shall be as recommended by the manufacturer.

B. Provide aluminum grating meeting the following requirements:

1. Bearing Bar: Extruded I-shape.
2. Pattern: rectangular.
3. Maximum spacing of bearing bars: 1-3/16 inches.
4. Maximum cross bar spacing: 4 inches
5. Load design: ANSI/NAAMH A202.1
6. Live Load: 100 lbs/square ft. minimum
7. Deflection under live load: Maximum ¼ inch
8. Top surface to be striated for non-slip footing

9. Removable with removable stainless steel fasteners.
10. Anodize after fabrication.

C. Aluminum stair treads shall be as specified above for grating and shall have abrasive, non-slip nosing.

D. Aluminum ladders shall be fabricated as detailed and installed as shown on the Drawings. Aluminum ships ladder shall have deeply serrated rungs no less than 1-¼" high and 4-1/8" deep, tread spacing shall be 1 ft. on center. Handrails shall be aluminum pipe no less than 1½" diameter (Schedule 40 for rails and Schedule 80 for posts).

E. Handrailings

1. Handrailings shall be a 1-1/2-inch inside diameter, welded, Schedule 40 aluminum pipe for rails and Schedule 80 aluminum pipe for posts with a floating panel screen as detailed on the Drawings.

2. Welds shall be circumferential ground smooth and even to produce a railing that is neat in appearance and structurally sound as approved. After welding, aluminum shall be anodized in clear satin finish that complies with Aluminum Association Designation M31 C21 A41.

3. Form bends to the dimensions shown for the angles required by the project conditions. No distortion of the circular railing shape will be allowed.

4. Spacing of posts shall be as approved on shop drawings, but in all cases, shall be uniform and shall be placed as shown or at 6 feet 0 inches O.C. maximum. Shorter spacing shall be used where required to maintain the maximum spacing and where indicated on the elevations to follow a pattern.

5. Floating panel shall be fabricated from 2-inch square press crimped 1/4-inch thick aluminum with a 1-inch by 2-inch by 1/3-inch thick framing channel. The finish on all the components of the floating panel shall be the same clear anodized aluminum as the pipe railing portion of the handrail. The frame shall be attached to the pipe rail with screws or by other fasteners that insure rigid construction. Fastening shall be on all edges of the screen and shall be as inconspicuous as possible. The screen and frame shall be manufactured by Kentucky Metal Products Company, Miller Wire Works, or equal.

6. Toeplates where shown on the Drawings or required by OSHA shall be fabricated and installed. Aluminum safety gate at handrailing openings where required shall be fabricated of matching pipe with approved spring hinges, stop and latch. Gate width shall be 3 feet 0 inches or as required by equipment.

7. All handrailings shall be erected to line and plumb. Field splicing and expansion compensation shall be accomplished using internal splice sleeves, welded one end and set screw fastened one end or where shown on the Drawings rivet fastened. Make provisions for removable railing sections as detailed and where shown on the Drawings.

8. Where handrailing is top mounted in concrete, the posts shall be set into sleeves of same material as handrailing and firmly grouted with Portland cement grout. Post collars shall be placed on the posts and fastened in place as detailed on approved shop drawings.

9. Where handrailing is supported from structural members, the connection shall be as detailed on the Drawings or shall be of approved sockets, flanges and brackets, or another approved means which will provide neat and substantial support.

10. All handrailing shall be properly protected by paper, or by an approved coating or by both against scratching, splashes of mortar, paint, or other defacements during transportation and erection and until adjacent work by other trades has been completed.

F. Elastomeric Expansion Joint Seals

1. Elastomeric joint seals shall be Elastolum Type ELV by Construction Specialists, equal by MM

Systems Corp. or equal.

2. Elastomeric material shall be factory bonded to aluminum side retainer frames of the configurations shown. Bonding surfaces for elastomeric material shall be toothed along entire length to increase bond strength. Provide all factory fabricated intersections and corners required by job conditions. Elastomeric material shall have a minimum depth of 2-inch and a minimum Shore A durometer of 18 and a maximum of 25.

3. Field joints shall be located at a maximum spacing of twenty (20) feet and as shown on the approved shop drawings. The Contractor shall provide a field joint sealer approved by the Engineer.

4. Color of elastomeric material shall be black.

5. Aluminum side retainer frames where in contact with concrete and masonry shall be factory coated with zinc chromate primer.

6. Provide masonry anchors and stainless steel fasteners as approved for securing aluminum frames into recesses in structural concrete as required at 24-inches on center.

7. Grout shall be non-ferric, non-shrink type equal to Master Builders Masterflow 713, Euclid Chemical Co. N-S Grout or equal.

G. Prefabricated Aluminum Hatches:

1. Prefabricated aluminum hatches shall be Type "J" or "JD" as manufactured by Bilco Co.; Halliday Products; or equal and sized as required. Hatches with either dimension over 3 feet 6 inches shall be double leaf type. Hatch doors shall be 1/4-inch aluminum diamond pattern plate designed to withstand a live load of 300 pounds per square foot. Channel frame shall be 1/4-inch aluminum with anchor flange all around the perimeter. Hatch shall be equipped with heavy duty hinges. Stainless steel pins, spring operators, and an automatic hold-open arm with release handle. A snap lock with removable handle shall be provided. Each individual hatch shall also be furnished with a removable threaded aluminum plug to seal the lock aperture. Special fabrications, if required to meet specific installation conditions, shall be provided by the Contractor at no additional cost. Hatch hinges shall be welded to the hatch assembly.

2. It will be required that the opening dimension be with the hatches opened at 90^0 upright, openings will not be considered enlarged by having to dismantle any portion of the operating mechanisms. Hatch clear openings shall provide a minimum 2-inch clearance on all sides for removal of equipment.

3. It will be required that all parts be welded including, but not limited to, hinges and all stiffening angles. All mechanisms housing springs and releases will be installed in housings similar to "Bilco" or "Halliday" or approved equal.

H. Checkerplate aluminum cover plates shall be fabricated to the details shown and installed at the locations shown.

I. Column covers shall be fabricated from two sheets of aluminum, sandwiching a core of extruded thermoplastic, formed in a continuous process, with no glues or adhesives between dissimilar materials. Aluminum shall be AA5205 alloy, .52 mm (0.020 inch) thick with a clear, integral coating AA-C22-41. Total composite panel shall be 3-mm (0.118-inch) thick. Deviation from vertical alignment shall be no more than 1/4-inch in twenty (20) feet. Panel bow shall not be more than 0.8 percent of the panel dimension in width and length. Panel lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle. Fasteners shall all be concealed and non-corrosive. Panels shall be circular and as detailed on the drawings and reinforced for exterior use. Panels shall be Alucobond by Consolidated Aluminum, Pittcon Industries, Inc., or equal.

J. Aluminum nosing at concrete stairs shall be 4 inches wide by 5/16 inch thick with abrasive cross hatch surface and a ¼ inch nose lip equal to Wooster Products, Inc., Alumogrit Treads, Type 116 x 4-inch wide; equal by Barry Pattern and Foundry Co.; Andco; or equal. Furnish with wing type anchors and flat head stainless steel

machine screws, 12-inch O.C. maximum. Nosing shall extend to within three (3) inches at each side of the stair.

K. Aluminum ladders shall be fabricated as detailed and installed as shown in accordance with ANSI A14.3. Side rails shall be fabricated from 3/8-inch by 2-1/2 inch continuous extruded flat bars, spaced a minimum 18-inches apart. Rungs shall be fabricated from extruded shapes with a serrated tread, number A5680 by Washington Aluminum Company or equal. Ladders shall be manufactured to comply with all safety codes which apply in the location.

L. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames for hatches, beams, grates, etc. shall be furnished complete with welded strap anchors attached. Furnish all miscellaneous aluminum shown but not otherwise specified herein.

2.03 STEEL ITEMS

A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the Drawings. All pipe sleeves shall have center anchor around circumference as shown.

B. All miscellaneous lintels and closures required, but not specifically shown on the Drawings, shall be galvanized steel and shall be provided as a part of this Section sized as required for strength and coverage.

C. Miscellaneous steel pipe for sleeves and lifting attachments and other uses as required including concrete filled galvanized steel bollards shall be Schedule 40 pipe fabricated according to details as shown on the Drawings.

D. Miscellaneous steel shall be fabricated and installed as required and in accordance with the Drawings and shall include miscellaneous angles, support brackets, anchor bolts (except for equipment furnished in Division 15); lintels coped-back 3/4-inch where they bear on masonry; checkerplates; bar racks; and any other miscellaneous steel called for on the Drawings and not otherwise specified.

2.04 CAST IRON FRAMES AND COVERS

A. Frames, covers, and grates for manholes, catch basins and inlets and emergency pump out manholes shall be of a good quality, strong, tough even grained cast iron except as otherwise specified below. Castings shall be as manufactured by Vulcan Foundry, or equal. Sizes shall be as shown on the Drawings. Covers to have letters "SEWER" or "DRAIN", as applicable, embossed on top.

B. Provide solid manhole and handhole covers and frames for electrical and telephone underground systems. (Covers to have letters "HIGH VOLTAGE", "LOW VOLTAGE", "SIGNAL", "TELEPHONE", as applicable, embossed on top.)

PART 3 - EXECUTION

3.01 FABRICATION

A. All miscellaneous metal work shall be formed true to detail with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.

B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.

D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the AWS and shall only be done where shown, specified, or permitted by the Engineer. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the

requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

E. Welding of aluminum work shall be on the unexposed side as much as possible in order to prevent pitting or discoloration.

F. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard mill finish. Aluminum handrails shall be given an anodic oxide treatment in accordance with the Aluminum Association Specification AA-C22-A41. A coating of methacrylate lacquer shall be applied to all aluminum before shipment from the factory.

G. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication, but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces. Abrasions in the field shall be touched up with primer immediately after erection. Shop and final painting is specified in Section 09900.

H. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc according to ASTM A525. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the batch until their temperature becomes the same as the bath. Coating shall be not less than 2 oz. per square foot of surface.

I. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damaged area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint conforming to the requirements of Military Specifications MIL-P-15145. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight.

J. Castings shall be of good quality, strong, tough, even-grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field by the Engineer. All finished surfaces shown on the Drawings and/or specified shall be machined to a true plane surface, and shall be true and seat at all points without rocking. Allowances shall be made in the patters so that the thickness specified or shown shall not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than ninety-five percent (95%) of the theoretical weight computed from the dimensions shown. The Contractor shall provide facilities for weighing castings in the presence of the Engineer showing true weights, certified by the supplier.

3.02 INSTALLATION

A. Install all items furnished except items to be embedded in concrete or other masonry which shall be installed under Division 3 and Division 4 respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.

B. All steel surfaces to come in contract with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

C. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two(2) coats of aluminum metal and masonry paint to the dissimilar metal.

D. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.

E. Where aluminum contacts wood, apply two (2) coats of aluminum metal and masonry paint to the wood.

F. Installation of column covers shall be after all plumbing, mechanical and electrical work behind them has been completed. Concealed fasteners shall be installed according to the manufacturer's recommendations. Panels shall be protected during construction and any damaged panels shall be removed and replaced. Clean exposed panel surfaces in accordance with the manufacturer's written instructions.

END OF SECTION

DIVISION 9

FINISHES

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

PART 1 - GENERAL

1.0 SCOPE OF WORK

A. The work of this section consists of furnishing all materials, labor, equipment and incidentals required and performing all the painting necessary. This section does not cover certain coatings specified for certain materials or surfaces specified elsewhere.

B. It is the intent of these Specifications to clean, perform surface preparation, and paint all new and existing concrete, exposed miscellaneous metal, doors, frames, transoms, pipe, fittings, valves, new equipment, existing equipment to remain, and all other exposed and submerged work customarily painted unless otherwise clearly specified in the drawings. Priming of equipment and piping is included in the respective equipment and piping sections. All parts of existing structures to remain (ceiling, floor, walls, etc.) are to be cleaned even if these surfaces are otherwise specified to not be painted (existing dry pit concrete and brick is not to be painted).

C. The following surfaces or items will not be painted:

1. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in concrete shall be coated to prevent electrolysis.

2. Aluminum hatches, handrails, and toeboards.

3. Stainless steel, brass, bronze, and aluminum other than exposed tubing.

4. Piping buried in the ground (except for air piping) or embedded in concrete.

5. Ducts, pipes, and other miscellaneous items covered with insulation or plastic coated.

6. Concealed surfaces of pipe or crawl spaces.

7. Finish hardware.

8. Manhole frames and covers.

9. Nonferrous architectural metals, unless specifically noted otherwise.

10. Electrical switchgear and motor control centers except for touch-up and recoating where factory coatings are unsatisfactory.

11. Packing glands and other adjustable parts and nameplates of mechanical equipment.

12. Floors of wet wells and other water holding structures unless specified elsewhere or shown on the drawings.

13. Slabs on grade.

14. Exposed concrete tops of wet wells and valve pits unless otherwise specified elsewhere or shown on the drawings.

1.01 QUALITY ASSURANCE

A. Include on label of paint containers:

1. Manufacturer's name
2. Type of paint
3. Manufacturer's stock number and batch code
4. Color
5. Instructions for reducing, where applicable
6. Label analysis
7. Federal specification number, if applicable

B. Sampling of Materials

When requested by the Engineer, obtain test samples of paint material stored at project site or source of supply:

1. 1 qt. - From batches of 50 gallons or less.
2. 2 qts. - From batches over 50 gallons.
3. Select samples at random from sealed containers.

1.02 SUBMITTALS

A. The Contractor shall submit to the Engineer, as provided in the General Conditions, manufacturers' specifications and printed technical data on the proposed paint systems and detailed surface preparation, mixing, thinning application procedures, and dry film thickness.

B. Schedule of painting Operations: The Contractor shall submit for approval a complete Schedule of Painting Operations within thirty (30) days after the Notice to Proceed. This Schedule is imperative so that the various fabricators may be notified of the proper shop prime coat to apply. It shall be the Contractor's responsibility to properly notify and coordinate the fabricators' surface preparation and painting operations with these Specifications. This Schedule shall include, for each surface to be painted, the brand name, the volume of solids, the coverage and the number of coats the Contractor proposes to use in order to achieve the specified dry film thickness, and color charts. When the Schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges may be utilized by the Engineer to verify the proper application while work is in progress.

C. The Contractor shall have available, at all times at the work site, a Nordson Dry Film gauge or other Engineer approved dry film thickness gauge to be used to inspect the coating thickness by the Contractor during the progress of the work. The gauge shall be made available to the Engineer upon request for dry film thickness inspection.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials

1. Deliver sealed containers with labels legible and intact and with batch codes indicating when the coating was manufactured.
2. Deliver to project site or segregate at source of supply in advance of need so as to allow fifteen (15)

days for testing.

B. Storage Materials

1. Store only acceptable project materials on project site.

2. Store in a protected location at temperatures printed on the container's label.

3. Restrict storage to paint materials and related equipment.

4. Comply with all applicable Federal, state, and local health and fire regulations.

5. No paint shall be stored on site or applied which exceeds the product shelf life at time of application.

1.04 JOB CONDITIONS

A. Environmental Requirements

1. Comply with manufacturer's recommendations as to environmental conditions under which painting systems can be applied.

2. Do not apply finish in areas where dust is being generated.

B. Protection

Cover or otherwise protect finished work of other trades or surfaces not being painted concurrently or not to be painted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All painting materials shall be fully the equal to those manufactured by the Tnemec Co.; Dupont, Sherwin Williams Protective Coatings or equal. The painting schedule and recommendation for application has been prepared on the basis of Tnemec and Sherwin Williams products (unless otherwise noted). No brand other than those named will be considered for approval, unless the brand and type of paint proposed for each item in the following schedule together with product data is furnished to demonstrate its equality to the paint(s) named submittal shall be in writing to the Engineer for approval within 30 days after signing the Notice to Proceed. The type and number of tests performed shall be subject to the Engineer's approval.

Minimum standards for testing shall be in accordance with the applicable test methods of the American Society for Testing and Material (ASTM) and Federal Standard No. 141 or other approved methods when not covered by the preceding. All coatings shall meet or exceed AWWA, UL, and NSF Standard 61.

B. All painting materials shall be delivered to the job site in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Engineer's approval before using.

C. Shop priming shall be done with primers that are specified by the manufacturer to be compatible with the finish paints to be used.

D. No paint containing lead will be allowed. All thinners used shall be from the coating manufacturer.

E. Work areas will be designated by the Engineer for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes, and no plumbing fixture shall be used for this

purpose.

F. All recommendations of the paint manufacturer in regard to the health and safety of workers shall be followed.

2.02 COLOR CODING FOR PIPES AND EQUIPMENT

A. Color coding shall consist of color code painting of all exposed conduits, trough items and pipelines for the transport of gases, liquid and semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and all operating accessories which are integral to the whole functional mechanical pipe and electrical conduit system Color code shall be in accordance with OSHA Standards and as selected by the Owner when OSHA Standards do not govern.

B. All hangers and pipe support floor stands shall be painted. The system shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical motors. Colors shall be as referenced above.

C. All systems which are an integral part of the equipment, that is originating from the equipment and returning to the same piece of equipment, shall be painted between and up to, but not including, the fixed flanges or connections on the equipment.

D. Once established, a color code defines, and assigns a definite color for each category of pipe. Pipelines, which are not assigned a color under the requirements stated above, shall be assigned a color by the Engineer and shall be treated as an integral part of the Contract.

E. All pipes, equipment, and accessories shall be painted according to the color codes established by the above listed requirements.

2.03 FABRICATED EQUIPMENT

A. Unless otherwise indicated below, all fabricated equipment shall be shop primed and field finished.

B. All items to be shop primed shall be prepared and primed in accordance with Section 09910. If, in the opinion of the Engineer, any prime coating shall have been improperly applied or if material contrary to these Specifications shall have been used, that coating shall be removed by sandblasting to white metal and reprimed in accordance with these Specifications.

C. Shop primed surfaces shall be cleaned thoroughly and retouched with the specified primer before the application of successive paint coats in the field.

D. Shop finish coats may be the standard finish as ordinarily applied by the manufacturer when approved by the Engineer. All pumps, motors, and blowers shall be repainted after installation.

E. The Contractor shall be responsible for and take whatever steps are necessary to properly protect the shop prime and finish coats against damage from weather or any other cause.

F. If, in the opinion of the Engineer, a shop finish coat does not give the protection quality of other work of similar nature, the Contractor shall apply additional coats of paint as directed by the Engineer to accomplish the desired protection quality.

G. Wherever fabricated equipment is required to be sandblasted, the Contractor shall protect all motors, drives, bearings, gears, and related equipment, from the entry of grit. Any equipment found to contain grit shall be promptly and thoroughly cleaned by the Contractor.

H. Engineer may request proof of purchase of specified materials by the Contractor and/or fabricator if the need arises.

2.04 EXTRA PAINT

A. Furnish one clearly marked unopened gallon can or equivalent kit, if coating is a catalyzed type coating, of each type and each color of paint used.

Refer to Section 02951 Wet Well Rehabilitation and Lining

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

A. Non ferrous Metal:
   1. All nonferrous metals specified to be coated shall be cleaned to remove all soluble surface contaminants.
   2. All surfaces shall be brush blasted with a fine abrasive to remove all insoluble surface contaminants and to achieve a uniformly profiled surface.

B. Concrete Masonry Units
   1. Allow mortar to cure a minimum of 14 days. Concrete block surface shall be smooth and cleaned of all dust, efflorescence, chalk, loose mortar, dirt, grease, oil, tar and other foreign matter.
   2. Remove fins and mortar spatter.

C. All plastic pipe surfaces shall be cleaned and lightly sanded before painting.

D. Exposed Pipe: Bituminous coated pipe shall not be used in exposed locations. Pipe which shall be exposed after project completion shall be primed in accordance with the requirements herein. Any bituminous coated pipe which is inadvertently installed in exposed locations shall be sandblasted clean before priming and painting. After installation, all exterior exposed flanged joints shall have the gap between adjoining flanges sealed with a single component Thiokol caulking prior to priming to prevent rust stains on the finish paint.

E. Cut Edges of Galvanized Steel: Cut edges of galvanized sheets and exposed threads and cut ends of galvanized steel piping, electrical conduit, and pipe sleeves shall be solvent cleaned and primed with Tnemec Series 90-97 Tnemec-Zinc per manufacturers' directions.

3.02 PAINTING SYSTEMS

A. All colors will be selected by the Engineer or Owner based on the color numbers contained in the finish schedule and sample color charts to be furnished by the Contractor.

B. The following surfaces shall have the types of paint schedule below applied at the dry film thickness in mils per coat (DFM) noted:

   1. Exterior non-submerged ferrous metals:

1 Coat	No. 90-97 Tneme-Zinc or SW Corothane 1 Galvapac (B65G11)	(2.5 –3.5 DFM) Carbozinc 859
1 Coats	No. 66 Epoxoline or SW Macropoxy 646 FC (B58-600)	(2.0 – 3.0 DFM/coat) Carboguard 60
1 Coats	No. 1074U Endura-Shield or SW Acrolon Ultra HP (B65-B20)	(2.0 – 3.0 DFM/coat) Carboguard 60

   2. Interior non-submerged concrete:

2 Coats	No. 66 Hi-Build Epoxoline or SW	(4.0 - 6.0 DFM/coat)

	Macropoxy 646 FC (B58-600)	Carboguard 60

3. Interior concrete masonry units:

1 Coat	No. 130 or SW Cement Plex 875 (B42-200)	(60-80 sq. ft/gallon) Sanitile 100
2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646 FC (B58-600)	(4.0 - 6.0 DFM/coat) Carboguard 60

4. Interior non-submerged ferrous metals:

2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646 FC (B58-600)	(3.0 - 5.0 DFM/coat) Carboguard 60

5. Submerged ferrous metals and ferrous metals subject to submersion or splashing:

1 Coat	No. 46-H-413 Hi Build Tneme Tar or SW HiMil SherTar (B69B40)	(16.0 - 20.0 DFM/coat) Bitumastic 300M

NOTE: For potable water, use the following system:

2 Coats	No. 20 Pota Pox or SW Macropoxy 5500 (B58x-740)	(4.0-6.0 DFM/coat) Carboguard 61

6. Plastic Piping:

2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-600)	(2.0 - 3.0 DFM/coat) Carboguard 60

7. Copper Pipe:

2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-600)	(2.0 - 3.0 DFM/coat) Carboguard 60

8. Galvanized metals:

<u>Interior</u> - <u>non-submerged</u>

2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-600)	(2.0 - 3.0 DFM/coat) Carboguard 60

<u>Exterior</u> - <u>non-submerged</u>

1 Coat	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-600)	(2.0 - 3.0 DFM/coat) Carboguard 60
1 Coat	No. 1074U Endura-Shield or SW Acrolon Ultra HP (B65-820)	(2.0 – 3.0 DFM/coat) Carboguard 60

9. Stainless steel:

Not painted.

10. Pipe insulation:

2 Coats	No. 66 Hi-Build Epoxoline or SW EpoPhen FF (B62A55)	(3.0 - 5.0 DFM/coat) Carboguard 60

Plastic or metal-sheathed insulation: Paint as scheduled for appropriate substrate.

12. Aluminum (only coat in locations indicated on the Drawings):

Interior - non-submerged

2 Coats	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-60)	(2.0 - 3.0 DFM/coat) Carboguard 60

Exterior - non-submerged

1 Coat	No. 66 Hi-Build Epoxoline or SW Macropoxy 646FC (B58-60)	(2.0 - 3.0 DFM/coat) Carboguard 60
1 Coat	No. 1074U Endura-Shield-Gloss or Acrolon Ultra HP (B65-820)	(3.0 – 4.0 DFM/coat) Carbothane 134HG

13. Exterior non-submerged concrete:

2 Coats	No. 156 Enviro-Crete or SW Loxon XP (A24-1400)	(6 - 8 DFM/coat) Flexxide

3.03 WORKMANSHIP

A. General:

1. Primer (spot) and paint used for repainting surfaces shall, in general, be as scheduled for that type of new surface. Confirm with the paint manufacturer that the paint proposed for a particular repaint condition will be compatible with the existing painted surface. Sample repainted areas on the actual site will be required to ensure this compatibility. Finished repainted areas shall be covered by the same guarantee specified for remainder of work.

2. At the request of the Engineer, samples of the finished work prepared in accordance with these Specifications shall be furnished, and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be performed to the satisfaction of the Engineer where standard chart colors are not satisfactory.

3. Protection of furniture and other movable objects, equipment, fittings and accessories shall be provided throughout the painting operations. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, and related materials before painting, and protect and replace them when completed. Mask all machinery name plates and all machinery parts not to receive a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from paint and damage during the operation and until the finished job is accepted.

4. On metal surfaces, apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of additional coats. On masonry, application rates will vary according to surface texture; however, in no case shall manufacturer's stated coverage rate be exceeded. On porous

surfaces, it shall be the Contractor's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

5. All safety equipment shall be maintained in accordance with OSHA Standards as approved.

6. Paints shall be mixed in proper containers of adequate capacity. All paints shall be thoroughly stirred before use and shall be kept stirred while using. No unauthorized thinners or other materials shall be added to any paint.

7. Only skilled painters shall be used on the work, and specialists shall be employed where required.

B. Field Priming:

1. Steel members, metal castings, mechanical and electrical equipment, and other metals which are shop primed before delivery at the site shall be touched up, prepared, and reprimed to obtain complete primary coverage satisfactory to the Engineer. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be prepared and reprimed as directed by the Engineer.

2. Equipment which has been specified to have a baked-on enamel shop finish or a standard factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop primed and have been damaged or where the shop prime coats or coats of paint have deteriorated shall be properly cleaned and reprimed and/or repainted as directed by the Engineer.

C. Field Painting:

1. All paint shall be applied in environmental conditions that are in accordance with the manufacturers written instructions when the air and surface temperatures are between 60-100 degrees F for epoxies, 50-100 degrees F for acrylic emulsions and 32-100 degrees F for all other coating systems applied, unless coating manufacturer's technical information states otherwise. No paint shall be applied unless the surface and air temperature is 5 degrees above the dew point and rising.

2. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.

3. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal to remove defects and provide a smooth, even surface. Top and bottom edges of doors shall be painted, and all exterior trim shall be back-primed before installation.

4. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. All exterior concrete and masonry painting shall be performed in a continuous manner structure by structure. Materials subject to weathering shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

5. All surfaces shall be brush painted unless spray painting is specifically approved by the Engineer for specific cases in writing.

6. All surfaces to be painted, as well as the atmosphere in which painting is to be done, shall be kept at the above temperatures and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be removed and the surface repainted in accordance with the Engineer's direction.

7. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.

8. Valves and fittings shall be painted the same color as the pipe.

9. The Contractor shall arrange a meeting at the site prior to the start of painting between the Contractor, his painter, the paint manufacturers, and the Engineer. All aspects of surface preparation and application of the specific paint systems shall be fully reviewed at the meeting.

10. The paint manufacturers shall provide a representative to provide onsite technical assistance to the Engineer and Contractor and to report the findings from the onsite inspection as to surface preparation, application procedures, and dry film thickness to the Engineer on a timely basis unless deemed unnecessary by the Engineer.

11. All materials shall be applied in accordance with manufacturer's written instructions.

3.04 CLEAN-UP

A. The premises shall at all times be kept free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting remove all tools, scaffolding, surplus materials, and all rubbish from and about the work and leave work "broom clean" unless more exactly specified.

B. Upon completion, remove all paint where it has been spilled, splashed, or splattered on floors, fixtures, equipment, furniture, and all other surfaces, leaving the work ready for inspection.

END OF SECTION

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SECTION 09910 -
SURFACE PREPARATION AND SHOP PRIME PAINTING

PART 1- GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steels, as specified herein.

B. This specification does not apply to equipment specified to have shop-finished painting, in which case the manufacturer shall use primers fully compatible with the service environment and finish coats.

1.02 SUBMITTALS

A. Submit to the ENGINEER for approval manufacturers' specifications and data on the proposed primers and detailed surface preparation, application procedures and dry film thickness.

B. Submit representative physical samples of the proposed primers, if required by the ENGINEER.

PART 2- PRODUCTS

2.01 MATERIALS

A. All painting materials shall be fully equal to those manufactured by the Tnemec Co.; Sherwin-Williams, Ameron or equal. The priming requirements below have been prepared on the basis of Tnemec products and the manufacturer's recommendations for applications. No brand other than those named will be considered for approval, unless the brand and type of paint proposed for each item in the following schedule together with product data is sufficient to demonstrate its equality to the paint(s) named submittal shall be in writing to the Engineer for approval within 30 days of the signing of the Notice to Proceed. The type and number of test performed shall be subject to the Engineer's approval. Minimum standards for testing shall be in accordance with the applicable test methods of the American Society for Testing Material (ASTM) and Federal Standard No. 141 or other approved methods when not covered by the preceding.

B. Submerged Services: Shop primer for ferrous metals which will be submerged or which are subject to splash action or which are specified to be considered submerged service shall be given one coat of Tnemec 66-1211 dry film thickness 3.0 to 5.0 mils. Note: For potable water service, the Series 91 H20 Hydrozinc 2000, at a dry film thickness of 2.5 to 3.5 mils shall be used in place of Series 66-1211.

C. Non-submerged Services: Shop primer for ferrous metals other than those covered by paragraph 2.01B shall be given one coat of Tnemec 90-97, dry film thickness 2.5 to 3.5 mils.

D. Nonprimed Surfaces: Gears, bearings surfaces, and other similar surfaces obviously not to be painting shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintain as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the Engineer up to time of the final acceptance test.

E. Compatibility of Coating Systems: Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats.

PART 3 - EXECUTION

3.01 APPLICATION

Surface preparation and priming shall be performed as follows:

1. Non-submerged components shall be sandblasted clean in accordance with SSFC-SP-6, Commercial Grade, immediately prior to priming. Submerged components shall be sandblasted clean in accordance with SSPC-SP-10, Near White, immediately prior to priming.

2. Surfaces shall be dry and free of dust, oil grease, dirt, rust, loose mill scale, and other foreign material before priming.

3. Shop prime in accordance with approved paint manufacturer's recommendations.

4. Priming shall follow sandblasting before any evidence of corrosion has occurred and within 24 hours.

END OF SECTION

DIVISION 11

EQUIPMENT

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

SEWER PUMPS

A. HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMPS:

1. GENERAL

A. PERFORMANCE CRITERIA

The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 10" suction connection, and 10" discharge connection. Each pump shall be selected to perform under engineer provided operating conditions:

Pump Controls shall be coordinated with pump supplier/manufacturer to insure all components are compatible with each other. The pump control shall have the capability of a simple reprogramming to allow fifth pump to not participate in the rotation.

Pump Performance Certifications

Solids Handling Capability

All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

Reprime Performance

Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.

During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.

Pump must reprime 20 vertical ft. at the specified speed and impeller diameter (as indicated on the standard published curve for the model specified). Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:

A check valve to be installed down stream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.

A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.

The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90° elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

Impeller clearances shall be set as recommended in the pump service manual.

Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

Liquid to be used for reprime test shall be water.

Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

B. Manufacturer's Warranty

The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pump equipment and all components.

Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly

operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

The pump supplier shall show evidence that he maintains a fully equipped factory authorized organization capable of furnishing adequate service for the equipment furnished, including spare parts within a 150 mile radius of the job site. Suppliers employing outside organizations for "on call" service shall not be considered. The pump supplier shall be a factory authorized distributor and warranty provider of the product offered.

2. PRODUCT

A. MANUFACTURER

The specifications and project drawings depict equipment and materials which are to be manufactured in the USA with all castings and machining to be sourced in North America and suitable for the service anticipated. Spare parts for offered pumps are to be readily available.

The pumps must be of standard catalog design, totally warranted by the manufacturer.

Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

The term "pump manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer" and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

B. PUMP DESIGN

Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

Materials and Construction Features

Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:

Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.

Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, a clamp bar screw must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.

Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.

Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

Suction Head shall be Class 30 cast iron. Its design must incorporate following maintenance features:

1) The suction head will be secured to the pump casing by using hex head cap screws and lock washers. Access to the impeller and mechanical seal shall be accomplished by removing the suction head.

2) Removal of any blockages in the impeller shall be accomplished by removing the suction head, or through a cleanout cover on the suction head. In consideration of safety, two clamp bar screws must provide slow release of pressure on two clamp bars securing the cleanout cover. A Teflon gasket shall prevent adhesion of the cleanout cover to the suction head casing.

3) Removal of the suction check valve shall be accomplished through the removable cleanout cover on the suction head.

4) In consideration for safety, a pressure relief valve shall be supplied in the suction head. The relief valve shall open at 75-200 PSI.

Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, sealplate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:

Seal plate shall be Class 30 iron and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.

The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

Impeller shall be ductile iron 65-45-12, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lock screw and conical washer.

Impeller shaft shall be AISI 17-4 pH stainless steel.

Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same cap screws as used for retaining rotating assembly.

Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.

Clearances shall be maintained by using external shims between the casing ring of the rotation assembly and the pump casing itself. Shims will be of

various sizes to allow precise adjustment of this clearance. The clearance can be measured by removing the cleanout cover on the suction head.

Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cleanout cover on the suction head without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

Removal of the rotating assembly will be accomplished through the front or the back of the pump casing.

Serviceability

The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

No special tools shall be required for replacement of any components within the pump.

Pumps are to be supplied be a Factory Authorized Distributor of the brand offered.

3. EXECUTION

A. EXAMINATION

Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

DIVISION 15

MECHANICAL

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

PART 1 - GENERAL CONDITIONS

1.01 WORK INCLUDED

A. The general conditions of the general specifications are made as part of these specifications and apply the same as if attached hereto. The mechanical subcontractors should, before bidding, read and thoroughly understand all general conditions, priority and scheduling.

1.02 SCOPE OF WORK

A. This section calls for the furnishing of labor, materials, equipment, and all the services, and of performing all operations required for the complete mechanical systems as hereinafter specified and/or shown on the accompanying drawings.

1.03 GENERAL REQUIREMENTS

A. The mechanical subcontractor shall install his work to meet the existing conditions as found at buildings and property, and to accommodate work of other trades. This contractor shall be responsible for timely placing of sleeves in forms before concrete is poured. Cooperate with the general contractor and place pipes and ducts in floors, walls, furred spaces, etc., so there will be no delay. Sheet metal or iron pipe sleeves shall be provided for pipes passing through floors, wall or partitions.

B. Contractor shall furnish and properly install materials, devices, equipment, insulation, controls, appurtenances, etc., mentioned in these specifications and/or shown on plans or required to make a complete and satisfactory installation in working order whether fully shown or not.

C. Contractor should visit the site and acquaint himself thoroughly with conditions governing installation of his work.

D. All other plans shall be checked in relation to these plans so that all conditions will be furnished and installed in this contract to provide complete and satisfactory systems.

1.04 LAWS, RULES, REGULATIONS, FEES, ETC.

A. The entire mechanical work shall comply with rules and regulations of the local and state authorities having jurisdiction including the State Fire Marshal and the State Board of Health. All modifications required by the said authorities at any time shall be made by the mechanical contractor without additional charge. In cases where alterations to or deviations from this specification and accompanying plans are required by the authorities, contractor shall report same to the Engineer and obtain his approval before work is started. Contractor shall obtain all necessary fees and permits, the cost of same to be included in the Contract.

1.05 DRAWINGS

A. Plans and detail sketches are submitted to limit, explain, and define structural conditions, specified requirements, pipe sizes, and manner of erecting work. Structural or other conditions may require certain deviations from manner of installation shown, and such deviations shall be made as required, but specified sizes and requirements necessary for satisfactory operation shall remain unchanged.

B. It may be necessary to shift or to change routing of ducts and or piping and this shall be done, but such changes must be referred to Engineer for approval before proceeding. Extra charges will not be allowed for these changes.

C. Typical details are shown on plans, and in any cases where Contractor is not certain about the method of installation of his work, he shall ask for details, lack of details will not be an excuse for improper installation.

D. Contractor bidding on this portion of the work must be fully experienced in installations of equal size, complexity and quality. In bidding, he acknowledges that he fully understands the scope of the work and design and has the ability, for the contract price to assemble and install the equipment, piping, and ductwork shown or specified, so as to mold same into a satisfactory workable system and arrangement, without responsibility for capacities and sizes set by these documents.

E. Contractor shall recognize that the amount of information and detail that could be provided in Contract Documents is limitless and could extend into every minute detail, step, sequence, and operation to a point where only workmen would be required, without drawing on ability experience, and ingenuity of the Contractor.

1.06 MATERIALS

A. All materials must be new and of the best quality. All materials and apparatus must be of the best grade and of standard manufacture and first-class in every respect. Where directed by the Engineer, Contractor shall submit a sample for approval before proceeding.

1.07 STANDARDS

A. In general, standards for products and workmanship shall be as described in each individual section.

B. The standards referred to, except as modified in these specifications shall have full force and effect as though printed in these specifications. These standards are not furnished to bidders for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements. The Engineer will furnish, upon request, information as to how copies of the standards referred to may be obtained.

C. Notwithstanding any reference in this section of the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such references shall be interpreted as establishing a standard of quality and shall not be construed limiting competition and the Contractor in such cases, may at his option, use any article, device, product, material, fixture, form or type of construction which in the judgement of the Engineer, expressed in writing, is equal to that specified.

1.08 MATERIALS SPECIFIED OR SUBSTITUTED (PRIOR APPROVALS)

A. Refer to Instructions to Bidders.

1.09 SHOP DRAWINGS

A. Before proceeding with the work, contractor shall make complete shop and working drawings of such apparatus or connections as directed by the Engineer and/or hereinafter specified. These drawings shall show construction details and dimensions of each piece of equipment so drawn.

B. Engineer's approval of shop drawings shall not relieve the Contractor from responsibility of incorrectly figured dimensions or any other errors in these drawings or specified even though approved by the Engineer, shall not relieve this Contractor from furnishing and erecting same.

C. Ten (10) sets of prints of shop drawings shall be submitted to Engineer for approval. These prints shall be supplied as part of this contract. Submit all shop drawings at the same time or as soon as practical after award of the contract. No separate items will be accepted.

D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such accessories shall be furnished if no specific reference to them is made in the specifications.

1.10 CUTTING AND PATCHING

A. All cutting necessary for this work will be done by this Contractor at his own expense, but all patching shall be done by the General Contractor. No beams or joists shall be cut without prior approval of Engineer. After initial resurfacing has been done any further cutting, patching or painting shall be done at the expense of this Contractor.

1.11 INTERFERENCES

A. The drawings are generally diagrammatic and this Contractor shall harmonize his work with that of the different equipment, piping, etc., shall be installed so as to function properly. In the case where an interference develops, the Architect is to state which equipment, piping, etc., is to be relocated regardless of which item was first installed.

1.12 EXCAVATION AND BACKFILL

A. This Contractor shall do all excavating required to lay the specified services and after same have been laid, he shall do all backfilling to the satisfaction of all parties concerned and shall cart away from the premises all unnecessary dirt, rubbish, etc., as directed. Backfill shall be well tamped.

1.13 SPACE REQUIREMENTS

A. Contractor shall check all plans pertaining to this job so as to be fully aware of the space limitations for all various items of equipment. Equipment is not to be bid on, submitted for preliminary approval nor placed on the job if it is so bulky and large that adequate access for proper maintenance and servicing cannot be achieved in the space provided.

1.14 FOUNDATIONS AND SUPPORTS

A. This contractor shall furnish and install foundations and supports of concrete or steel shapes for equipment requiring same, unless specifically indicated otherwise or specified.

B. All floor mounted mechanical equipment shall be mounted on 4" high concrete housekeeping pad unless specifically shown otherwise on plans. Refer to plans for special requirements for foundations and supports.

1.15 HANGERS, ESCUTCHEONS, ETC.

A. Mechanical Contractor shall furnish and install all thimbles, inserts and other requirements necessary for the support of his equipment and piping. Assist and cooperate with other trades in locating and placing these items.

1.16 PROTECTION OF EQUIPMENT

A. See individual sections for protection of equipment.

B. This Contractor shall at all times take such precautions as may be necessary to properly protect his equipment from damage. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Engineer will be sufficient cause for the rejection of the particular piece of equipment in question.

1.17 TESTING

A. All pressure lines, unless elsewhere specified, shall be tested under 150" hydrostatic pressure for a minimum of 5 hours. Contractor shall provide valve at farthest point in line to bleed off air and for inspection.

B. Notice shall be given the Engineer and building inspector before tests are made, the test is not to be drawn off pipes and pipes are not to be covered or insulated until filled pipes have been examined and testing approved by

the Engineer and inspectors.

C. In case of defects, they shall be made good to the satisfaction of the Engineer and work retested. All such work shall be done by the Contractor with no additional expense to the Owner.

D. Gas piping shall be tested at 10 psi air pressure for a minimum of one (1) hour period without appreciable drop. Text pipe with soap suds for leaks prior to final connections.

E. Contractor shall make any other tests as may be called for by the Engineer, and all other tests so called for elsewhere in these specifications.

F. All sanitary sewer piping shall be hydrostatic pressure tested with a 10'-0" high test tee for a minimum of one (1) hour in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly sealed, except the highest opening and the system shall be filled to the point of overflow. Any leaks detected shall be corrected and the test reapplied. If the system is tested in sections, each opening shall be tightly sealed except the highest opening of the section under test, and each section shall be filled with water, but no section will be tested with less than 10'-0" head of water. In testing successive sections at least 10'-0" of the next section shall be tested, so that no joint of pipe in the building shall have been submitted to a test of less than a 10'-0" head of water. The water shall be kept in the system, or in a portion under test, for a minimum of one (1) hour before the inspection starts.

A final test of the completed sanitary drainage system, including vents, shall be made using the peppermint or smoke test as instructed by the Engineer. The smoke test will be made by filling all traps with water and then introducing into the system a pungent thick smoke produced by one or more smoke machines. When smoke appears at a vent opening on the roof, they shall close and a pressure equivalent to a 1" water column shall be built and maintained for fifteen minutes before the inspection starts. When peppermint test is used, 2 oz. of oil of peppermint shall be introduced for each line or vent.

1.18 CLEANING AND ADJUSTING

A. Before receiving final approval from the Engineer, the Contractor shall clean out all lines, adjust all valves, control equipment and other equipment. Clean all pipe and equipment and leave the entire installation in good working order. All heaters, fans, grilles, controls, etc., shall be adjusted to perform in correct and satisfactory manner, with sequences, etc., as called for in the specifications hereinafter specified and on plans.

1.19 PAINTING

A. Refer to Section 09900 for painting requirements.

1.20 PARTS LIST AND INSTRUCTION MANUAL

A. See individual sections for specific instructions.

B. This Contractor shall deliver to the Engineer three (3) copies of printed instructions relating to operating, proper maintenance and repair parts list indicating the various parts by name, number and diagram for each piece of equipment installed. An independent test and balance report shall also be included in parts lists and instruction manual.

C. The shop drawings, parts list, and maintenance and repair instructions shall be neatly bound in a canvas-covered notebook and turned over to the Engineer before acceptance of the work.

1.21 GUARANTEE

A. Contractor shall guarantee materials, equipment and workmanship installed and performed under this contract for a period of one (1) year from date of the final completion and official acceptance of the contract.

He shall furnish free of charge to the Owner all materials and labor necessary to comply with the above guarantee, which shall be based on defective materials and/or workmanship, and on such basis shall be responsible if a deficiency if found, for any adjustment, replacement, or correction which may be necessary to replace the project to first class condition. This guarantee shall include refrigerant charges, but shall not include the changing of filters.

END OF SECTION

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PART 1- GENERAL

1.01 SCOPE OF WORK

A. Furnish labor, materials, equipment, services, and incidentals required to install and test a complete plumbing system as shown on the Drawings. More specifically the work shall include, but shall not be limited to the following:

1. Installation of sanitary, waste, rainwater leader, floor, deck, trench and equipment drainage system.
2. Installation of potable hot and cold water, and protected hot and cold water systems.
3. Plumbing fixtures, wash hose stations, emergency showers and eye wash units.
4. Floor drains, deck drains, trench drains and cleanouts.
5. Roof drains furnish under this Section.
6. Protected water and drain outlets left for connections required by miscellaneous mechanical and process equipment.
7. Removal of existing piping fixtures and equipment in existing buildings.
8. All parts necessary to make a complete Plumbing System ready for continuous operation.

B. Alterations and Additions to Existing Buildings.

1. Each Bidder or their authorized representative shall, before preparing their bid, visit all areas of the existing building in which plumbing demolition and new work is to be performed and inspect carefully the present plumbing installation. The submission of a bid by a bidder will be considered evidence that their representative has visited the building and noted the location and conditions under which the work will be performed and that they take full responsibility for a complete knowledge of all factors governing their work.
2. Provide all temporary plumbing connections as required to maintain all services at all times, in all existing areas affected by the new construction.
3. Special consideration shall be given to the method and coordination of the work to be done in connection with the present building so as to minimize the conflict and interference with the Owner's function.

1.02 SUBMITTAL

A. Furnish to the Engineer shop drawings and technical literature covering details of plumbing-piping systems being furnished under this Section prior to fabrication, assembly or shipment.

B. Operation and Maintenance Data

1. Operating and maintenance manuals shall be furnished to the Engineer. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

1.03 REFERENCE STANDARDS

A. American Society For Testing and Materials (ASTM)

B. American National Standards Institute (ANSI)

C. American Water Works Association (AWWA)

D. Southern Building Code Congress International, Inc. (SBCCI)

E. National Fire Protection Association (NFPA)

F. National Electrical Manufacturers Association (NEMA)

G. Plumbing and Drainage Institute Standards (PDI)

H. Cast Iron Soil Pipe Institute (CISPI)

I. Underwriters Laboratory (UL)

J. Factory Manual (FM)

K. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. The Contractor for this Section shall be fully responsible for the proper execution and performance of the work described herein. It shall be their responsibility to inspect all installation conditions and bring to the attention of the Engineer any conditions which may affect their work adversely. They shall report to the Engineer, prior to commencing any portion of this work, any conditions unsuitable for the installation of their portion of the work.

B. Mention herein or indication on the Drawings of equipment, materials, operation or methods shall require that each item mentioned or indicated be provided to make a complete system of plumbing ready for continuous operation.

C. The location of all equipment, fixtures and piping shall be considered as approximate only and the right is reserved by the Engineer to change at any time, before the work is installed, the position of such equipment and piping to meet structural conditions and to provide proper headroom clearance or for other sufficient causes and such changes shall be made without additional expense to the Owner.

D. Attention is called to the necessity for elimination of transmission of vibration from mechanical equipment to building structures. All equipment, therefore, shall be carefully selected and installed to meet this condition and isolators and water hammer arresters shall be provided where required.

E. Instruct such persons as designated by the Owner in the care and use of all plumbing equipment and piping systems installed.

F. Comply with all the laws, ordinances, codes, rules and regulations of the local, State or other authorized having jurisdiction over any of the work specified herein.

G. Obtain all required permits, pay all legal fees for the same and in general take complete charge and responsibility for all legal requirements pertaining to this Section of the work.

H. Requirements set forth in this Section and indicated on the Drawings shall be followed when in excess of the required or minimum regulations.

I. If any work is performed and subsequent changes are necessary to conform to the regulations, such change shall

be made as part of this work at no additional cost to the Owner.

J. All work shown on the Drawings is intended to be approximately correct to scale, but figured dimensions and detailed Drawings shall be followed in every case. The Drawings shall be taken in a sense as diagrammatic. Size of pipes and general method of running them are shown, but it is not intended to show every offset and fitting nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings all necessary parts to make complete working systems ready for use shall be furnished without extra charge.

K. Refer to the Structural Drawings which indicate the type of construction in which the work shall be installed. Locations shown on the Plumbing Drawings shall be checked against the general and detailed drawings of the construction proper. All measurements must be taken at the building.

1.05 MAINTENANCE

A. Materials, fixtures and equipment shall be properly protected at all times and all pipe openings shall be temporarily closed so as to prevent obstruction and damage. Items damaged during construction shall be replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 INSTALLATION

A. All the items shall be installed according to the applicable manufacturer's recommendations, the details shown on the Drawings and as specified herein.

B. All work shall be installed in accordance with the manufacturer's printed instructions and shall be rigid, plumb and true to line, with all parts in perfect working order. Maintain protective covers on all units until final cleanup time and at that time remove covers and clean and polish all surfaces.

3.02 TESTING

A. The various piping systems shall be subject to water, smoke, or air tests as noted and shall hold tight at pressures stated without extra pumping or water addition for the time intervals stated.

B. All additional tests, methods or materials as may be required by the local ordinances and not specifically mentioned herein, shall be made as directed by the Engineer or the local Inspection Authority.

C. Provide all apparatus and all other supplies or materials which may be necessary for testing the systems and operating the apparatus during the period while tests of any kind are being made, or for carrying out the work of the Contract.

3.03 CLEANING

A. At the completion of the work, all fixtures, equipment, apparatus and exposed trim for same included in this Section shall be clean and, where required, polished ready for use.

B. Protect this work during construction and all finished work damaged during construction shall be replaced.

3.04 PROTECTION

A. Materials, fixtures and equipment shall be properly protected at all times and all pipe openings shall be temporarily closed so as to prevent obstruction and damage.

3.05 COORDINATION SKETCHES

A. It shall be the responsibility of the Subcontractor to have in his employ a competent coordinator of mechanical systems and as such to provide all coordination of drawings or sketches as may be required or deemed necessary by the Engineer to obtain the required ceiling heights and eliminate conflicts with all piping, ducts and electrical installation.

END OF SECTION

DIVISION 26

ELECTRICAL

PROFESSIONAL ENGINEERING
CONSULTANTS CORPORATION

DIVISION 26 - ELECTRICAL
SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1.00 GENERAL

1.01 SCOPE

A. The work to be performed under these specifications shall include the furnishing of all labor, materials, equipment and services required for a complete electrical system as specified herein and as shown by the Drawings. A state of Louisiana licensed Electrical Contractor shall perform the work specified herein. The work includes but is not limited to:

1. Demolition of the existing Pump Station electrical at the site, as shown on the drawings.

2. Furnishing and installing underground conduits and secondary service conductors from utility company service pole to new service entrance motor control center.

3. Coordination with utility company for the replacement of service transformer and installation of metering as required.

4. Furnishing and installing motor control center complete with automatic transfer switch, breakers, dry type transformer, SPD (Surge Protection Device) and panelboard.

5. Furnishing and installing five (5) new variable frequency drives.

6. Furnishing and installing conduits and wiring from MCC to five (5) new VFDs (Variable-Frequency Drive) and pumps.

7. Furnishing and installing all appurtenances for five (5) new VFDs with galvanized support rack at each new pump.

8. Furnishing and installing control conduits and wiring to five (5) new VFDs from the existing Telemetry Cabinet.

9. Furnishing and installing new components (Analog I/O Cards), and all appurtenances to the existing Telemetry Cabinet to facilitate five (5) pumps.

10. Furnishing and installing new Dead Front inner swing Panel and all appurtenances to allow for 5 pump switches and lights to existing Telemetry Cabinet.

11. Reprogram PLC and remote HMI (Human Machine Interface), after completion to ensure all SCADA components are working properly.

12. Furnishing and installing all appurtenances for new Pressure Transducer and High Float Alarm for wet well number one, with control conduits and wiring from existing Telemetry Cabinet.

13. Furnishing control and power conduits with wiring to new MCC from existing diesel generator.

14. Installation of temporary construction power required by the General Contractor and Sub-Contractors during the construction period.

1.02 GENERAL CONDITIONS

A. The General Conditions and Supplementary General Conditions are a part of this section of these Specifications. The Contractor is cautioned to read and be thoroughly familiar with all provisions of the General Conditions. These conditions shall be complied with in every aspect. The word "shall" where used, is to be understood, as mandatory and the word "should" as advisory. "May" is used in the permissive sense.

1.03 GENERAL REQUIREMENTS

A. The Contractor is referred to all the Drawings for construction as well as the electrical Drawings.

B. The Contractor shall examine the site and shall verify to his own satisfaction the location of all utilities, and shall adequately inform himself as to their relation to his work before entering into a Contract and he shall base his bid on any conditions, which may be encountered during the progress of the work.

C. The Contractor shall furnish and install properly all materials, devices, equipment, supports, controls, appurtenances, etc., mentioned or required to make complete or satisfactory installations in working order whether shown or not. All electrical equipment shall be connected in accordance with manufacturer's instructions. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when completed.

D. Electrical service required for all equipment furnished under this general contract shall be roughed-in and connected by the Contractor. It is the responsibility of the Contractor to obtain correct roughing-in dimensions and requirements for this equipment. Refer to other sections of these Specifications.

1.04 MINIMUM STANDARDS

A. Applicable rules of the National Electrical Code apply as a minimum standard for this contract, but do not replace or reduce any specific requirement herein.

1.05 DRAWINGS

A. Plans and detail sketches are submitted to limit, explain, and define structural conditions, specified requirements, conduit sizes, and manner of erecting work. The Contractor is cautioned to field check and verify all existing conditions before bidding, as no extra compensation will be allowed for conditions found different than represented in the construction drawings and/or specifications. Written approval of the Architect shall be obtained prior to any alterations or additions to specified work.

B. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required, but specified sizes and requirements necessary for satisfactory operations shall remain unchanged. Shifting of conduits or equipment shall be referred to the Engineer for approval. Extra charges will not be allowed for these changes without the written approval of Architect.

C. The drawings and these specifications are complementary to each other and what is called for by one shall be binding as if called for by both.

D. General arrangement of work is indicated on plans. Due to the small scale of the drawings, offsets, fittings, and boxes required are not all indicated; provide fittings, boxes, etc., as needed in accordance with codes and accepted practices.

1.06 SUPERVISION

A. The Contractor shall personally or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, he shall keep the same foreman and workmen throughout the project duration.

B. During its progress, the work shall be subject to inspection by representatives of the Engineer, at which times the Contractor shall furnish required information.

C. It is not the Engineer's duty to direct or guarantee the work of the Contractor, but to assist the Owner in obtaining a complete building in accordance with plans, specifications and addenda and to furnish engineering services in accordance with recognized practices.

1.07 PRIOR APPROVALS

A. The Contractor shall base his proposal on materials as specified herein. Any references to a specific manufacturer or trade name is made to establish a standard of quality and to define a type of product and is not intended to indicate a preference for a manufacturer. It is the intent of these specifications to allow all manufacturers of equipment, products, etc., judged equal to the specified product to bid on a competitive basis.

B. Requests for substitutions or prior approvals shall be made as indicated in the Instructions to Bidders, General Conditions of the Contract for Construction, Supplementary General Conditions, Special Conditions and/or general requirements.

1.08 MEASUREMENTS

A. The Contractor shall verify all measurements and shall be responsible for the correctness of same, before ordering any materials or doing any work. No extra charge or compensation will be allowed for any differences between the actual measurements and those indicated on the drawings.

1.09 LAWS, PERMITS AND FEES

A. The entire electrical work shall comply with the rules and regulations of the City, Parish, and State, including the State Fire Marshal and State Board of Health, whether so shown on plans or not. The Contractor shall pay fees for permits, inspections, etc., and shall arrange with the inspecting authorities all required inspections. The Contractor shall contact utility companies and make arrangements for all service connections, verifying locations with the utility and paying all charges pertaining thereto.

1.10 SITE INSPECTION

A. The Contractor shall visit the site and familiarize himself with difficulties attendant to the successful execution of the work before bidding. Failure to visit the site shall not relieve the Contractor of the extent or conditions of the work required of him.

PART 2.00 PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. All materials, equipment, and accessories installed under this Contract, whether approved or not, shall be new and shall conform to all rules, codes, etc., as recommended or adopted by the National Association(s) governing the manufacture, rating and testing of such materials, equipment, and accessories.

2.02 SHOP DRAWINGS

A. The Contractor shall submit to the Architect complete descriptive and dimensional data on the following items for review and approval:
1. Disconnect Switches
2. Motor Control Center with Breakers
3. Dry Type Transformer
4. Automatic Transfer Switch
5. Panelboard
6. Telemetry Cabinet Devices and Controls
7. Variable Frequency Drive Motor Starters

PART 3.00 METHODS OF INSTALLATIONS

3.01 CONTRACTOR COORDINATION

A. The Drawings are diagrammatic in nature. Cooperate with other trades so the interferences of facilities and equipment will be avoided.

3.02 OPENINGS, CUTTING AND PATCHING

A. Cut all openings as required for the electrical work. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other Contractors. Caulk, flash or otherwise make weatherproof all penetrations through the roof and exterior walls.

3.03 PAINTING

A. No painting will be required by the Contractor except for touch-up of factory finishes on equipment furnished under this contract.

3.04 APPLICABLE GENERAL CODES AND REGULATIONS

A. All electrical work and equipment, in whole or in part, shall conform to the applicable portions of the following specifications, codes and regulations in effect on that date of invitation for bids, and shall form a part of this specification.
   1. National Electrical Code, 2011 Edition
   2. National Electrical Manufacturers Association Standards
   3. National Fire Protection Association Recommended Practices
   4. Local, City and State Codes and Ordinances
   5. National Board of Fire Underwriter's Recommended Practices
   6. Life Safety Code, 2012 Edition
   7. International Building Code

B. Equipment that has been inspected and approved by the Underwriter's Laboratory shall bear its label or appear on its list of approved apparatus.

3.05 TESTS AND INSPECTIONS

A. The Contractor shall assist in making periodic inspections or tests required by the Engineer. When requested, the Contractor shall provide the assistance of foremen and qualified craftsmen for reasonable duration of each test, etc.

3.06 SAFETY PRECAUTIONS DURING CONSTRUCTION

A. It shall be the Contractor's responsibility to furnish and install proper guards and instruction signs for prevention of accidents and to provide and maintain for the duration of construction any installations needed for safety of life and property.

3.07 SLEEVES, INSERTS AND OPENINGS

A. This Contractor shall plan work in advance of pouring concrete. He shall furnish and install all sleeves or openings required for passage of conduits, pipes, or ducts installed by him. This Contractor shall furnish and install inserts and hangers required to support cables, pull boxes, etc.

B. Sleeves shall be of 16-gauge galvanized sheet steel, rigidly supported and suitably packed to prevent ingress of wet concrete. If the sleeves, hangers, inserts, etc., are improperly installed, this Contractor shall, at his own expense, do all necessary cutting and patching to rectify the errors.

3.08 MOTOR AND CONTROL WIRING

A. Other Contractors will furnish and install motors. The Contractor shall install VFDs and connect motors and motor control wiring as required.

3.09 EXISTING TELEMETRY SYSTEM

A. Contractor shall be required to modify the existing telemetry cabinet. Work involved shall include installing a new dead front swing panel with new pump indicating lights, analog input cards, analog output cards, and reprogramming the existing PLC. Refer to drawings for descriptions of telemetry system modifications required.

B. Two (2) analog 4-input cards shall be provided. Analog inputs shall be used for five (5) pump speed, and one (1) well level. Two (2) analog 4-output cards shall be provided. Analog outputs shall be used to control pump speed.

C. The telemetry system PLC and remote HMI shall be reprogrammed to control the new 5-pump arrangement.

3.10 EQUIPMENT NAMEPLATE TAG

A. Each item of electrical equipment installed by the Contractor shall be provided with an engraved nameplate noting the equipment's function or designation. Nameplates shall be engraved laminated plastic with black letters on a white background. Letters shall be 1/4" high, all caps.

3.11 PANELBOARD SCHEDULES

A. The Contractor shall provide and affix typed panelboard schedules for each panelboard. Schedule will accurately list equipment served by each branch circuit.

3.12 COMPLETION

A. The Contractor shall leave all electrical equipment with proper connections, and in proper working order. He shall test the entire electrical system in the presence of the Engineer or his representative to show that it is properly installed. Contractor shall leave all panels and switches completely fused or complete with circuit breakers.

3.13 RECORD DRAWINGS

A. The Contractor shall furnish one (1) complete set of drawings on which any changes in the work shall be shown. These drawings must be turned over to the Engineer prior to final acceptance of the work. In the event unforeseen obstructions occur in the work, the Contractor shall confer with the Engineer and obtain his written consent before undertaking any deviation from the governing plans.

3.14 GUARANTEE

A. The Contractor shall guarantee to keep the entire electrical system as installed by him or his subcontractors in repair and in perfect working order for one (1) year from the date of the final Certification of Final Acceptance, and shall furnish free of cost to the Owner, all material and labor necessary to comply with the above guarantee; said guarantee shall be based upon defective material and workmanship. In any case where equipment has a factory warranty exceeding this one-year limit, the full extent of the warranty shall apply.

3.15 CLEANING

A. When all work has been finally tested, the Contractor shall clean all fixtures, equipment, conduits, ducts, and all exposed work. All cover plates and other finished products shall be thoroughly cleaned.

3.16 INSTRUCTION MANUALS

A. The Contractor shall provide three (3) operating and maintenance instruction manuals on all systems and equipment installed in the electrical work.

3.17 CONTRACTOR SPECIAL NOTE

A. The Contractor is again cautioned to refer to all parts of these Specifications and all Drawings, not just electrical sections, and the individual cross references made to other standard specifications or details describing any electrical work, which may be required under these other sections. The Contractor is cautioned to note carefully any other sections which may reference electrical work for this Contractor to fully understand the wiring requirements and electrical work that is required. Any conflicts found between the electrical sections of these Specifications or Drawings shall be immediately directed to the General Contractor for clarification.

B. These Specifications and the electrical Drawings size equipment, wire, conduit, etc. based on the horsepower of motors and/or wattages of equipment as shown on the plans or specified herein. The Contractor shall install electrical raceways, conductors, fuses, safety switches, breakers, contactors, starters or any other electrical equipment with the capacities to suit the horsepower and/or wattages of the equipment actually furnished and installed. The Contractor shall not furnish or install any electrical raceways, conductors, safety switches, contactors or motor starters of sizes smaller than those shown on the Drawings or specified herein. The Contractor shall coordinate with the various sections of the Specifications and/or Drawings and with the various Sub-Contractors to provide the properly sized equipment without additional cost to the Owner.

C. The Contractor shall be required to install electrical services underground. Contractor is cautioned to exercise extreme care when digging to not damage any existing utilities or equipment. Contractor shall be required to repair any utilities or equipment he may damage during construction.

D. The Contractor shall be required to modify existing equipment on site, including removal of items. Contractor shall coordinate all modifications to the existing equipment with the Owner. Equipment shutdown shall not be allowed unless coordinated with Owner in advance.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1.00 GENERAL

1.01 GENERAL REQUIREMENTS

A. All material furnished shall be new and shall conform to all rules and codes as recommended or adopted by the National Association governing the manufacture, rating and testing of the material. All electrical equipment shall be UL listed for the intended use.

PART 2.00 PRODUCTS

2.01 RACEWAYS AND FITTINGS

A. Raceways permitted on this project shall be rigid aluminum; liquid-tight flexible metal conduit; and rigid polyvinyl chloride (PVC) conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc.

B. Metallic conduit shall be rigid aluminum. Non-metallic conduit shall be schedule 40 PVC.

C. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. All fittings for rigid aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

2.02 EXPOSED CONDUIT

A. Exposed conduit shall be firmly supported on galvanized hangers; on brackets, hangers, or pipe straps; or by beam clamps. Conduit installed exposed shall be neatly aligned and run at right angles to the building walls or walls of the rooms in which they are installed. All exposed conduit shall be located to avoid all conflicts with architectural or mechanical components.

2.03 FLEXIBLE CONDUIT

A. Liquid-tight flexible metal conduit shall have a spiral wound, flexible, galvanized steel core and a tough extruded synthetic moisture-tight outer covering. All flexible conduits shall be UL listed.

2.04 WIRE (600 VOLT AND BELOW)

A. All conductors used in the work shall be of soft drawn annealed copper having a conductivity of not less than 98% of that of pure copper. Conductors shall be standard code gauge in size, insulated and shall have insulation rated for use at 600 volts.

B. Unless noted otherwise or specified, insulation shall be type THW, THWN, or THHN for sizes up to and including No. 2 AWG. Insulation for wire sizes larger than No. 2 AWG shall be type THW, XHHW, or THHN. Lighting fixture wire shall be heat resistant type TF (150°C) with 300-volt insulation minimum. Wires shall be of the single conductor type.

Sizes No. 8 AWG and larger shall be stranded. Sizes No. 12 thru No. 14 shall be single strand solid copper.

C. Throughout the system, all conductors shall be identified as to the phase and voltage of the system by color-coding in accordance with NEC 210.5. Color-coding shall be continuous the full length of the wire with surface printing at regular intervals on all conductors and for neutral conductors.

D. Color coding shall be as follows:

3phase, 480V System	1phase, 120/240V System
Phase 1-Brown	Phase 1-Black
Phase 2-Orange	Phase 2-Red
Phase 3-Yellow	
Neutral-Gray	Neutral-White
Ground-Green	Ground-Green

2.07 PVC CONDUIT

A. PVC Schedule 40 Conduit shall be used for application underground, encased, or exposed applications in accordance with the National Electrical Code (Article 347). Conduit shall be rated for use with 90° C conductors, UL Listed or approved equal. Material shall comply to NEMA Specification TC-2 (Conduit), TC-3 (Fittings) and UL 651 (Conduit) and 514b (Fittings). Conduit and fittings shall carry a UL label (Conduit - on each 10 foot length; Fittings - stamped or molded on each fitting). Conduit and fittings shall be identified for type and manufacturer and shall be traceable to location of plant and date manufactured. The markings shall be legible and permanent.

B. The Conduit shall be made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weather ability and heat distortion. Clean rework material, generated by the manufacturer's own conduit production, may be used by the same manufacturer, provided the end products meet the requirements of this specification. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables. The same manufacturer to assure system integrity shall produce conduit, fittings, and cement.

C. Testing and Acceptance Criteria: Conduit and fittings shall be tested in accordance with the testing requirements defined in NEMA TC-2, NEMA TC-3 and UL-651 and 514. The acceptance criteria shall be given in the same standards. All conduit and fittings shall be solvent cemented in applications in accordance with instructions from the manufacturer.

D. Continuous roll PVC conduits used for boring applications shall be schedule 80.

2.05 WEATHERPROOF RECEPTACLES

A. Weatherproof receptacles shall be GFCI duplex receptacles as specified under WIRING DEVICES, mounted in a cast iron type FD conduit box and fitted with a gasketed, Raintight While-In-Use Cover, thermoplastic housing with clear cover. Weatherproof receptacles

shall be flush mounted in exterior walls.

2.11 WIRING DEVICES

A. Wiring devices shall be as listed. The color of device shall match color of outlet cover plate. It shall be the responsibility of the Contractor to provide plugs, receptacles and fittings required for any equipment furnished or installed or connected under the contract.

	Leviton	P & S	Hubbell
Toggle Switches: 20A 120/277V Single pole	1221-I	20AC1-I	1221-I
Duplex Receptacle: 20A, 125V, NEMA 5-20R	5362-I	5362-I	5363-I
Ground Fault Circuit Interrupter: 20A, 125V, Feed Through, NEMA 5-20R	6899-I	2091-S	GF-5362-I

PART 3.00 EXECUTION

3.01 WIRING - GENERAL

A. Unless otherwise specified, all wiring shall be installed in conduit. No wire shall be smaller than No. 12 unless noted otherwise. Wiring for low voltage control may be #14 AWG. Wire for each branch circuit shall be of single size and type from the branch circuit protective device the last outlet of the circuit. BX wiring shall not be allowed.

B. Feeders, motor circuit conductors and main service entrance conductors shall run their entire length without joints or splices. Wiring for branch circuits shall run the entire length without splices, with splices and joints made only at outlets or in accessible junction boxes only when necessary and approved by the Engineer. Joints and splices in branch circuit wiring shall be made with compression type solderless connectors.

C. Connectors of the non-metallic screw on type are not acceptable. Terminations or splices for conductors No. 6 AWG and larger shall utilize bolted connecting lugs. All splices and terminations shall be insulated in an approved manner by an integral or separate cover or by taping to provide insulating value equal to that of the conductors being joined.

D. Type THW or THWN conductors may be connected directly to recessed fixtures only when the fixtures are equipped with outlet boxes listed by Underwriters Laboratories, Inc. for use with wire having insulation rated for maximum operating temperatures of 75°C (167°F); otherwise, for fixtures not rated for 75°C directly connection, use 125°C insulated conductors from the fixture to an outlet box placed at least one (1) foot, but not more than four (4) feet from the fixture.

E. Branch circuit home run numbers shown on the drawings shall be used as a guide for

connection of circuit wiring to similarly number protective devices in branch circuit panelboards. Requests for changes in the plans shall be directed to the Architect. No changes shall be made without approval from the Engineer.

F. Where the length of a power, receptacle or lighting fixture home run, from panel to first outlet, exceeds 75 feet for 20 amp, 120 volts circuits and 175 feet for 277 volt circuit, the conductor size shall be No.10 AWG or that shown on the drawings, whichever is larger.

3.02 ELECTRICAL SERVICE GROUNDING

A. Main electrical service equipment, conduit work, motors, panelboards and all other electrical equipment shall be effectively and permanently grounded. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code, Article 250 and local or State ordinances.

B. All conduit entering panelboards shall be grounded to the panelboard by means of a grounding type locknut installed on the inside of the panelboard. Where the continuity of the metallic conduit system is interrupted by a run of non-metallic conduit, a separate grounding conductor, sized in accordance with NEC Table 250.122 shall be run in the conduit with the insulated conductors. A separate grounding conductor, as described above or as called for on the plans, shall be run in the conduit with the circuit conductors for all circuits serving multi-outlet assemblies.

C. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The grounding screw on all grounding type receptacles shall be securely grounded to the outlet box using a No. 12 green insulated conductor attached to the outlet box with lug screw.

D. All switch legs shall include a green ground conductor connected to the circuit ground conductor and terminated in the switch outlet box.

3.03 CONDUIT - MATERIALS AND METHODS

A. Conduit shall be installed as per NEC and NEMA regulations and the manufacturer's recommendations. Conduit shall be as follows:

B. Rigid Aluminum Conduit shall be used for all conduits exposed to the weather

C. All conduits routed underground shall not be placed in building slab. Conduits larger than 1" routed under building slab shall be routed below the vapor barrier. Minimum conduit size allowed to be routed underground shall be 3/4". Conduits routed under building slab may be PVC.

D. Non-metallic conduit, minimum schedule 40 PVC, shall be permitted to be installed underground. Non-metallic conduit shall not be used in any environmental air plenum. If PVC conduit is run, a full-sized grounding conductor shall be pulled with the circuit conductors. PVC conduit shall not be run exposed. Where PVC conduit is run underground, it shall be encased in concrete or run minimum 24" below grade, or at the depth below grade shown on the drawings.

E. Flexible metal conduit or liquid-tight flexible metal conduit shall be used for the final connection of runs to motors. Flexible conduit shall be at least twelve (12) inches, but not more than 48 inches long. Where used, an external grounding conductor shall be run with conduit unless conductor is made as a part of the conduit.

3.04 CONDUIT - GENERAL

A. Fittings for rigid conduits shall be of a type especially designed and manufactured for their purpose. Rigid conduit joints for single conduit runs shall be made with threaded fittings made tight with at least five threads fully engaged. Compression type threadless fittings and setscrew type fittings shall not be used for rigid conduit. Fittings for rigid non-metallic conduit shall be solvent welded.

B. Where they enter boxes or cabinets that do not have threaded hubs, conduits shall be secured in place with galvanized locknuts inside and outside the cabinet and shall have bushings inside. Conduits larger than 1-1/4 inch shall have galvanized locknuts and galvanized bushings.

C. All conduits shall be installed concealed or as indicated or scheduled on the drawings and shall be of sufficient size to accommodate the required number of insulated conductors including equipment grounding conductor where such grounding conductor is required or specified.

D. Conduit runs shall be straight; elbows and bends shall be uniform, symmetrical and free from dents or flattening. Exposed conduits shall be installed with runs parallel or perpendicular to walls, ceilings or structural members and shall be located to avoid any conflicts with ceiling inserts.

E. Pull boxes shall be installed as required to permit proper installation of conductors and expansion fittings installed where conduit runs cross building expansion joints.

F. Conduit shall be held securely in place by hangers and fasteners of appropriate design and dimensions for the application. Support shall be such that no strain will be transmitted to outlet box and pull box supports. Wire shall not be used, with or without spring steel fasteners, clips or clamps, for the support of any conduit.

G. All conduits shall be cut square and reamed at the ends. The conduit system shall be complete and cleaned before any conductors are installed. Open ends of all conduits shall be capped until conductors are installed. A non-metallic fish wire shall be installed in all empty conduits. Empty conduit shall remain capped.

H. Contractor shall refer to National Electrical Code Appendix C, Conduit and Tubing Fill Tables for Conductors and Fixture Wire of the Same Size. Contractor shall refer to the appropriate table for the conduit and wire condition and shall install wiring in accordance with code requirements.

3.05 SUPPORTS AND FITTINGS

A. The Contractor shall furnish and install all supports for equipment under this contract.

Supports shall be spaced at intervals of eight (8) feet maximum for rigid conduit and five (5) feet maximum for PVC conduits and as necessary to obtain rigid support. Perforated strap supports will not be permitted.

B. All conduits shall be firmly secured with pipe clamps, conduit straps, or suspension hangers as appropriate. All conduit and accessories shall be rigidly supported to form a firm, well-braced installation. Joints shall be made tight with standard galvanized or sheradized couplings; corners turned with fittings, elbows, or long radius bends.

C. Support rack for motor disconnect switches and control panel shall be heavy duty construction with galvanized steel support members. Refer to drawing for rack description.

3.06 UNDERGROUND CONDUIT

A. Conduit run underground shall be routed at least 24" below top of grade. Conduit shall be securely supported on plastic spacers placed at intervals of 4' maximum and tied in place securely. Maintain 2" separation between conduits. Conduit joints shall be made up watertight to prevent the entrance of moisture. Provide warning tape approximately 12" above buried conduits.

B. Horizontal portions of conduit installed underground 1" and larger may be schedule 40 PVC plastic. Vertical portions of underground conduit shall be rigid galvanized steel with an approved metallic bushing at point of entry. Termination elbows shall be rigid galvanized steel installed using a plastic-to-metal adapter. A full-sized copper, grounding conductor shall be provided for the full length of each non-metallic conduit, terminated with an accessible connection to a ground lug on the cabinet or steel conduit extension.

C. Underground conduits shall be installed pitched to drain away from the building and shall use long radius bend instead of standard elbows. Empty conduits shall be capped with an approved plug. Where conduits, ducts, etc., pass under sidewalks, roads, or curbs, this Contractor shall use rigid steel conduit. The conduit shall extend at least 3' on either side of the sidewalk, road, etc.

D. Before installing cables in underground conduits, the Contractor shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit. If any concrete or obstructions are found the Contractor shall remove them and clear all conduits. All underground conduits shall be swabbed before cables are pulled.

3.07 DIRECTIONAL BORE

A. Conduits installed underground shall be installed using directional bore equipment where shown on the drawings. The installation shall utilize continuous roll, heavy wall PVC conduits in lieu of individual conduit sections.

3.08 EXCAVATING, BACK FILLING AND REPAIR

A. After trenches have been dug and all conduits properly installed, the trenches shall be back filled with material free of grass, roots and other debris in 6" layers and tamped thoroughly. After settling is complete, the surface shall be repaired to its original condition.

For trenches in areas to be paved, back fill shall be placed in 6" layers and each layer compacted to not less than 95% density.

B. The Contractor shall repair the ground disturbed in the installation of underground conduits. The dirt above the new conduits shall be compacted and final grading shall be made after the soil has had a chance to settle. The Contractor shall repair the ground to an equal or better condition than the condition prior to initiating the work. Concrete shall not be cut, but removed between construction joints. Finish on new concrete shall match or exceed the quality of finish on the existing concrete. Grass shall be planted in trenches cut in grassy areas. Plants shall be installed in landscaped areas. Any damaged plants, or plants that die because of work performed as part of this contract shall be replaced by the Contractor.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 20 00 - SERVICE AND DISTRIBUTION

PART 1.00 GENERAL

1.01 SYSTEM VOLTAGE

A. The distribution voltage shall be 480-volt, 3 phase, 3 wire, as provided from the new utility company overhead service, and transformed to 120/240 volt, single phase, 3 wire via dry type transformer furnished under this project and as described on the drawings.

PART 2.00 PRODUCTS

2.01 SAFETY SWITCHES

A. Furnish and install safety switches as shown on the Drawings. All switches shall be fused NEMA Heavy Duty Type HD and Underwriter's Laboratories listed. All switches shall have blades that are fully visible in the "OFF" position with the door open. Switches shall be dead-front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and aluminum conductor and front removable. All current carrying parts shall be plated to resist corrosion. Switches shall be quick-make, quick-break type. During operation of the switch, the movable contacts shall not be able to be restrained by the handle once the closing or the opening action of the contacts has been initiated. Switches shall have cover interlocks to prevent opening of the switch door while the switch is in the "ON" position or closing the switch with the door open. Switch shall have padlocking capabilities in the "OFF" position.

B. Safety switches shall be rated 600 volts for 480 volt service and rated 250 volts for 240 volt or 208 volt service. Switches shall be motor rated when used for motor loads. Switches shall be NEMA 4X Stainless Steel for outdoor or wet area locations. Switches shall be non-fused.

C. Safety switches shall be Square D Heavy Duty Class 3110 type, or Siemens Heavy Duty Vacu-Break type.

2.02 FUSES

A. All fuse holders shall be provided with dual-element, time-lag fuses as scheduled on the Drawings or as recommended by the equipment manufacturer. Fuses shall be rated 200,000 AIC. Fuses shall be Buss Fusetron, Economy Econ, or Gould Shawmut Tri-Onic for component protection and Buss Limitron, Economy Econolin, or Gould Shawmut Amp-Trap for circuit protection.

2.03 CIRCUIT BREAKER PANELBOARDS

A. Panelboards shall be sized as shown on the drawings and schedules, and shall be the bolted breaker panelboard type.

B. All branch breakers are to be quick-make, quick-break (over center toggle device) with trip

indication and common trip on all multiple breakers. Trip indication shall be clearly shown by breaker handle taking a position between "ON" and "OFF" position. Breakers shall be ambient compensated to carry full NEC load in 120 degree F room temperature. Panelboards shall have distributed phase busing throughout. Any two adjacent single pole breakers shall be replaceable by a two pole breaker, and any three adjacent single pole breakers shall be replaceable by a three pole breaker.

C. Minimum interrupting capacity of breakers shall be as shown on panel schedules. No breakers shall be rated less than 10,000 RMS symmetrical amperes.

D. Branch breakers shall be numbered 1, 3, 5, etc. from top to bottom beginning at the top of the left hand column so that #1 shall be on phase A, #3 on phase B, and #5 on phase C.

E. All breakers shall be bolt on type. Panelboards for 120/208 volt or 120/240 volt service shall be GE type NLAB, Square D type NQOD, Siemens type CDP-7, Cutler-Hammer POW-R-LINE series, or equal. Panelboards for 480/277 volt service shall be Square D type NEHB, Siemens type Sentron, Cutler-Hammer POW-R-LINE series, or equal.

F. Circuit breaker panelboard shall be installed within the motor control center.

2.04 DRY TYPE TRANSFORMERS

A. Contractor shall install dry type transformer(s) in the size and at the location(s) as shown on the drawings. Transformers will be used to step down voltage from 480 volts to 120/240 volts. All transformers shall comply and must be tested in accordance with UL, NEMA and ANSI standards. Transformers shall be energy efficient and shall meet NEMA Standard TP-1 requirements.

B. Transformers shall have the KVA ratings shown on the drawings. Transformers shall be single phase type rated for 480 volts primary and 120/240 volt secondary as shown on the drawings. Transformers shall be self-cooled. When transformer is delivering full KVA load continuously, temperature rise shall not exceed 150 degrees C above a 40 degree C ambient with 200 degrees C temperature class insulation system.

C. Transformers shall be panel mounted on isolation pads within motor control center.

D. Transformers shall be equal to Siemens ITE type 1D1N, Square D Class 7400 Dry Type, or approved equal.

E. Dry type transformer shall be installed within the motor control center as shown on the drawings.

PART 3.00 EXECUTION

3.01 COORDINATION

A. Contractor shall coordinate all service and distribution work with other crafts on the project.

3.02 TEST AND BALANCING

A. At such times as the Engineer directs, the Contractor shall conduct in the Engineer's presence operating tests to demonstrate the electrical systems are installed and will operate properly and in accordance with the requirements of the specifications. The Contractor shall furnish instruments and personnel required for such tests. Any work that is found to be defective, or material that are found to vary from the requirements of the drawings or specifications shall be replaced by the Contractor without additional cost of the Owner.

3.03 EQUIPMENT FUSING

A. All equipment shall be furnished complete with fuses as described herein and/or as shown on the Drawings. Contractor shall furnish one set of spare fuses for each size fuse furnished on the project. Fuses shall be delivered to Owner prior to acceptance of project.

B. Fusing for protective equipment shall be of the type specifically designed for the intended application. Fuses for service entrance rated equipment shall be Class L. Fuses for branch circuit protection shall be Class RK5 unless specified otherwise. Provide protective fuses as specifically required by the equipment manufacturer.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 24 19 - LOW VOLTAGE MOTOR CONTROL CENTERS

PART 1.00 GENERAL

1.01 SCOPE

A. The requirements of the contract, Division 26 applies to work in this section. Motor Control Centers as specified and as shown on the contract drawings shall be furnished and installed by the contractor.

1.02 RELATED DOCUMENTS

A. Related sections include the following:
1. Section 26 29 23 – Variable Frequency Drive Starters
2. Section 26 20 00 – Enclosed Switches and Circuit Breakers
3. Section 26 09 00 – Process Controls for Electrical Systems
4. Section 26 36 23 – Automatic Transfer Switches
5. Section 26 43 13 – Surge Protection Devices for Low Voltage Electrical Power Circuits.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data.

B. Drawings: Submit shop drawings for approval. Drawings shall include all dimensions, weights, electrical ratings, wiring diagrams and required clearances.

1.04 RELATED STANDARDS

A. The Motor Control Center shall be manufactured and tested according to the latest applicable standards of the following agencies:
1. UL 845 – Motor Control Centers
2. UL 489 – Molded Case Circuit Breakers
3. NEMA ICS 18-2001 – Motor Control Centers
4. NEMA ICS 2-322
5. NEMA ICS 1-2001 – Industrial Control and Systems: General Requirements
6. NFPA 70
7. National Electrical Code

1.05 QUALITY ASSURANCE

A. Manufacturer: For equipment required for the work of this section, provide products which are the responsibility of one manufacturer. Manufacturer shall have had produced similar electrical equipment for a minimum of 5 years.

B. Manufacturer shall be ISO 9001 certified.

1.06 DELIVERY, STORAGE AND HANDLING

A. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manual. One (1) copy of this document shall be provided with the equipment at the time of shipment.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

A. The motor control centers shall be Eaton Freedom 2100 series, Siemens TRISTAR series, or pre-approved equal.

2.02 GENERAL REQUIREMENTS

A. STRUCTURES

1. The enclosure shall be NEMA Type 4X. Vertical sections shall be constructed with steel divider sheet assemblies formed or otherwise fabricated to eliminate open framework between adjacent sections, and full-length bolted-on side sheet assemblies at the ends of the MCC(s).
2. Vertical sections shall be 90" high excluding mounting sills, 20" wide and 20" deep for front mounting of units. The width of the vertical section may be increased for special oversize units that cannot be accommodated in the standard 20" side structure.
3. Vertical structures shall be divided into six (6) 12" space factors and shall accommodate six (6) full size NEMA size 1 or 2 Full Voltage Non Reversing FVNR combination starters. MCC unit sizes shall be multiples of 1/2 space factor (6"). The vertical structures shall accommodate 6" high density and dual mounted units.
4. Back-to-back, front and rear unit mounting, structures shall be 21" deep maximum and shall accommodate 12 full size NEMA size 1 or 2 Full Voltage Non Reversing FVNR combination starters per section.
5. Each standard 20" and 24" wide structure shall be supplied with a vertical wireway. 4" wide wireways shall be installed on 20" wide structures and 8" wide wireways on 24" wide structures. Wireways shall be completely isolated from all power busses. The rear surface of the vertical wireway shall be painted white. A minimum of three (3) formed wire cable supports, extending the full depth of the vertical wireway shall be supplied in each vertical section. A separate hinged door shall cover the vertical wireway.
6. Each standard structure shall be supplied with a 12 inch top and six (6) inch bottom horizontal wireway that are continuous for the entire length of the MCC. The minimum horizontal wireway opening between sections is 40 square inches for the top and 30 square inches for the bottom horizontal wireway. A hinged door shall be supplied to cover the top horizontal wireway.
7. Doors are to be hinged in a manner that allows for the removal of individual doors without the removal of any door above or below. Unit doors shall be hinged on the left and vertical wireway doors on the right for unobstructed access to the units and associated vertical wireway. All doors shall be mounted on removable pin-type hinges and secured with steel quarter-turn, indicating type fasteners.

8. Wireways shall be completely isolated from bus compartments by suitable barriers. Sliding barriers between the horizontal bus and top horizontal wireway are not acceptable.
9. Removable top cover plates shall be provided for conduit entry to the top horizontal wireway and shall provide a minimum of 116 square inches of area for conduit location. Top cover plates shall be fabricated from 13 gauge steel.
10. All MCC structures shall be supplied with 1-1/8" high X 3" wide base channel sills that are continuous for the entire length of the shipping split. The base channel sills shall be fabricated of 7 gauge steel and shall be suitable for grouting the base channel sills in place, welding to leveling plates or securing to the floor with 1/2" anchor bolts. MCC structures shall be supplied with reversible bottom end cover plates to cover the bottom horizontal wireway and ends of the base channel sills. The bottom end cover plates shall be factory installed to cover the ends of the base channel sills to prevent entrance of dirt and rodents into the MCC when installed flush on the floor and shall be removable to expose the ends of the base channel sills if they are to be grouted into the floor.
11. A removable, full length lifting angle shall be provided for each shipping split of each MCC. The lifting angle shall be bolted to each side sheet or divider sheet of the shipping split to evenly distribute the weight of the MCC during lifting.
12. MCC's shall be assembled in such a manner that it is not necessary to have rear accessibility to remove any internal devices or components.

B. BUSSING

1. The main horizontal bus shall be:
   a. Silver plated copper rated amperage as shown on the drawings with a conductivity rating of 100% AICS. The horizontal bus bars shall be fully sized to carry 100% of the rated current the entire length of the MCC. Horizontal bus bars shall be mounted edge wise and located at the top of the MCC. Tapered horizontal bus is not acceptable. All power bus shall be braced to withstand a fault current of 65,000 RMS symmetrical amperes.
   b. The entire horizontal bus assembly must be located behind the top horizontal wireway at any amperage. Horizontal bus bars located behind usable unit space are not acceptable.
   c. The horizontal bus shall be isolated from the top horizontal wireway by a clear, flexible, polycarbonate, Lexan®, barrier allowing visual inspection of the horizontal bus without removing any hardware.
2. The vertical bus shall be:
   a. Shall be rated 1200 amperes. Vertical bus bars shall be fabricated of silver plated solid copper bars with a conductivity rating of 100% AICS.
   b. The vertical bus barrier support shall be designed as to effectively enclose each vertical bus bar. Provisions shall be made to close off unused unit stab openings in the vertical bus barrier with removable covers.
3. All bus ratings are to be based on a maximum temperature rise of 50°C over a 40°C ambient temperature.
4. Horizontal to vertical bus and horizontal bus splice connections shall be made with two (2) 3/8" grade 5 bolts and Belleville-type conical washers at each connection point. All connecting hardware shall be designed to be tightened from the front of the MCC without applying any tools to the rear of the connection.

5. The horizontal ground bus shall be rated 400 amp copper.

C. UNITS

1. Plug-in units shall connect to the vertical bus by means of self-aligning, tin plated copper stab-on connectors provided with spring steel back-up springs to insure positive connection to the vertical bus.
2. When vertical ground bus is specified, plug-in units shall include a ground stab which engages the vertical ground bus before the power stabs engage the vertical bus when the unit is inserted into the structure. When the plug-in unit is withdrawn from the vertical bus, the vertical ground stab shall release after the power stabs.
3. The interior of all MCC units shall be painted white, including unit top and bottom plates or isolation barriers.
4. All plug-in units 12" tall and larger will include two (2) auxiliary handles to aid in installation, removal and transporting plug-in units.
5. All plug-in units will include a racking mechanism to assure full engagement with the stab-on connectors with the vertical bus.
6. Plug-in units shall be provided with interference type draw-out to prevent complete removal of the plug-in unit from the structure in one motion. The interference mechanism shall also provide clear indication when the plug-in unit has been withdrawn to the "TEST" position.
7. A mechanical interlock shall be supplied on all plug-in units to prevent insertion of removal of a unit from the structure when the unit operator handle is in the ON position. This interlock may not be defeated.
8. Each 12" tall and larger plug-in unit shall be secured in the structure by two (2) readily accessible devices, one of which is tool operated. These devices shall be located at the front of the unit.
9. Plug-in units with NEMA Type B or C wiring shall be supplied with unit terminal block mounted on the right hand side of the unit, adjacent to the vertical wireway. The terminal blocks shall be mounted on a movable bracket that maintains the terminals inside the unit structure for normal operation and pivots into the vertical wireway exposing the terminals for wiring, test and maintenance.
10. All plug-in units shall include a positive means of grounding the unit to the structure at all times.
11. The MCC unit disconnect operator for 600 ampere maximum units shall operate in a vertical, up-down, plane. High density units shall have horizontal motion. All unit disconnects shall remain engaged with the disconnect device at all times, regardless of the unit door position. The operating handles shall be interlocked with the unit door so that the door can neither be opened with the disconnect device in the ON position, nor can the disconnect device be turned ON with the unit door open except by operation of a defeater mechanism. Indication of the disconnect device shall be clearly indicated by the position of the operating handle. When applied with circuit breaker devices, the handle shall also provide clear indication of a circuit breaker trip.
12. When pilot lights, push buttons or sector switches are specified, the devices shall be mounted in a formed metal device panel that is capable of accepting four (4) such devices in any combination. The device panel shall be secured to the unit door for normal operation, or mounted on the plug-in unit as required for unit removal and bench testing.

13. Pilot devices shall be heavy duty, oil tight 30mm devices with a NEMA 4 rating. Pilot device contacts shall be rated at 10A, 600 VAC (NEMA A600). The pilot device bodies shall be fabricated from metal.
14. Unit identification nameplate shall be provided for each unit. Nameplates shall be a black surface with white core. Engraving shall cut through the gray surface exposing white lettering of the unit designation. Nameplates shall be 1" tall by 3 1/2" wide. Adhesives or glues are not an acceptable means of mounting unit nameplates.

D. WIRING
1. The wiring shall be NEMA Class 1, Type B.

E. FEEDERS
1. Feeder disconnects shall be Siemens thermal-magnetic circuit breaker, or Eaton J250H breakers as specifically shown on drawings.

2.03 AUTOMATIC TRANSFER SWITCH

A. A service entrance rated automatic transfer switch shall be installed in the Motor Control Center. The MCC section enclosing the automatic transfer switch will require a larger section width than the standard width. The MCC size shall be adjusted appropriately. Refer to specification section 26 36 23 for description of the automatic transfer switch.

2.04 PANELBOARD

A. Motor Control Center shall include step down transformer and low voltage panelboard as shown on the drawings. MCC shall include primary and secondary breakers, transformer, and panelboard. Refer to specification section 26 20 00 for panelboard and transformer specifications.

2.05 SURGE PROTECTIVE DEVICES

A. Motor Control Center shall include surge protective device as shown on the drawings. Refer to specification section 26 43 13 for SPD specifications.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. Install per manufacturer's recommendations and contract documents. Coordinate installation with adjacent work to ensure proper sequence of construction, clearances and support.

3.02 TESTING

A. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.

3.03 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation.

3.04 FIELD TESTS

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 36 23 - AUTOMATIC TRANSFER SWITCHES

PART 1.00 GENERAL

1.01 SCOPE

A. Provide, install, and acceptance test an operable automatic transfer switch, as shown on the drawings, or required for the service. Equipment shall be new, factory tested, and installed in the new motor control center.

1.02 APPROVED MANUFACTURERS

A. The equipment, documentation, and services described in the generator portion of this specification and as shown on the plans are as provided by ASCO Power Technologies 300SE series, or approved equal.

B. Proposed substitutions shall include complete submittal data, as specified herein, clearly denoting any and all deviations and/or exceptions to the equipment specified. The complete proposal must be submitted for approval/disapproval not less than 10 days prior to the scheduled bid date. Proposed manufacturer shall be certified under ISO 9001.

1.03 SUBMITTALS

A. After award of contract, provide three sets of submittal documents. One set will be retained by the engineer and the remaining sets will be returned to contractor. Contractor will include two sets with the close out documents at the end of the project construction. Contractor shall submit additional copies for engineer's review if required for use by Contractor or Contractor's sub-contractors. Submit the following information for review:

1. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
2. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
3. Manufacturer's certification of prototype testing.
4. Manufacturer's published warranty documents.
5. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
6. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
7. Manufacturer's installation instructions.

1.04 WARRANTY

A. The Contractor shall warrant the completed emergency power system wiring and equipment, including automatic transfer switches, and panel boards to be free from inherent mechanical and electrical defects, for a period of one year from the date of final project acceptance.

B. The automatic transfer switch shall also include a 5-year, 1,500-hour comprehensive

warranty.

1.05 MANUALS

A. Operators and spare parts manuals shall be provided for all system equipment. The manuals shall include outline, interconnection, wiring, and control drawings accurately describing the equipment provided. Provide ladder logic for all programmable logic controllers in the system. Contractor shall furnish two copies of the operation, maintenance and spare parts manuals at the completion of the project to be included in the project close out documents. Also, provide an electronic copy of the operation, maintenance and spare parts manuals for User Agency's use.

PART 2.00 PRODUCTS

2.01 AUTOMATIC TRANSFER SWITCH – SERVICE ENTRANCE RATED

A. Furnish and install an automatic transfer switch (ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

B. Furnish an enclosure for the ATS that is for service entry. It shall provide all the proper disconnecting, protection, grounding and bonding required for service entrance equipment.

C. The automatic transfer switches and accessories shall conform to the requirements of:
UL 1008 - Standard for Automatic Transfer Switches
NFPA 70 - National Electrical Code
NFPA 110 - Emergency and Standby Power Systems
IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
NEC Articles 700, 701, 702
International Standards Organization ISO 9001
UL 891 According to this UL standard the equipment shall be labeled:
"Suitable for use only as service equipment."
UL 508 Industrial Control Equipment

D. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

E. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts. Inspection of all contacts shall be possible from the

front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

G. Where neutral conductors must be switched, the ATS shall be provided with fully rated neutral transfer contacts. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully rated AL-CU pressure connectors shall be provided.

H. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

I. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers.

J. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
   1. ANSI C37.90A/IEEE 472 Voltage Surge Test
   2. NEMA ICS – 109.21 Impulse Withstand Test
   3. EC801-2 Electrostatic discharge (ESD) immunity
   4. ENV50140 and IEC 801 – 3 Radiated electromagnetic field immunity
   5. IEC 801 – 4 Electrical fast transient (EFT) immunity
   6. ENV50142 Surge transient immunity
   7. ENV50141: Conducted radio-frequency field immunity
   8. EN55011: Group 1, Class A conducted and radiated emissions
   9. EN61000 –4 – 11 Voltage dips and interruptions immunity

K. The ATS shall be installed in the new motor control center. Provide strip heater with thermostat as required. Controller shall be flush-mounted display with LED indicators for switch position and source availability. It shall also include test and time delay bypass switches.

L. For those automatic transfer switches that are less than 1000 amperes, the connection between the normal disconnecting device and the ATS shall be made with the appropriate size cable. For those automatic transfer switches that are greater than 1000 amperes, the connection between the normal disconnecting device and the ATS shall be made with the appropriate size bus. Bus shall be silver plated copper rated no less than 1000 amps per square inch.

M. A pressure disconnect link shall be provided to disconnect the normal source neutral connection from the emergency and load neutral connections for 4-wire applications. A ground bus shall be provided for connection of the grounding conductor to the grounding electrode. A pressure disconnect link for the neutral to ground bonding jumper shall be provided to connect the normal neutral connection to the ground bus.

N. Control wiring shall be rated for 600 volt, UL 1015. Wires shall be placed in wire duct or harnessed, and shall be supported to prevent sagging or breakage from weight or vibration. All wiring to hinged doors shall be run through door terminal blocks or connection plugs.

O. Disconnecting and Overcurrent Protection Device: For those automatic transfer switches less than 1000 amperes, the normal connection shall be provided with a thermal magnetic, 3 pole, molded case circuit breaker with current ratings as shown on the plans. It shall have a thermal magnetic trip unit. For those automatic transfer switches rated above 1000 amperes, the normal connection shall be provided with a stationary mount, insulated case circuit breaker with a solid-state trip unit. The trip unit shall have an adjustable long time, short time, instantaneous, and ground fault trip settings. The insulated case circuit breaker shall trip open when the ground fault setting is exceeded.

P. Voltage and Frequency Sensing: The voltage of each phase of the normal source shall be monitored, with pickup adjustable to 95% of nominal and dropout adjustable from 70% to 90% of pickup setting. Single-phase voltage and frequency sensing of the emergency source shall be provided.

Q. Time Delays: An adjustable time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. An adjustable time delay shall be provided on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency. An adjustable time delay shall be provided on retransfer to normal, adjustable to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable. A 5-minute cool-down time delay shall be provided on shutdown of engine generator. All adjustable time delays shall be field adjustable without the use of tools.

R. Additional Features – The following additional features shall be included:

1. A set of gold-flashed contacts rated 10 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
2. A push-button type test switch shall be provided to simulate a normal source failure.
3. A push-button type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer to normal time delay whichever delay is active at the time the push-button is activated.
4. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact, closed, when the ATS is connected to the emergency source.
5. Indicating lights shall be provided, one to indicate when the ATS is connected to

the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.

6. Programmable Engine Exerciser - A seven or fourteen day programmable engine exerciser with digital readout display. Shall also include one form C N/O & N/C contact for availability of normal and emergency sources. Included "with or without" load control switch for exerciser period. The exerciser shall be backed up by a permanent battery. (Accessory 11BG)
7. In-phase Monitor - An In-phase monitor shall be inherently built into the controls. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The In-Phase monitor shall be specifically designed for and be the product of the ATS manufacturer.
8. Selective Load Disconnect - A double throw contact shall be provided to operate after a time delay, adjustable to 20 seconds prior to transfer and reset 0 to 20 seconds after transfer. This contact can be used to selectively disconnect specific load(s) when the transfer switch is transferred. Output contacts shall be rated 6 amps at 28 VDC or 120 VAC.

S. Withstand and Closing Ratings: The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings as be as follows when used with specific circuit breakers:

ATS Size	Withstand & Closing Rating MCCB	W/CLF
150 – 200	22,000A	200,000
225 – 400	42,000A	200,000
600 – 1200	65,000A	200,000
1600 – 2000	85,000A	200,000
2600 – 3000	100,000A	200,000

T. Tests and Certification: The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

U. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

V. Service entrance rated automatic transfer switches shall be ASCO 300SE Series, or approved equal.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. Installation shall comply with applicable codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

3.02 COORDINATION OF CONTROLS

A. The contractor shall install control wiring as required to properly start and stop the existing generator. Contractor shall also be responsible for coordinating the installation of control wiring between the existing transfer switches in the individual buildings with the new service entrance transfer switch to properly start and stop the new generator. Contractor will need to contact the manufacturers of the new and the existing transfer switches to insure the correct control wiring is installed, terminated, and any required start/stop sequencing controls are properly programmed.

3.03 FACTORY TESTS

A. Equipment supplied shall be fully tested at the factory for function and performance.

B. Transfer equipment factory tests: Each transfer switch supplied shall be factory tested before shipment. Factory tests shall include a complete functional test of the transfer switch controls, including calibration of the voltage sensors.

3.04 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested for compliance with the specification following completion of all site work. Representatives of the equipment manufacturer shall conduct on-site testing. The Engineer shall be notified in advance and shall have the option to witness the tests.

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 29 23 – VARIABLE FREQUENCY DRIVES

PART 1.00 GENERAL

1.01 SCOPE

A. This specification defines the minimum requirements for Variable Frequency Drives (VFD) and accessories for speed control of either constant or variable torque loads.

1.02 REFERENCES

1. UL 508C
2. CE
3. NEC
4. Canadian Underwrites Laboratory (C_{UL})
5. ISO 9001
6. IEEE519-1992

1.03 SUBMITTALS

A. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers, catalog information and catalog cut-sheets for all major components.

B. All drawings shall be in an 8.5" x 11" reproducible format, and incorporate the manufacturer's title block on the drawing.

C. This specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

D. Five (5) copies of all submittals shall be provided.

1.04 QUALITY ASSURANCE

A. The manufacturer shall be both ISO-9001 and ISO-14001 certified.

B. All products shall be CE marked; UL labeled, and meet the requirements of UL-508C.

C. To ensure quality and minimize infantile failures on the jobsite, all VFD's shall be completely tested by the manufacturer. The VFD shall operate a dynamometer at full load and speed under elevated temperature conditions.

D. All optional features shall be functionally tested at the factory for proper operation.

E. Factory test documentation shall be available upon request.

1.05 WARRANTY

A. A 6-year on-site warranty shall be provided such that the owner is not responsible for any warranty costs including travel, labor, parts, or other costs for a full 6 years from the date of manufacture of the Drive. Warranty shall cover line anomalies including electrical issues, load anomalies, accidental exposure to the elements or other acts of nature. The cost of the warranty shall be included in the bid.

PART 2.00 PRODUCTS

2.01 GENERAL

A. Furnish complete VFD as specified herein or in the equipment schedule for loads designated to be variable speed. VFD's shall be user-selectable for either constant or variable torque loads.

B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be a six-pulse input design, and the input voltage rectifier shall employ a full wave diode bridge; VFD's utilizing controlled SCR rectifiers shall not be acceptable. The output waveform shall closely approximate a sine wave. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform.

C. The VFD shall include a full-wave diode bridge rectifier and maintain a displacement power factor of near unity regardless of speed and load.

D. The manufacturer of the VFD shall demonstrate a continuous period of manufacturing and development of VFD's for a minimum of 40 years. VFD's that are brand-labeled are not acceptable.

E. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating.

F. The VFD shall utilize VVC^{PLUS}, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VVC^{PLUS} provides rated RMS fundamental voltage from the VFD. This allows the motor to operate at a lower temperature rise, extending its thermal life. VFD's that cannot produce rated RMS fundamental output voltage or require the input voltage to be increased above motor nameplate value to achieve rated RMS fundamental output voltage are not acceptable. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.

G. The VFD selected must be able to source the motor's full load nameplate amperage (fundamental RMS) on a continuous basis, and be capable of running the motor at its nameplate RPM, voltage, current, and slip without having to utilize the service factor of the motor.

H. The VFD shall offer a programmable motor parameter that allows the total number of poles of a motor to be programmed to optimize motor performance.

I. VFD shall automatically boost power factor at lower speeds.

J. The VFD will be capable of running either variable or constant torque loads. In variable torque applications, the VFD shall provide a CT-start feature and be able to provide full torque at any speed up to the base speed of the motor. In either CT or VT mode, the VFD shall be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.

K. An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. Feature shall optimize motor magnetization voltage. This feature shall dynamically adjust output voltage in response to load, independent of speed. Output voltage adjustment based on frequency alone is not acceptable for single motor VT configurations.

L. For multi-motor variable torque configurations, user-selectable load profile curves including VT-High, VT-Medium, and VT-Low shall be provided to ensure easy commissioning and improved energy efficiency. VFD's requiring the operator to assign load torque data-points to create a V/Hz profile, are not acceptable.

M. An initial ramp function shall be available to provide a different beginning ramp time, up to 60 seconds, for applications requiring a faster or slower ramp than the normal ramp.

N. A Dual Ramp Down feature shall include a Check Valve Ramp Down and a final Ramp feature. The Check Valve Ramp Down shall be programmable to gently seat a check valve and reduce the potential of damage from excess pressure while shutting down the system. Both time and end speed shall be programmable. On the Final ramp, the VFD shall be programmable to quickly stop the motor after seating of a check valve for a more rapid stopping than the normal ramp down setting.

O. VFD shall offer up to 4 separate PID controllers. One controller shall operate the drive in closed loop, while the other 3 provide control signals to other equipment. VFD's with PI controllers only are not acceptable.

P. An Auto-tuning PI controller output feature shall provide automated PI controller settings. Once the user accepts these settings, the VFD will save the settings to memory.

Q. An empty pipe fill mode shall be available to fill an empty pipe in a short period of time, and then revert to the PID controller for stable operation. Pipe fill mode shall have a programmable time to reduce water hammer in the system or fill the pipe at a unit per time rate.

R. VFD shall offer a motor spinning test that will run the motor at 5 Hz until the OK button is pressed to allow the user to determine if the motor is running in the correct direction

S. An embedded cascade pump controller shall be included to provide lead pump alternation, improved redundancy and, with an option card, shall operate with unequal sized pumps.

T. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes.

U. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.

V. An Automatic Motor Adaptation (AMA) function shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to spin the motor shaft or decouple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user-programmable.

W. The VFD shall have temperature controlled dual speed cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.

X. VFD shall provide full torque to the motor given input voltage fluctuations of up to +10% to -10% of the rated input voltage. Line frequency variation of +/- 2% shall be acceptable.

Y. 100hp, 130 FLA (460/3/60), NEMA 4X Rated Enclosure VFD shall be Danfoss Aqua Model FC 202-P75K-T4-E66-H2-X-G-X-X-X-X-SXXX-X-AX-BX-CX-5-XX-D0.

2.02 HARMONICS

A. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC link reactor shall be installed so that power fluctuations to the DC capacitors shall be reduced to increase capacitor life. VFD's without a DC link reactor shall provide a 5% impedance line side reactor.

2.03 PROTECTIVE FEATURES

A. VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3 msec.

B. VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.

C. VFD shall auto-derate the output voltage and frequency to the motor if an input phase is lost. This result will maintain operation without decreasing the life expectancy of the VFD. The use of this feature shall be user selectable and export a warning during the event.

D. Printed circuit boards shall be conformal coated to reduce the corrosion effect from environmental gases and other conditions. The conformal coating must meet IEC 721-3-3 Class 3C3 as standard.

E. Automatic "No-Flow Detection" shall be available to detect a no-flow situation in pump systems where all valves can be closed. This shall be functional in closed loop control or when controlled by an external signal.

F. Dry-pump detection shall be available to detect if the pump has run dry and trip the drive. A timer shall be included to prevent nuisance tripping.

G. End-of-Pump curve detection shall stop motor when the pump is operating outside of its programmed pump curve.

H. VFD shall provide flow compensation to reduce energy by adjusting the Setpoint to match changes in flow (friction loss). Flow compensation shall also operate in Cascade control mode.

I. VFD shall include current sensors on all three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.

J. VFD shall auto-derate the output voltage and frequency to the motor in the presence of sustained ambient temperatures higher than the normal operating range, so as not to trip on an inverter temperature fault. The use of this feature shall be user-selectable and a warning will be exported during the event. Function shall reduce switching frequency before reducing motor speed.

K. VFD shall auto-derate the output frequency by limiting the output current before allowing the VFD to trip on overload. Speed can be reduced, but not stopped.

L. The VFD shall have an integral RFI filter. VFD enclosures shall be made of metal to minimize RFI and provide immunity.

M. The VFD shall have a motor preheat function with the ability to be programmed to induce a small amount of current to the motor whenever it is at rest. This will prevent condensation inside the motor and help to extend its life without the need for space heaters or other external equipment.

N. VFD shall offer the ability to have back-up 24 VDC power to keep control logic powered in the event of a power failure. Back-up power shall keep communications, PID loops and drive logic operational until power is restored.

O. The VFD shall be provided with an optional enclosure that is IP66/NEMA 4X rated. A VFD that is mounted in a separate enclosure will not be acceptable.

2.04 INTERFACE FEATURES:

A. VFD shall provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.

B. VFD Keypad shall offer an INFO key that, when pressed, shall offer the contents of the programming manual for the feature that is currently in the display. The contents shall explain the feature and how the settings can be made.

C. VFD shall display all faults in plain text; VFD's which can display only fault codes are not acceptable.

D. The keypad shall feature a 6-line graphical display and be capable of digitally displaying up to five separate operational parameters or status values simultaneously (including process values with the appropriate engineering unit) in addition to Hand/Off/Auto, Local/Remote, and operating status.

E. Two lines of the display shall allow "free text programming" so that a description, or the actual name, of the equipment being controlled by the VFD can be entered into the display.

F. Keypad shall provide an integral H-O-A (Hand-Off-Auto) and Local-Remote selection capability, and manual control of speed locally without the need for adding selector switches, potentiometers, or other devices.

G. All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.

H. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.

I. VFD Display shall have the ability to display 5 different parameters about the VFD or load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different parameters.

J. VFD display shall indicate which digital inputs are active, and the status of each relay.

K. It shall be possible to toggle between three status read-out screens by pressing the Status key. Different operating variables with different formatting can be shown in each status screen.

L. VFD display shall indicate the value of any voltage or current signal connected to the analog input terminals.

M. VFD display shall indicate the value of the current on the analog output terminals.

N. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

O. Two-level password protection shall be provided to prevent unauthorized changes to the programming of the VFD. The parameters can be locked via a digital input and/or the unit can be programmed not to allow an unauthorized user to change the parameter settings.

P. A quick setup menu with factory preset typical parameters shall be provided on the VFD to facilitate commissioning. Use of macros shall not be required.

Q. A digital elapsed time meter and kilowatt hour meter shall be provided in the display.

R. VFD shall offer as standard an internal clock. The internal clock can be used for: Timed Actions, Energy Meter, Trend Analysis, date/time stamps on alarms, Logged data, Preventive maintenance, or other uses. It shall be possible to program the clock for Daylight Saving Time / summertime, weekly working days or non-working days including 20 exceptions (holidays etc.). It shall be possible to program a Warning in case clock has not been reset after a power loss.

S. Battery back-up shall be provided to maintain internal clock operation during power interruptions. Battery life shall be no less than 10 years of normal operation.

T. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.

U. All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.

V. There shall be six fully programmable digital inputs for interfacing with the systems external control and safety interlock circuitry. Two of these inputs shall be programmable as inputs or outputs.

W. The VFD shall have two analog signal inputs. Inputs shall be programmable for either 0 - 10V or 0/4-20 mA.

X. One programmable analog output shall be provided for indication of a drive status. This output shall be programmable for output speed, voltage, frequency, motor current and output power. The analog output signal shall be 0/4-20 mA.

Y. The VFD shall provide two user programmable relays with 75 selectable functions. Two form 'C' 230VAC/2A rated dry contact relay outputs shall be provided.

Z. Floating point control interface shall be provided to increase/decrease frequency in response to external switch closures.

AA. The VFD shall accept a NC motor temperature over-temperature switch input, as well as possess the capability to accept a motor thermistor input.

BB. The VFD shall store in memory the last 10 faults with time stamp and recorded data.

CC. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until isolation valves, seal water pumps or other types of auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.

DD. The VFD shall be equipped with a standard RS-485 serial communications port and front-of-drive accessible USB port. Danfoss FC or ModBus RTU shall be integrally mounted.

EE. A Windows® compatible software to display all monitoring, fault, alarm, and status signals shall be provided. This software shall allow parameter changes, storage of all VFD operating and setup parameters, and remote operation of the VFD.

2.05 ADJUSTMENTS:

A. The VFD shall have an adjustable output switching frequency.

B. Four complete programming parameter setups shall be provided, which can be locally selected through the keypad or remotely selected via digital input(s), allowing the VFD to be programmed for up to four alternate control scenarios without requiring parameter changes.

C. In each programming set up, independent acceleration and deceleration ramps shall be provided. Acceleration and deceleration time shall be adjustable over the range from 0 to 3,600 seconds to base speed.

D. The VFD shall have four programmable "bypass frequencies" with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency. The feature shall offer a semi-automatic program to simplify the setup.

E. VFD shall include an automatic acceleration and deceleration ramp-time function to prevent nuisance tripping and simplify start-up.

F. In each programming setup, independent current limit settings, programmable between 50% and 110% of the drives output current rating, shall be provided.

G. PID parameter settings shall be adjustable while the VFD is operating, to aid in tuning the loop at start up. The VFD will also be capable of simultaneously displaying set-point reference and feedback values with appropriate engineering units, as well as output frequency, output current, and run status while programming the PID function.

H. The VFD will include a "loss of follower" function to detect the loss of process feedback or reference signals with a live-zero value, with a user-selectable choice of responses (go to set speed, min speed, max speed, stop, stop and trip).

I. A Sleep Mode function shall be provided to reduce wear and heating of the pump and other equipment in periods where system demands are minimal. This function will operate in both open and closed loop modes:

1. In closed loop process control, when the output speed drops to a user-programmed minimum value ("sleep frequency") for a specified time ("sleep mode timer"), the drive will enter sleep mode and either go into standby, or boost mode before entering standby. The drive shall automatically restart the motor once the output of the PID processor exceeds a programmable value "wake up frequency".
   a. Boost mode shall prevent short-cycling of the motor by temporarily adjusting the set-point by a user programmable percentage. Upon reaching this value, the unit will go into standby.

2. In open loop, the drive shall be capable of entering sleep mode if the input reference drops below a user programmable value. When the input reference increases above a programmable reference, the drive will automatically start.

J. An integral motor alternation function shall be provided to enable the drives output to alternate between two motors. The alternation interval shall be programmable in hours. This function shall operate external relays as required to control the motor alternation sequence. A dwell time shall be integral to the function and can prevent damage to the motor contactors.

K. The VFD will include a user selectable Reset function, which enables the selection of between zero and twenty restart attempts after any self-clearing fault condition (under-voltage, over-voltage, current limit, inverter overload and motor overload), or the selection of an infinite number of attempts. The time between attempts shall be adjustable from 0 through 600 seconds.

L. An automatic "on delay" function may be selected from 0 to 120 seconds.

M. The VFD will include a user-selectable Auto-Restart function that enables the VFD to power up in a running condition after a power loss, to prevent the need to manually reset and restart the VFD.

N. VFD shall catch a rotating motor operating either in forward or reverse at up to full speed.

O. The VFD shall include an integral pump controller to automatically stage and de-stage up to eight (8) pumps in either standard cascade or leader follower mode, utilizing the VFD's PID loop controller feature to regulate either pressure, level, or flow in a system. The controller shall be compatible with systems having multiple VFD's, or with a VFD "master" and either soft starter or across-the-line follower unitsAn integral motor alternation function shall be provided to enable the output of the drive to alternate between two motors. The alternation interval shall be user-programmable in hours. This function shall operate external relays as required to control the motor alternation sequence. A dwell time shall be integral to the function and can prevent damage to the motor contactors.

2.06 SERVICE CONDITIONS:

A. The ambient temperature of the VFD shall be -10 to 50°C (14 to 122°F), with a 24-hour average not to exceed 45°C.

B. 0 to 95% relative humidity, non-condensing.

C. Elevation to 1000 meters (3,300 feet) without derating.

D. VFD's shall be rated for line voltage 380 to 480VAC with +10% to -10% variations. Line frequency variation of ± 2% shall be acceptable.

E. No side clearance shall be required for cooling of the units.

PART 3.00 EXECUTION

3.01 EXAMINATION:

A. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.

B. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

3.02 START-UP

A. A factory-authorized service technician shall perform start-up on each drive. ("Startup" shall not include installation or termination of either power or control wiring.) Start-up costs provided with the bid shall include time and travel for the estimated number of visits required, but shall not be less than at least one half-day with travel. Upon completion, a start up service report shall be provided.

- END -

DIVISION 26 - ELECTRICAL
SECTION 26 43 13 - SURGE PROTECTION DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1.00 GENERAL

1.01 SCOPE

A. This section describes the materials and installation requirements for surge protective devices (SPD) for the protection of all AC electrical circuits.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. Other sections that may relate to the work in this section include, but are not limited to, the following:
   1. Section 26 20 00 – Service and Distribution

1.03 SUBMITTALS

A. Submit shop drawings and product information for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location, and customer order number shall identify all transmittals.

B. Submittals shall include UL 1449 3rd Edition Listing documentation verifiable by visiting www.UL.com, clicking "Certifications" link, searching using UL Category Code: VZCA.
   1. Short Circuit Current Rating (SCCR)
   2. Voltage Protection Ratings (VPRs) for all modes
   3. Maximum Continuous Operating Voltage rating (MCOV)
   4. I-nominal rating (I-n)
   5. SPD shall be Type 1 UL listed and labeled

C. Upon request, an unencapsulated but complete SPD formally known as TVSS shall be presented for visual inspection.

D. Minimum of ten (10) year warranty

1.04 RELATED STANDARDS

A. The following codes and standards shall be referenced:
   1. IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits,
   2. IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits,
   3. IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
   4. National Electrical Code: Article 285
   5. UL 1283 - Electromagnetic Interference Filters
   6. UL 1449, Third Edition, effective September 29, 2009 – Surge Protective Devices

1.05 LISTING REQUIREMENTS

A. SPD shall bear the UL Mark and shall be Listed to most recent editions of UL 1449 and UL 1283. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification.

B. SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA. Products or parameters without posting at UL.com shall not be approved.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm with at least ten (10) years experience in manufacturing transient voltage surge suppressors.

B. Manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.07 DELIVERY, STORAGE AND HANDLING

A. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manuals. One (1) copy of this document to be provided with the equipment at time of shipment.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

A. Provide an externally mounted transient voltage suppressor as described herein.

B. Manufacturer and/or manufacturer's model number listed in this Specification are used to establish general style, type, character, and quality of product desired. Similar items manufactured by manufacturers other than those listed will be considered, providing submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders.

C. Where no manufacturer or model number are given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid Approval is not required.

D. Subject to compliance with the specified requirements, provide products by one of the following manufacturers:
   1. Siemens

2. Advanced Protection Technologies
3. Asco Power Systems

2.02 SURGE PROTECTIVE DEVICE FEATURES

A. SPD shall be UL 1449 labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

B. SPD shall be UL 1449 labeled as Type 1 intended for use without need for external or supplemental overcurrent controls. Internal overcurrent and thermal overtemperature controls shall protect every suppression component of every mode, including N-G. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

C. SPD shall be UL 1449 labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

D. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.

E. Standard 7 Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

F. If a dedicated breaker for the SPD is not provided in the switchboard, the service entrance SPD shall include an integral UL Recognized disconnect switch. A dedicated breaker shall serve as a means of disconnect for distribution SPD's.

G. SPD shall meet or exceed the following criteria:
1. Minimum surge current capability (single pulse rated) per phase shall be:
   a. Service Entrance applications:
      1. Siemens Model TPS3 12 with Maximum 7-Mode surge current capability shall be 300kAper phase.
      2. Advanced Protection Technologies Model TE_XAS30 series with Maximum 7-Mode surge current capability of 300kA per phase.
   b. Distribution applications:
      1. Siemens Model TPS3 12 with Maximum surge current capability of 200kA per phase.
      2. Advanced Protection Technologies Model TE_XAS20 series with Maximum surge current capability of 200kA per phase
   c. Branch Panel applications:
      1. Siemens Model TPS3 12 with Maximum surge current capability of 100kA per phase.
      2. Advanced Protection Technologies Model TE_XDS104 series with Maximum surge current capability of 100kA per phase
2. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
208Y/120V	700V	700V	700V

480Y/277V	1500V	1500V	1500V

H. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277V	20%	320V

I. SPD shall include a serviceable, replaceable module (excluding Distribution).

J. Service Entrance SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50dB at 100kHz.

K. SPD shall have a warranty for a period of ten (10) years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period.

L. Service Entrance SPDs shall be equipped with the following diagnostics:
1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
2. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
3. Form C dry contacts
4. Surge Counter
5. No other test equipment shall be required for SPD monitoring or testing before or after installation.

M. Distribution Panels and Branch Panels SPDs shall be equipped with the following diagnostics:
1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
2. No other test equipment shall be required for SPD monitoring or testing before or after installation.

N. Surge protection devices installed for individual equipment items shall meet or exceed the following criteria:
1. Minimum surge current capability (single pulse rated) per phase shall be:
   a. Siemens Model TPS3_0305 series with dry contacts and audible alarm and surge current capability shall be 50kA per phase.
   b. Advanced Protection Technologies Model S50A series with dry contact and surge current capability shall be 50kA per phase.
2. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
208Y/120V	600V	1000V	1000V
480Y/277V	1200V	2000V	1000V

3. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V

480Y/277V	20%	320V

4. Furnished with NEMA 4X Polycarbonate enclosure.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. The installation shall meet the following criteria:
1. Install per manufacturer's recommendations and contract documents.
2. Install units plumb, level and rigid without distortion
3. One primary suppressor shall be installed external to the service entrance in accordance with manufacturer instructions.
4. Service Entrance SPD shall be installed on the line or load side of the main service disconnect.
5. Service Entrance SPD ground shall be bonded to the service entrance ground.
6. At Service Entrance or Transfer Switch, a UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60A breaker is not available.
7. One SPD shall be installed external to each designated distribution panelboard.
8. At Distribution, MCC and Branch, TVSS shall have an independent means of servicing disconnect such that the protected panel remains energized. A 30A breaker (or larger) may serve this function.
9. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.
10. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs.
11. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

3.02 ADJUSTMENTS AND CLEANING

A. Remove debris from SPD and wipe dust and dirt from all components.

B. Repaint marred and scratched surfaces with touch up paint to match original finish.

3.03 TESTING

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.

B. Check all installed panels for proper grounding, fastening and alignment.

3.04 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

- END -