ELLIS & ASSOCIATES

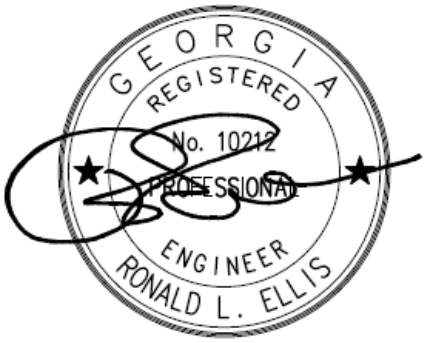
Specifications

Contract B
2023 Hills & Dales Lift Station, Force Main & Sewer Improvements For the City of LaGrange, Georgia

January 30, 2023

Prepared for:
City of LaGrange, Georgia
200 Ridley Avenue
LaGrange, Georgia 30240

Prepared by:
Ronald L. Ellis & Associates, Inc.
Consulting Engineers
P.O. Box 1150
Pelham, Alabama 35124



01/30/2023

CITY OF LAGRANGE, GEORGIA
CONTRACT B
2023 HILLS & DALES LIFT STATION, FORCE MAIN & SEWER IMPROVEMENTS

TABLE OF CONTENTS

DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

DIVISION 1 - GENERAL REQUIREMENTS

CITY OF LAGRANGE, GEORGIA
CONTRACT B
2023 HILLS & DALES LIFT STATION, FORCE MAIN & SEWER IMPROVEMENTS

TABLE OF CONTENTS

CITY OF LAGRANGE, GEORGIA
CONTRACT B
2023 HILLS & DALES LIFT STATION, FORCE MAIN & SEWER IMPROVEMENTS

TABLE OF CONTENTS

DIVISION 10, 11, 12, 13 & 14 - (Not Used)

DIVISION 15 - MECHANICAL

DIVISION 16 - ELECTRICAL

DIVISION 0

BIDDING AND CONTRACT REQUIREMENTS

SECTION 00010

NOTICE TO CONTRACTORS

CONTRACT B
2023 HILLS & DALES LIFT STATION, FORCE MAIN & SEWER IMPROVEMENTS

Sealed Proposals shall be addressed to Jeremy Andrews, Purchasing Agent of the City of LaGrange, and marked "Bid for Construction of Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements." All Bids shall be received by The City of LaGrange, mail or in person at the City Hall, Office of Purchasing, Third Floor, 200 Ridley Avenue, LaGrange, Georgia 30240 until 2:00 p.m., local time on **Tuesday, March 7, 2023**. The Bids will be publicly opened and read aloud.

The Work to be performed under Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements includes the following:
1) 240 GPM Package Lift Station, including a 6' diameter by 21' deep Wetwell, a 6' diameter by 4' deep Valve Vault, 20 HP KSB Pumps and all accessories, Complete per Plans,
2) Access Road for the Project, Complete per Plans,
3) 3" Sewage Surge Relief Valve, 5' diameter Manhole and accessories, Complete per Plans,
4) 4" Flow Meter with Controls, Vault and piping, Complete per Plans,
5) 80 KW Generator and Concrete Pad, Complete per Plans,
6) Electrical associated with the Lift Station, Complete per Plans,
7) 450 LF of 6" HDPE, DR 11 (DIPS) Force Main, Complete per Plans,
8) 100 LF of 10" PVC SDR26 Sewer, Complete per Plans,
9) 340 LF of 8" PVC SDR26 Sewer, Complete per Plans,
10) 5 EA 4' Diameter Sewer Manholes, various Depths, Complete per Plans,
11) 1 LS Erosion Control Plan Requirements, Complete per Plans,
12) 1 LS Mobilization,
13) 1 LS Demobilization,
14) Allowance for Field Testing of Materials, only if approved by the Engineer for Payment.
15) The Project Also Includes the required clearing, grading, excavation, backfill, testing and all other appurtenances and accessories, refer to the Plans.

Plans, Specifications and Contract Documents may be examined in the office of the Director of Utilities, LaGrange City Hall, Monday through Friday, 9:00 a.m. to 3:00 p.m. Contact Ronald L. Ellis, Ellis & Associates, Inc. at ron@rlellisco.com to obtain an electronic copy of Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements. All bidders should submit any and all questions concerning the Plans and Specifications to Ellis & Associates by email to: ron@rlellisco.com.

All Bidders must have a State of Georgia Utility Contractors License and must employ a state Utility Manager Certificate holder in compliance with Act O.C.G.A. 43-14.

One contract shall be awarded covering all the work of this Contract and the maximum time of completion shall not exceed **120** consecutive calendar days from the commencement date established by the Notice to Proceed.

All proposals shall be accompanied by a Bid Bond in amount equal to five percent (5%) of the Bid Amount. The Bid Bond shall be forfeited to the City of LaGrange, Georgia, as liquidated damages if the BIDDER fails to execute the Contract and provide Performance and Payment Bonds within ten (10) days after being

notified that they had been awarded the Contract.

A Performance Bond and Payment Bond such as described in Specification Sections 00610 and 00620 will be required of the successful BIDDER. The Performance Bond must be in the penal amount of 100% of the Contract price and the Payment Bond shall be in the penal amount of 100% of the Contract price.

Surety and insurance companies must have an AM Best rating of A-6 or greater, be listed in the Federal Registry of Companies holding Certificates of Authority and Acceptable Sureties on Federal Bonds, be licensed by the Georgia Insurance Department and the Georgia Secretary of State to do business in the State of Georgia.

E-Verify Requirements: All Contractors and Subcontractors bidding and performing work for the City of LaGrange, Georgia must participate in the E-Verify Program pursuant to the Georgia Security and Immigration Compliance Act (SB 529).

The award will be made to the low, responsive, responsible BIDDER. No bid may be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for the receipt of bids. The City of LaGrange, Georgia, reserves the right to reject all bids, to waive informalities and to readvertise.

Additional Bid Information: The following Equipment & Materials will be furnished by the Owner:

1. 240 GPM Package Lift Station including;
   a. 6’ diameter by 21’ deep Wetwell, 6’ diameter by 4’ deep Valve Vault, with all piping & valves.
   b. Two KSB Pumps - 20HP.
   c. Duplex Control Panel.
2. 80 KW Generator & ATS.
3. 3” Sewage Surge Relief Valve & accessories.
4. 4” Mag Flux Flow Meter & Controls.
5. 6” HDPE DR 11 Force Main Pipe, 2” HDPE Water Line Pipe, 10” PVC SDR26 Sewer Pipe, 8” PVC SDR26 Sewer Pipe and Locate Tape.

Patrick Bowie
Director of Utilities
City of LaGrange
City Hall
200 Ridley Avenue
LaGrange, Georgia 30240

END OF SECTION

SECTION 00100

INFORMATION TO BIDDERS

1. PREPARATION OF PROPOSALS

A. Bidders shall use only the proposal forms provided in the documents or by Addendum. All blank spaces in these forms shall be filled in, in both words and figures where required. Written amounts shall govern in case of discrepancy between the amounts. **The entire Bid Document Set shall be submitted with the Bid.**

B. Prices quoted shall be F.O.B. with freight and full insurance paid by Bidder, to the jobsite, in LaGrange, Georgia.

C. The Bidder shall acknowledge receipt of all addendums in the proposal. Proposals without acknowledgment or without the addendum enclosed will be considered non responsive.

D. **Each bid must be submitted in a sealed envelope bearing on the outside the name of Bidder, the Bidder's State Utility Contractor's License Number, his address, and the name of the project for which the bid is submitted. Any bid which is not properly prepared and accompanied by required Bonds and Certifications may be rejected by the Owner.**

2. SUBMISSION OF PROPOSALS

A. All Proposals must be submitted in tact not later than the time prescribed, at the place noted.

3. ADDENDA

A. Any addenda issued by the Engineer during the period of bidding shall be included in the Proposal and in the Executed Contract. Such addenda shall become a part thereof and modify specifications and drawings accordingly.

4. BID SECURITY

A. All Proposals shall be accompanied by a Bid Bond in amount equal to five percent (5%) of the Total Base Bid Amount. The Bid Bond shall be forfeited to the City of LaGrange, Georgia, as liquidated damages if the BIDDER fails to execute the Contract and provide Performance and Payment Bonds within ten (10) days after being notified that he had been awarded the Contract.

5. PERFORMANCE AND PAYMENT BONDS FOR CONTRACT

A. A Performance Bond and Payment Bond such as described in Specification Sections 00610 and 00620 will be required of the successful Bidder. Performance Bond must be in the penal amount of 100% of the Contract price.

B. Surety and insurance companies must have an AM Best rating of A-6 or greater, be listed in the Federal Registry of Companies holding Certificates of Authority and Acceptable Sureties on Federal Bonds, be licensed by the Georgia Insurance Department and the Georgia Secretary of State to do business in the State of Georgia.

6. FAILURE TO EXECUTE THE CONTRACT AND FURNISH BONDS

A. The Bidder who has a Contract awarded to him and who fails to promptly and properly execute the Contract and furnish the required bond(s) shall forfeit the bid security that accompanied his bid, and the bid security shall be retained as liquidated damages by the Owner, and it is agreed that this said sum is a fair estimate of the amount of damages the Owner will sustain in case the Bidder fails to enter into a Contract and furnish the bond(s) as hereinbefore provided.

7. WITHDRAWAL OF BIDS

A. No bid may be withdrawn for a period of sixty (60) days after the scheduled closing time for the receipt of bids.

8. LICENSES AND PERMITS

A. The successful low Bidder shall obtain and pay for all licenses and permits required by the State, County, and City authorities having jurisdiction over the various phases of this Contract.

9. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

A. Refer to Section 00800.

10. TAXES

A. Contractors shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work. The proposal prices shall include the total cost of all such taxes.

11. METHOD FOR AWARD OF CONTRACT

A. **If at the time this contract is to be awarded, the lowest Total Base Bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the Contract. The Contract will be awarded based on the Total Base Bid.**

12. CONTRACT WEEKLY WORK SCHEDULE

A. **The time for completion of this project is based on a standard weekly work schedule of Monday through Friday. No work on shall be scheduled or performed on Saturday, Sunday or Holidays, unless emergency work is approved by the Owner.**

END OF SECTION

SECTION 00300

PROPOSAL

MADE BY _____

ADDRESS _____

TO: The City of LaGrange, Georgia

The undersigned, as Bidder, proposes and agrees, if this Bid is accepted, to enter into a Contract with The City of LaGrange, Georgia in the form of Contract specified and shown in the attached Contract Documents, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation, and labor necessary to complete the construction of the Work described in the Notice To Contractors, and in the Contract Documents attached hereto, which are hereby referred to and made a part of the same extent as if fully set out herein, and in full and complete accordance with the shown, noted described and reasonably intended requirements of the Plans, Specifications and Contract Documents, to the full and entire satisfaction of the Owner. The Bidder understands that no money will be allowed for extra Work except as set forth in the attached Contract Documents.

The Bidder declares that he has examined the site of the Work, that he has fully informed himself of conditions that would affect the proposed Work, that, prior to the tender of his bid, he has examined the Plans, Specifications and Contract Documents for the Work and has read all special instructions and provisions contained in the Documents, and that he has satisfied himself with respect to the quality and extent of Work to be performed.

The Bidder declares that he understands that, when quantities of Work for which unit price bids are requested are shown in the Notice to Contractors for Bids and in the Proposal, such quantities are approximate only and are subject to either increase or decrease, that, should the quantities of any of the Work items be increased, the Bidder proposes to perform the additional Work at the unit prices bid by him, that should the quantities of any of the Work items be decreased, payment will be made only for the actual quantities of Work performed and such payment will be based upon the unit prices bid by him, and that he shall make no claim for profits anticipated on the decrease in quantities of Work. Actual quantities will be paid for as the Work progresses, in accordance with the provisions of the Contract, and such quantities shall be subject to final measurements and determinations made upon completion of the Work. **Refer to Section 01152, I.10 Explanation of Bid Items and Payment, for a description of the bid items and the unit bid price for each item. Also, refer to Section 00800, 1.C. for a description of Equipment & Materials furnished by the Owner for this Contract.**

The Bidder agrees to perform the Work described in the Contract Documents for the following Unit prices and/or Lump Sum prices on the Base Bid Form included in Section 00300.

The Bidder understands that the Owner reserves the right to reject any or all bids, to waive any informality in any bid, and to accept any bid considered to be advantageous to the Owner.

The Bidder agrees that his bid shall be valid for a period of sixty (60) calendar days after the date set for receipt of bids, and shall not be withdrawn for a period of sixty (60) calendar days after the date set for receipt of bids.

The Bidder has attached hereto a Bid Bond executed by a Surety Company authorized to do business in the State of Georgia (with valid Power-of-Attorney attached) made payable to The City of LaGrange, Georgia in the amount of 5% of his bid amount.

The Bidder agrees that, should he be notified that his Bid on the Work has been accepted, he will, within ten (10) days from receipt of such Notice of Award, execute the Contract bound herein, and furnish the Bonds and Certification of Insurance Coverage, in all accordance with the requirements of the Contract Documents.

The Bidder further agrees that, in case of failure on his part to execute said Contract, and to furnish all Bonds required by the Contract Documents, within ten (10) consecutive calendar days after receipt of Notice of Award of Contract to him, the monies payable to the Obligee of his Bid Bond, in accordance with the terms and conditions of the Bond, shall be paid to the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure on the part of the Bidder.

The Bidder hereby agrees that, should the Work under the Contract be awarded to him, he will commence Work under this Contract on or before a date to be specified in the "Notice to Proceed" issued by the Owner, and that he will fully complete the Contract within the consecutive calendar days specified in Section 00800 - Supplementary Conditions or pay liquidated damages at the rate per consecutive day specified in Section 00800 - Supplementary Conditions.

The undersigned bidder states that he fully understands the meaning of "low, responsive, responsible Bidder", as defined in these Documents, and that these criteria will be applied in the evaluation of this Bid.

The Bidder acknowledges receipt of the following Addenda:

_____

_____

The undersigned, as Bidder, hereby declares that the name or names of the only person or persons interested in this Proposal, as principal or principals, is or are, as herein below set out and that no person other than that or those herein below stated has any interest in this Proposal, or in the Contract to be entered into; that this Proposal is made without connection with any other person, firm or corporation making a proposal; and that it is in all respects fair and in good faith, without collusion or fraud.

Following are the names and addresses of all persons, firms, and corporations interested in the foregoing bid:

Name and Address of all interested Persons, Firms, Corporations, Partners (if Partnership) and Members (if Limited Liability Company).

Bidder's Name

Signature

Title

Address

City
State Zip Code

Phone No.

Date

Contractor's License Number

ATTEST
(Seal If Bid By Corporation)

BASE BID FORM
Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements
LaGrange, Georgia

Each of the following Base Bid Items includes the Construction, Testing & Placing into Service of each Base Bid Item, Complete per the Plans, Specifications & Contract Documents. Refer to Specification Section 01152, I.10 Explanation of Bid Items and Payment. Also, refer to Section 00800, 1.C. for a list of Equipment and Materials furnished by the Owner for Contract B. All required clearing is included in the Erosion Control Bid Item.

Item No.	Description	Quantity	Unit	Unit Price	Total Price
	Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements				
1	Grading & compaction required for the Project Area, including Lift Station, Force Main, Sewer 12' Access Road & Parking Area, see Plan Sheet B-1.	1	LS	$	$
2	Grading & compaction required for the 10' Access Road, see Plan Sheets B-1 & B-2.	1	LS	$	$
3	Install 6" crushed aggregate base course to stabilize the 12' Access Road with Parking Area, see Plan Sheet B-1.	110	CY	$	$
4	Install 6" crushed aggregate base course to stabilize the 10' Access Road, see Plan Sheets B-1 & B-2.	160	CY	$	$
5	Install 6" crushed aggregate base course to stabilize the Lift Station Fenced Area, see Plan Sheet B-3.	45	CY	$	$
6	Installation of 18" HDPE Storm Drain with two Precast Headwalls, see Plan Sheet B-1	40	LF	$	$
7	Installation of 8" HDPE Storm Drain with two Precast Headwalls, see Plan Sheet B-1	20	LF	$	$
8	Install 6' diameter by 21' deep Packaged Lift Station Wet Well, see Plan Sheets B-3, B-4 & B-5.	1	LS	$	$
9	Install 6' diameter by 4' deep Packaged Lift Station Valve Vault, see Plan Sheets B-3, B-4 & B-5.	1	LS	$	$
10	Install 6" Bypass Connect and Piping and Fittings from the Valve Vault, see Plan Sheets B-3 & B-6.	1	LS	$	$
11	Install 3" Flanged Surge Relief Valve Assembly in accordance with the Assembly Details on Plan Sheets B-3 & B-6, includung the 4" Drain Line to the Wetwell.	1	LS	$	$

BASE BID FORM

Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements

LaGrange, Georgia

Each of the following Base Bid Items includes the Construction, Testing & Placing into Service of each Base Bid Item, Complete per the Plans, Specifications & Contract Documents. Refer to Specification Section 01152, I.10 Explanation of Bid Items and Payment. Also, refer to Section 00800, 1.C. for a list of Equipment and Materials furnished by the Owner for Contract B. All required clearing is included in the Erosion Control Bid Item.

Item No.	Description	Quantity	Unit	Unit Price	Total Price
12	Install 4" Flow Meter & Accessories in accordance with the Flow Meter Vault Details on Plan Sheets B-3 & B-6, includung the 4" & 6" Piping & Accessories.	1	LS	$	$
13	Install 3/4" Non-Freeze Yard Hydrant, per Plans	1	LS	$	$
14	Install 10' by 10' Concrete Pads around top elevation of Lift Station Wetwell & Valve Vault, per Plans	1	LS	$	$
15	Install Generator Pad, per the Plans	1	LS	$	$
16	Install the 80 KW Generator, per the Plans.	1	LS	$	$
17	Perform all Electrical Work associated with the Hills & Dales Lift Station, per the Electical Plans & Specifications, Complete	1	LS	$	$
18	Install the Chain Link Fence & Gates for the Lift Station Site and install Six Pipe Guards as directed.	1	LS	$	$
19	Perform all portions of the Hills & Dales Lift Station Improvements Project that is not contained in Bid Item Nos. 8-18.	1	LS	$	$
20	Install 6" HDPE DR11 (DIPS) Force Main, Min. 4' Depth, See Plans for Actual Depth.	450	LF	$	$
21	Install 10" PVC SDR26 Sewer, See Plans for Actual Depths.	100	LF	$	$
22	Install 8" PVC SDR26 Sewer, See Plans for Actual Depths.	340	LF	$	$
23	Install 2" HDPE Water Line, from Transformer area to 3/4" Yard Hydrant, see Plans.	80	LF	$	$
24	Install 4' Diameter Sewer Manholes, See Plans for Actual Depths.	5	EA	$	$

BASE BID FORM

Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements
LaGrange, Georgia

Each of the following Base Bid Items includes the Construction, Testing & Placing into Service of each Base Bid Item, Complete per the Plans, Specifications & Contract Documents. Refer to Specification Section 01152, I.10 Explanation of Bid Items and Payment. Also, refer to Section 00800, 1.C. for a list of Equipment and Materials furnished by the Owner for Contract B. All required clearing is included in the Erosion Control Bid Item.

Item No.	Description	Quantity	Unit	Unit Price	Total Price
25	Erosion Control Plan Requirements, Complete per Plans, Specifications & Contract Documents	1	LS	$	$
26	Mobilization	1	LS	**$ 10,000.00**	**$ 10,000.00**
27	Demobilization	1	LS	**$ 5,000.00**	**$ 5,000.00**
28	Allowance for Field Testing of Materials, Only if Approved by Engineer for Payment	1	LS	**$ 5,000.00**	**$ 5,000.00**
	TOTAL BASE BID AMOUNT (Total of Items 1-28)				**$**

Total Base Bid In Words: _____

_____ Dollars and Cents

(In Case of Conflict, The Amount Shown in Words Shall Govern)

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 the City of LaGrange, Georgia, as OWNER in the penal sum equal to 5% of the Total Base Bid Amount for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves our heirs, executors, administrators, successors and assigns.

Signed, this _____ day of _____, 2023.

The condition of the above obligation is such that whereas the Principal has submitted to The City of LaGrange, Georgia, a certain bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements.

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of Contract attached hereto (Properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or 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 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 these presents to be signed by their proper officers the day and year first set forth above.

_____(L.S.)
PRINCIPAL

_____
SURETY

By_____

SEAL

END OF SECTION

SECTION 00500

CONTRACT

THIS AGREEMENT made this _____ day of _____ , 2023, by and between _____ a corporation organized and existing under the laws of the State of _____ hereinafter called the CONTRACTOR, and The City of LaGrange, Georgia hereinafter called the OWNER.

WITNESSETH, that the CONTRACTOR and the OWNER for the considerations stated herein mutually agree as follows:

1. The CONTRACTOR shall furnish all materials, equipment, labor, supervision, technical personnel, machinery, tools, and services to perform and complete all Work required for the construction of Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements, at or in the vicinity of LaGrange, Georgia; and shall perform such work in strict accordance with these Contract Documents, which are attached hereto, and are a part of this Contract.

2. The CONTRACT DOCUMENTS shall consist of the following:

a) Notice to Contractors
b) Proposal
c) Bid Bond
d) Contract
e) Performance Bond
f) Payment Bond
g) General Conditions
h) Supplementary Conditions
i) General Requirements
j) Technical Specifications
k) Contract Drawings
l) Addenda (as numbered and dated below)
Addendum No. __, dated _____
Addendum No. __, dated _____
Addendum No. __, dated _____

3. The CONTRACTOR shall commence Work to be performed under this Contract on the date specified in a written Notice to Proceed issued by the OWNER, and shall be substantially complete within **105** consecutive calendar days and shall fully complete all Work hereunder within **120** consecutive calendar days from said date.

4. The OWNER hereby agrees to pay in lawful money of the United States, and the CONTRACTOR agrees to accept the sum of **$** _____ as payment to perform all of the Work described in the Contract Documents, subject to the additions and deletions as provided in the Specifications or Proposal.

5. The OWNER will pay the CONTRACTOR in the manner, at such times, and in such amounts as set forth in the General Conditions and General Requirements.

6. 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 shall be deemed an original on the date first above written.

OWNER:
City of LaGrange, Georgia

(SEAL)

ATTEST

By _____

_____

Name Meg Kelsey

Name _____

Title City Manager

Title _____

CONTRACTOR:

_____

(SEAL)
ATTEST

By _____

Name _____

Title _____

_____
`

Address _____

Name _____

_____

Title _____

END OF SECTION

SECTION 00610

PERFORMANCE BOND

STATE OF GEORGIA)

COUNTY OF TROUP) ss:

CITY OF LAGRANGE)

KNOW ALL MEN BY THESE PRESENTS, that we, _____ _____as, Principal, and _____, as Surety, are held and firmly bound unto The City of LaGrange, Georgia in the full sum of _____ _____Dollars ($ _____) for the payment of which well and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

WHEREAS, the above bound Principal has entered into a contract with The City of LaGrange, Georgia, dated the _____ day of _____, 2023, for the construction of Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements.

NOW THEREFORE, the conditions of this obligation are such that if the above bound Principal shall faithfully and fully comply with the terms and conditions of said contract and such alterations or additions as may be made therein or in the plans and specifications, and shall indemnify and save The City of LaGrange, Georgia harmless against any claims for using any form of material, process, composition or anything which is patented, and likewise indemnify and save the Owner or the City, if the City is not the Owner, harmless against all claims for damages by reason of any default or negligence, want of skill or care on part of said Principal or Agents in and about the performance of said Contract, and shall comply with all laws pertaining to said Work, and shall comply with and perform any guarantee provided for in said Contract, then this obligation shall be void, otherwise of full force and effect.

And the Surety of this bond, for value received, agrees that no change, extensions of time, alterations or additions thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations or additions to the terms of the contract or the Work or to the plans and specifications.

It is agreed that this bond is executed pursuant to and in accordance with the provisions of the Official Code of Georgia Annotated, as Amended, including, but not limited to, O.C.G.A. § 36-91-1 et seq., and is intended to be and shall be construed as a bond in compliance with the requirements thereof.

IN WITNESS WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed this _____ day of _____, 2023.

(As to Principal) _____L.S.

Signed, sealed and delivered
in the presence of:

_____ BY: _____

_____ **TITLE**: _____

(As to Surety) _____L.S.
Surety

Signed, sealed and delivered
in the presence of:

_____ **BY**: _____

_____ **TITLE**: _____

APPROVED AS TO FORM

_____
City Attorney

COUNTERSIGNED

BY: _____
Resident Agent

END OF SECTION

SECTION 00620

PAYMENT BOND

STATE OF GEORGIA)

COUNTY OF TROUP) ss:

CITY OF LAGRANGE)

KNOW ALL MEN BY THESE PRESENTS, that we, _____ _____as Principal, and _____ as Surety, are held and firmly bound unto The City of LaGrange, Georgia, in the full sum of _____ _____Dollars ($_____) for the use and protection of said Owner or City if the City is not the Owner, and all subcontractors and all persons supplying labor, materials, machinery and equipment for the performance of the work provided for in the Contract hereinafter referred to, for the payment of which well and truly to be made we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

WHEREAS, the above bound Principal has entered into a contract with The City of LaGrange, Georgia dated the _____ day of _____, 2023 for the construction of Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements.

NOW THEREFORE, the conditions of this obligation are such that if the above bound Principal shall promptly pay all subcontractors and all other persons supplying labor, materials, machinery and equipment furnished for the performance of the Work provided for by said contract and such alterations or additions as may be made therein or in the plans and specifications, then this bond to be void; otherwise, of full force and effect.

And the Surety of this bond, for value received, agrees that no change, extensions of time, alterations or additions to the terms of this Contract or to the Work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations or additions to the terms of the Contract or the Work or to the plans and specifications.

It is agreed that this bond is executed pursuant to and in accordance with the provisions of the Official Code of Georgia Annotated, as Amended, including, but not limited to, O.C.G.A. § 36-91-1 et seq., and is intended to be and shall be construed to be a bond in compliance with the requirements thereof.

IN WITNESS WHEREOF, the Principal and the Surety have caused these presents to be duly signed and sealed this _____ day of _____, 2023.

(As to Principal) _____L.S.

Signed, sealed and delivered
in the presence of:

_____ BY: _____

_____ **TITLE**: _____

(As to Surety) _____L.S.
Surety

Signed, sealed and delivered
in the presence of:

_____ **BY**: _____

_____ **TITLE**: _____

APPROVED AS TO FORM

_____
City Attorney

COUNTERSIGNED

BY: _____
Resident Agent

END OF SECTION

SECTION 00700

GENERAL CONDITIONS

1. CONTRACT DOCUMENTS

The Notice to Contractors, Instructions to Bidders, Proposal, Bid Bond, Contract, Performance and Payment Bonds, Certificate of Insurance, Notice of Award, Notice to Proceed, Change Order Form, Contractor's Affidavit to Accompany Partial Payment Estimate, General Conditions, Supplemental Conditions, and Information, Drawings, Addenda and Specifications shall all be binding on the Contractor, and shall be fully a part of the Contract as if thereto attached or therein repeated in words and figures.

2. DEFINITIONS OF TERMS

Whenever in the Contract Documents the following terms or pronouns referring to them are used, the intent and meaning shall be interpreted as follows which shall be applicable to both the singular and plural thereof:

A. The CONTRACT shall mean the Contract executed by the Owner and the Contractor, of which these General Conditions form a part; the terms CONTRACT and AGREEMENT are synonymous.

B. The terms OWNER and CONTRACTOR shall mean the respective parties to the Contract; the OWNER being a public or quasi-public body or authority, corporation, association, partnership, or individual for whom the Work is to be performed; the CONTRACTOR being the individual, partnership, limited liability company, or corporation with whom the Owner has executed the Contract.

C. The term ENGINEER shall mean Ellis & Associates, Inc. successor, or duly authorized representative.

D. ADDENDA shall mean 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.

E. BIDDER shall mean any individual, partnership, limited liability company, or corporation submitting a BID for the WORK.

F. BONDS shall mean Bid, Performance, and Payment Bonds and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.

G. CHANGE ORDER shall mean 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.

H. CONTRACT DOCUMENTS shall mean the contract, including NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS, PROPOSAL BID BOND, PAYMENT BOND, PERFORMANCE BOND, CERTIFICATE OF INSURANCE, NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE ORDER, CONTRACTOR'S AFFIDAVIT TO ACCOMPANY PARTIAL PAYMENT ESTIMATE, GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, DRAWINGS, ADDENDA and

SPECIFICATIONS.

I. CONTRACT PRICE shall mean the total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

J. CONTRACT TIME shall mean the number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

K. DRAWINGS shall mean the part 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.

L. FIELD ORDER shall mean a written order effecting a change on 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.

M. NOTICE OF AWARD shall mean the written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

N. NOTICE TO PROCEED shall mean written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK; the terms NOTICE TO PROCEED and WORK ORDER are synonymous.

O. PROJECT shall mean the undertaking to be performed as provided in the CONTRACT DOCUMENTS.

P. PROPOSAL shall mean the offer or BID of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed; the terms BID and PROPOSAL are synonymous.

Q. RESIDENT PROJECT REPRESENTATIVE shall mean the authorized representative of the OWNER who is assigned to the PROJECT site or any part thereof.

R. SHOP DRAWING shall mean 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; the terms SHOP DRAWINGS and SUBMITTALS are synonymous.

S. SPECIFICATIONS shall mean a part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

T. SUBCONTRACTOR shall mean individual, partnership, limited liability company, or corporation having a direct contract with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

U. SUBSTANTIAL COMPLETION shall mean that date as certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is efficiently completed, in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part thereof can be utilized for the purposes for which it is intended.

V. SUPPLIERS shall mean any person, supplier 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.

W. WORK shall mean labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

X. WRITTEN NOTICE shall mean 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 his last given address, or delivered in person to said party to his authorized representative on the WORK.

3. DRAWINGS AND SPECIFICATIONS

A. 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.

B. The Engineer will furnish to the Contractor at cost, sets of documents that are required by the Contractor for the proper handling of the Work.

C. The Contractor shall keep one set of the Drawings and Specifications on the site of the Work. This set shall be kept current by the addition of all reviewed changes, addenda and amendments thereto. The Drawings shall be keep current for AS BUILT DRAWINGS for the Project and must be submitted to the Engineer at the Project Completion.

D. The Drawings and Specifications are intended to be explanatory to each other, but should any discrepancy appear or any misunderstanding arise as to the importance of anything contained in either, the Engineer shall make the necessary interpretation. Corrections of errors or omissions in the Drawings or Specifications may be made by the Engineer when such corrections are necessary for the proper fulfillment of their intention as construed by the ENGINEER.

E. All work or materials shown on the Drawings and not mentioned in the Specifications, or any work specified and not shown on the Drawings, shall be furnished, performed, and done by the Contractor as if same were both mentioned in the Specifications and shown on the Drawings.

F. Should the Contractor in preparing his bid find anything necessary for the construction of the project that is not mentioned in the Specifications or shown on the Drawings, or find any other discrepancy in the Contract Documents, he shall notify the Engineer so that such discrepancies may be corrected by addendum prior to the bid opening. Should the Contractor fail to notify the Engineer of such discrepancies, it will be assumed that his bid included everything necessary for the complete construction in the spirit and intent of the designs shown.

G. 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. 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.

4. DISCREPANCIES IN DRAWINGS, SPECIFICATIONS AND SHOP DRAWINGS

A. In case of a discrepancy on the Drawings, figure dimensions shall govern over scale dimensions and large scale drawings shall govern over small scale drawings. In case of a discrepancy in the Specifications and Contract Documents, detailed technical specifications and special or supplementary conditions shall govern over general conditions and other sections of the Contract Documents. In case of a discrepancy between the Drawings and Specifications, the Specifications shall govern; addenda shall govern over all Drawings, Specifications and Contract Documents. Supplemental Conditions shall govern over these General Conditions.

B. In case of discrepancy between the shop drawings and the requirements of the Drawings, Specifications and Contract Documents, the provisions of the Drawings, Specifications and Contract Documents, the provisions of the Drawings, Specifications, and Contract Documents shall prevail, even though the shop drawings have been reviewed by the Engineer, unless the conflict therein has been specifically waived in writing by the Engineer.

C. 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 his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.

5. PREPARATION PROPOSAL FORM

A. Bidder's Proposal must be submitted on the Bid Form furnished him by the Engineer. Bid Forms are not transferable, and will not be removed from the bound Bid Document Book.

B. The Bidder must specify in figures, without interlineation, alterations or erasures, a single Lump Sum price and/or Unit Prices, as set forth in the Bid Form, to completely construct the Work described and shown in the Specifications and Drawings. In the case discrepancy between the prices shown in figures and in words, the words will govern.

C. The Proposal will be properly signed by the Bidder. If the Bidder is an individual, his name and his post office address must be shown; if a firm, partnership or limited liability company, the name and post office address of each member of the firm, partnership or limited liability company must be shown; if a corporation, the president, vice-president or secretary will sign and affix the corporate seal, or if the person signing the Proposal is an agent, the said agent must attach written authorization from the president, vice-president or secretary of the Corporation, and the Proposal must show the name of the Corporation, the name of the state under the laws of which the corporation is chartered, and the names, titles and business addresses of the officers. Corporate information required above will be typed on a separate sheet and submitted with Proposal materials at time of bidding.

6. IRREGULAR PROPOSALS

A. Proposals may be rejected if they contain any omissions, alterations of form, additions not called for, conditional bids, alternate bids unless called for, incomplete bids, erasures, or irregularities of any kind. Proposals in which the unit or lump sum prices are obviously unbalanced may be rejected.

7. PROPOSAL GUARANTY

A. No Proposal will be considered unless accompanied by cash or a properly certified check or bid bond made payable to the Owner in the amount indicated, and as provided in the Notice to Contractors. Cashiers' checks will not be accepted in lieu thereof.

8. DELIVERY OF PROPOSALS

A. Each Proposal for each Contract will be placed, together with the Proposal Guaranty, in a sealed envelope on the outside of which is written in large letters, the name and address of the Bidder, the location and description of the Work as is designated in the Notice to Contractors, and the date and time of the bid opening. Proposals may be delivered in person or by registered mail. When sent by registered mail, the sealed Proposal, marked as indicated above, will be enclosed in another envelope for mailing. Proposals will be received by the Owner, unless otherwise provided, until the hour of the date set in the Notice to Contractors for the opening thereof.

9. WITHDRAWAL OR REVISION OF PROPOSALS

A. A Proposal may be withdrawn at any time prior to the hour fixed in the Notice to Contractors for opening of Proposals, provided a request in writing, executed by the Bidder or his duly authorized representative, is filed with the Owner prior to that time. When such Proposal is reached, it will be returned to the Bidder unopened. Telegrams or written communications to correct Proposals will be accepted and the Proposal corrected in accordance therewith if received by Owner prior to the hour set in the Notice to Contractors for the opening of bids. No Proposal can be withdrawn, modified or corrected after the hour set for opening such Proposals.

10. OPENING OF PROPOSALS

A. Proposals will be opened and read publicly at the time and place indicated in the Notice to Contractors. Bidders or their authorized agents are invited to be present.

11. DISQUALIFICATION OF BIDDERS

A. Any Bidder using the same or different names for submitting more than one Proposal upon the Work will be disqualified from further consideration on the Work. Evidence that any Bidder is interested, as a principal, in more than one Proposal for the Work contemplated (for example, bidding in a partnership; as a joint partnership or association and as a partnership association, or individuals) will cause the rejection of any such Proposal.

B. If there is any reason to believe that collusion exists among the Bidders, any or all Proposals may be rejected and those participating in such collusion may be barred from submitting bids on the same or other Work.

12. CONSIDERATION OF PROPOSALS

A. After the proposals are opened and read, the approximate estimated quantity of each item multiplied by the unit price bid for that item and the products calculated and the gross sums bid obtained in each of the acceptable Proposals, the Contract Bid Prices will be compared and the results of such comparison will be made public. Until the final award of the Contract, however, the Owner reserves the right to reject any

and all Proposals, and to waive technical errors, if, in the judgment of the Engineer, the best interest of the Owner will thereby be promoted. A Proposal will not be considered unless signed by the Bidder or his authorized agent and accompanied by a certified check, cash or bid bond.

13. AWARD OF CONTRACT

A. The award of the Contract, if it be awarded, will be by the Owner to the low responsive, responsible Bidder whose Proposal will have complied with all the requirements necessary to render it formal. The successful Bidder will be notified by letter mailed to the address shown on his Proposal, that his bid has been accepted and that he has been awarded the Contract.

14. CANCELLATION OF AWARD

A. The Owner reserves the right to cancel the award of any Contract at any time before the execution of the said Contract by all parties without any liability against the Owner.

15. APPROVAL OF CONTRACT

A. The Owner will approve the Contractor's bond and complete the execution of the Contract. No contract will be binding upon the Owner until it has been executed by the Owner.

16. FAILURE TO EXECUTE CONTRACT

A. Should the successful Bidder or Bidders to whom the Contract is awarded fail to execute a Contract and furnish acceptable Contract security, the Owner will retain from the Proposal Guaranty, if it be certified check, or recover from the principal on the sureties if the guaranty be a bid bond, the difference between the amount of the Contract as awarded and the amount of the Proposal of the next lowest Bidder. If no other Bids are received, the full amount of the Proposal Guaranty will be retained or recovered as liquidated damages for such default. Any sums so retained or recovered will be the property of the Owner.

17. ALTERATION OF DRAWINGS AND CHARACTER OF WORK

A. The Engineer may without notice to the Surety and without change in any bid unit prices, make alterations in the Drawings or in the nature of the Work which he may consider necessary or desirable during the progress of the Work to complete fully and acceptably the proposed construction. Alterations provided for herein will not be considered as a waiver of any of the conditions of the Contract or invalidating any of the provisions thereof, and the Contractor will perform the Work as increased or decreased and no allowances will be made for anticipated profits. The Engineer may, under this reservation, increase or decrease any or all of the quantities of any bid items as set out in the Proposal and such increase or decrease will not be considered as a waiver of any conditions of the Contract or Contract Bonds.

18. EXTRA WORK

A. At any time during the Progress of the Work performed under this Contract, the Engineer may order other work or materials incidental thereto. If any such work and material is not listed as a pay item with a contract unit bid price, or compensation therefor is not included in the contract unit prices bid for other pay items under the items of the Contract, it will be designated as Extra Work, and will be performed by the Contractor as directed, provided, however, that before Extra Work is started the Contractor will comply with SECTION 01035, Change Order Procedures.

19. COMPLIANCE WITH LAWS, ORDINANCES AND REGULATIONS

A. The Contractor will at all times observe and comply with all Federal, State and local laws and ordinances, orders, decrees, codes, and regulations existing or enacted subsequent to the execution of the Contract which in any manner affect the prosecution of the Work. The Contractor and his Surety will indemnify and save harmless the Owner, Engineer and all of their representatives or agents against any suits or actions of any kind or nature brought, or which may be brought, against them for any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, codes, or decree, whether by himself, his employees or his sub-contractors and their employees.

20. LICENSES AND PERMITS

A. The Contractor will procure all licenses and permits, pay all charges, and give all notices necessary and incident to the due and lawful prosecution of the Work. Contractors are advised to contact the authorities having jurisdiction in the area of the Work as to the costs associated with building permits, licenses and inspection fees required for this Project.

21. PATENTED DEVICES, MATERIALS AND PROCESSES

A. The Contractor will pay the costs of all royalties, license fees and patent fees involved by use, or manner of use, in the work of all designs, devices, materials, equipment or processes, and the Contractor will provide for such use or manner of use by legal agreement with the Owner of the patent or a duly authorized licensee of such Owner. All such costs referred to hereinabove will be included in the price or unit prices bid for the Work under this Contract.

B. The Contractor and the Surety will indemnify and save harmless the Owner and Engineer and all their representatives from any and all suits, costs, penalties, or claims for infringement by reason of the use of any such patented design, device, material, or process, or any trademark or copy right in connection with the Work agreed to be performed under the Contract; and will indemnify the Owner, the Engineer and all their representatives for any costs, expenses and damages which it or they may be obliged to pay any reason of such infringement or alleged infringement at any time during the prosecution or after the completion of the Work.

22. SAFETY

A. The Contractor will at all times comply with the requirements of "Safety and Health Regulations for Construction" of the Occupational Safety and Health Administration, U.S. Government Department of Labor, and of other authorities having jurisdiction in Safety Matters. In the prosecution of his work the Contractor will observe all precautions and safety provisions as outlined in the "Manual Of Accident Prevention in Construction", as published by the Associated General Contractors Of America, to the extent that such provisions are not inconsistent with applicable laws or regulations.

B. Under the terms and conditions of this Contract, the Engineer shall not act as Safety Engineer or Safety Supervisor, since such responsibility remains solely with the Contractor. The Engineer shall not be responsible for establishing safety procedures or for prescribing safety measures for the Contractor.

C. The Contractor will be solely and completely responsible for conditions of the job site, including safety of persons and property affected directly or indirectly by his operations during the performance of Work; and this requirement will not be limited in application to normal working hours, but will apply

continuously twenty-four (24) hours per day until acceptance of work by the Owner, and thereafter will be subject to the terms and conditions of the Guaranty.

D The duty of the Engineer to review the Work in order to determine its acceptability in accordance with the Specifications, and to conduct construction review of the Contractor's performance for the benefit of the Owner, will not be construed as a duty to review the adequacy of the Contractor's safety measures on or near the construction site and/or to direct the actions of the Contractor's employees in the performance of the Work as such a duty is not included in the responsibilities of the Engineer.

23. PUBLIC CONVENIENCE

A. The Contractor shall provide and maintain for the safe use of such temporary roads as may be necessary to provide convenient access to driveways, houses, buildings, or other property abutting the Work. Where temporary bridges are necessary for the safe use of traffic and pedestrians, these bridges shall be constructed at the expense of the Contractor.

B. The Contractor's work shall not cause undue or prolonged blocking of business establishments .

C. Materials and equipment stored on the Right-of-Way or Project Site shall be so placed and the Work at all times shall be so conducted as to insure minimum danger and obstruction to the traveling public.

D. During operations where traffic is being permitted to pass through construction, the Contractor shall provide a smooth, even surface that will provide a satisfactory passageway for use of traffic. The road bed shall be sprinkled with water if necessary to prevent a dust nuisance, provided the dust nuisance is a result of the Work.

E. Fire hydrants shall be accessible at all times to the Fire Department. No material or other obstructions shall be placed closer to a fire hydrant than permitted by ordinances, rules or regulations or within fifteen (15) feet of a fire hydrant, in the absence of such ordinances, rules or regulations. on all work with City or Town Limits, the Contractor shall give the Chief of the Fire Department at least twenty-four (24) hours notice in writing before it becomes necessary to obstruct a cross street.

24. WORK AT RAILROAD CROSSINGS

A. No work of any character shall be commenced on railroad Right-of-Way until the Railroad Company has issued a permit to the Contractor. The Railroad Company has been duly notified by the Contractor in writing (with a copy forwarded to the Engineer) of the date he proposes to begin work and until an authorized representative of the Railroad Company is present, unless the Railroad Company waives such requirement.

B. All work performed by the Contractor within the Right-of-Way limits of the Railroad shall be subject to the inspection and approval of the chief engineer of the Railroad Company, or his authorized representative and any precautions considered necessary by said chief engineer to safeguard the property, equipment, employees and passengers of the Railroad Company shall be taken by the Contractor without extra compensation.

C. The Contractor shall, without extra compensation, take such precautions and erect and maintain such tell-tale or warning devices as the Railroad Company considers necessary to safeguard the operations of its trains. The temporary vertical and horizontal clearances specified by the chief engineer of the Railroad

Company in approving these shall be maintained at all times. No steel, brick, pipe or any other loose material shall be left on the ground in the immediate vicinity of the railway track. The Contractor shall so plan his work so as not to delay Railroad Company operations in making track changes or placing temporary or permanent structures, or work incidental thereto.

D. Whatever insurance and bond requirements that may be stipulated by the railroads prior to or in connection with the issuance of permits to the Owner or Contractor shall be complied with and paid for by the Contractor. All such insurance and/or bonds shall specifically provide full coverage for both the Owner and Engineer, in addition to such other coverage as may be required.

25. USE OF EXPLOSIVES

A. When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use utmost care to prevent danger to life or property. Blasting operations shall be conducted under the most careful supervision by the Contractor. In populated areas and at any point of special danger the Contractor shall use suitable mats or other approved methods to smother the blasts.

B. The Contractor and his Surety shall indemnify and save harmless the Owner, the Engineer and all their representatives from all claims for damages arising out of the use of explosives.

26. PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

A. The Contractor shall not enter upon private property for any purpose without first obtaining permission from the Owners and lessees. The Contractor shall be responsible for the preservation of all public and private property, monuments, highway signs, telephone lines, other utilities, et cetera, along and adjacent to the Work; shall use every precaution necessary to prevent damage to pipes, conduits, and other underground structures; and shall protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. The Contractor must obtain all necessary information in regard to existing utilities and shall give notice in writing to the Owners or the proper authorities in charge of streets, gas, water pipes, electric, sewers and other underground structures, including conduits, railways, poles and pole lines, manholes, catch basins, fixtures, appurtenances, and all other property that may be affected by the Contractor's operations, at least forty-eight (48) hours before his operations will affect such property. The Contractor will not hinder or interfere with any person in the protection of such work or with the operation of utilities, at any time. When property or the operation of railways, telephone lines, telegraph lines, or other public -utilities are endangered, the Contractor will at his own expense, maintain flagmen or watchmen and the other necessary precautions to avoid interruption of service or damage to life or property, and he will promptly repair, restore, or make good any injury or damage caused by his operations in an acceptable manner. The Contractor must also obtain all necessary information in regard to the installation of new cables, conduits, et cetera, and make proper provision and give proper notification, so that these can be installed at the proper time without delay to the Contractor or unnecessary inconvenience to the Owner.

B. When the Work involves the undercutting of any buildings along the Work, the Contractor must give property owners and lessees due and sufficient notice of the undercutting and the Contractor will adequately support such buildings. The Contractor and his Surety will hold the Owner and Engineer and their representatives harmless from any damages resulting from undercutting any such buildings.

C. The Contractor will not remove, injure, cut or destroy trees, shrubs, plants or grass that are to remain on

the site of the Work or those which are privately owned, without proper authority. Unless otherwise provided in the Special Provisions, or the Proposal, the Contractor will replace and replant all plants, shrubs and grass and restore the grounds back to its original good condition to the satisfaction of the Owner and the property owner. The Contractor will assume the responsibility of replanting and guarantee that the plants, shrubs and grass will be watered, fertilized and cultivated until they are in a growing condition. No direct payment will be made for removing and replanting of trees, shrubs, plants or grass unless such items are set forth in the Proposal.

D. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or otherwise of the Contractor, he will make good such damage or injury in an acceptable manner.

27. RESPONSIBILITY FOR DAMAGE CLAIMS

A. The Contractor will indemnify and save harmless the Owner, the Engineer, and their officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damages received or sustained by any person, persons, or property on account of the operations of the said Contractor, in the construction work involved in this Contract, or on account of or in consequence of any neglect in safeguarding the Work; or through use of any unacceptable materials in constructing the Work; or because of any act or omission, neglect, or misconduct of said Contractor, or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act" or any other law, ordinance or decree; and so much of the money due the said Contractor under and by virtue of his Contract as will be considered necessary by the Owner for such purpose, may be retained for the use of the Owner; or, in case no money is due, his Surety will be held until such suits, action or actions, claim or claims for injuries or damages as aforesaid will have been settled and suitable evidence to that effect furnished to the Owner and Engineer. The Owner or Engineer will not be liable to the Contractor for damages or delays resulting from Work by third parties or by injunctions or other restraining orders obtained by third parties.

B. The Contractor will report to the Engineer and Owner all accidents occurring on the Work within forty-eight (48) hours after their occurrence. The report will contain the complete information on the accident, including names, addresses, or persons involved, and names and addresses of witnesses. Accidents involving Workmen's Compensation claims need not be reported.

28. INSURANCE

A. The Contractor will not commence any work on the Project until he obtains, at his own expense, all required insurance: and the Contractor will not, at one time, conduct any operations on the Project or associated with the Project unless such operations are covered by the specified insurance. Such insurance must have the approval of the Owner as to limit, form and amount. The Contractor will not permit any subcontractor to commence work on the Project until the same insurance coverage requirements have been complied with by such subcontractor(s) with limits to be determined by the Contractor. However, the failure of the subcontractor(s) to carry adequate insurance will in no way affect the coverage afforded by the Owner by the prime Contractor's insurance. The insurance coverage will be maintained throughout the full period of the Contract. Any insurance bearing on adequacy of the performance will be maintained after completion of the project for the full guaranty period.

B. Proof of insurance coverage specified herein will be furnished the Owner in the form of copies of the

policies. The Owner, however, in lieu of copies of policies, and at his discretion, accept certificates issued by the insurance carrier and showing such policies to be in force for specified periods. The Contractor will furnish to the Owner, prior to the expiration date of any policy, renewal certificates showing that policies will remain in force throughout the full period of the Contract. The insurance carrier will be satisfactory to the Owners. No insurance coverage will be canceled or materially changed without prior written notice having been give to the Owner and then only after arrangements satisfactory to the Owner have made to ensure insurance coverage until the Project has been completed and accepted. All Contractors in a joint venture will have insurance coverage through the same company; or, if that is not practical, then the Owner must be furnished an endorsement which allocates primary and secondary payment responsibilities.

C. **The Owner, its governing body, its elected officials, employees, and agents and the Engineers will also be named "additional insured" in all insurance policies provided by the Contractor and his subcontractor(s) as respects all work performed under this Contract.**

D. In the event that the Contractor or his Surety is prevented by law or by charter from naming the Owner and his agents, and the Engineer as insured in the policies providing the coverage listed herein, the Contractor will purchase and maintain during the life of this agreement an Owner's and Contractor's Protective Liability Insurance Policy in an amount equal to the maximum amount specified under the various coverage including Umbrella Excess Liability over primary insurance; and the named insured in the Owner's and Contractor's Protective Liability Insurance Policy will be the Owner, its governing body, its elected officials, employees and agents and the Engineer. The insurance will protect the Owner and his agents, and the Engineer, from any claim or loss arising from any act of the Contractor or his subcontractors, or any failure to act on the part of the Contractor or his subcontractors, during the performance of work under this agreement.

E. The types of insurance that the Contractor will be required to obtain and maintain for the full period of the contract are listed below.

1. **Workmen's Compensation and Employer's Liability Insurance** will be in strict accordance with the requirements of the current and applicable Workmen's Compensation Laws of the State of the Project. The insurance will cover all of the Contractor's employees employed or associated with the Project; and where any part of the Work is subcontracted, the Contractor will require subcontractor to provide similar Workmen's Compensation and Employer's Liability Insurance for all employees of the subcontractor 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 is not protected under the Workmen's Compensation Statute, the Contractor will provide, and will cause such subcontractor to provide, adequate coverage for the protection of all employees on the Project not otherwise protected under applicable provisions of the Statues relating to Workmen's Compensation and Employer's Liability Insurance. The minimum limits of coverage will be as follows:

a.	State	Statutory
b.	Applicable Federal	Statutory
c.	Employers Liability	$1,000,000
d.	Voluntary Compensation	$1,000,000
e.	Broad Form All State Endorsement	

2. **Comprehensive General Liability Insurance** will protect the Contractor and any subcontractor performing work under this Contract from any claims for bodily injury, sickness or disease, death, personal injury, and property damages which may arise either directly or indirectly out of, or in

connection with the performance of work under this Contract. The Comprehensive General Liability Insurance Coverage will include: Premised - Operations; Independent Contractor's Protective; Explosion, Collapse, and Underground Property Damage; Broad Form Property Damage; Contractual Liability (written and oral); and fellow Employee Coverage. The minimum limits of coverage will be as follows:

a.	General Liability	$1,000,000
b.	Damage to Rented Premise	$100,000
c.	Medical Expense	$10,000
d.	Personal & ADV Injury	$1,000,000
e.	General Aggregate	$2,000,000
f.	Products - Comp/OP Agg	$2,000,000

3. **Personal Injury** (with Employment Exclusion deleted).

minimum limits	$500,000	Annual Aggregate

4. **Comprehensive Automobile Liability Insurance** (Owned, Non-owned, Hired) will protect the Contractor and any subcontractor performing work under this contract from any claims for bodily injury, death, and property damage which may arise either directly or indirectly out of, or in connection with, the performance of work under this contract. The minimum limits of coverage will be as follows:

Bodily Injury	$1,000,000	Each Occurrence
Property Damage	$1,000,000	Each Occurrence
or		
Bodily Injury and		
Property Damage	$1,000,000	Each Occurrence

5. **Umbrella Excess Liability over all Primary Insurance** as Scheduled Above

minimum limits	$5,000,000	Each Occurrence
	$5,000,000	Aggregate

6. **Property Insurance** Unless otherwise specified, the Contractor will provide All Risk Course of Construction Insurance (excluding floods and earthquake) to cover the interests of all Contractor and subcontractors of any tiers. The Contractor and subcontractors of any tiers will be responsible for all risks of physical loss to the work.
   a. The total amount of the insurance will be the amount of the Contract.
   b. The policy or policies will be endorsed to waive all rights of subrogation among, between and to each insured under the policy or policies. The waiver, however, will apply only to the policy, or policies. and not to another part or parts of this Contract.
   c. Any claim coming under the terms and conditions of the policy or policies, will be immediately reported to the Engineer.
7. **All of the above policies will have a 30-day written Notice of Cancellation.**

The specified limits and coverage in any of the policies for the various types of insurance will not be construed as limiting the Contractor's responsibility to provide contractual coverage sufficiently broad so as to ensure the provisions of the Articles of these General Conditions relating to

Indemnity, or limiting the responsibilities of the Contractor as outlined under the aforesaid Articles.

Nothing contained in these insurance requirements will be construed as limiting the extent of the Contractor' responsibility for payment of damages resulting from his operation under this Contract.

Insurance carried by the Contractor on the work will not relieve the Contractor of the responsibility for the protection of all materials and all work until the Project has been accepted by the Owner. Any loss, including insurance deductibles surrendered on the Project, will be borne by the Contractor and/or the insurance company providing the coverage for the Contractor; and the Owner will not be liable for any cost or replacement of lost or damaged work or material.

The cost of insurance required herein will be included in the lump sum price or unit prices bid on other items, and no additional amount will be paid.

29. INDEMNITY

A. **The Contractor will at all times release, indemnify and save harmless the Owner and their Engineer, their commissioners, officers, agents, servants and employees from and against all liability, claim of liability, loss, claim of loss, any and all suits, actions, legal proceedings, claims, demands, damages, costs, orders (including consent and clean-up orders) and expenses (including engineering and attorney fees) arising from personal injury, including death or disease, and property damage, including environmental contamination or impairment, occurring from any cause whatsoever in any work involved in the Contract, or from the acquisition, permitting, or operations will at his expense defend on behalf of the Owner and their Engineer, their officers, agents, servants and employees, either or all, any suit or administrative action brought against them or any of them, arising from any such cause.**

30. USE OF SECTIONS OF WORK

A. Whenever, in the opinion of the Engineer, the Work or any portion thereof, is in suitable condition for use, it will be put into service but such use will not be held to be in any way an acceptance of the Work or any part of it, or as a waiver of any of the provisions of the Specifications and Contract. When such use is required or permitted by the Engineer, the Contractor will make such provisions for the safety of the public as herein specified, and such use will not relieve the Contractor of his liability and responsibility during the period the Work is so opened prior to Final Acceptance. Necessary repairs or renewals on any of the Work, after being placed in use, due to defective materials or Work, natural causes or to ordinary wear and tear, pending completion and acceptance of the Contract will be performed at the expense of the Contractor.

31. CONTRACTOR'S RESPONSIBILITY FOR WORK

A. Until final acceptance of the Work by the Engineer as evidenced by approval of the final estimate, the Work will be in the custody and under the charge and care of the Contractor and he will take every necessary precaution against injury or damage to any part there of by the action of the elements or from any other cause, whether arising from execution or from the non-execution of the Work, unless otherwise provided for elsewhere in the Specifications or Contract. The Contractor will rebuild, repair, restore and make good, without extra compensation, all injuries or damage to any portion of the Work occasioned by any of the above causes before its completion and acceptance, and will bear the expenses thereof. In case of suspension of the Work from any cause whatever, the Contractor will be responsible for all materials and equipment and will properly store them, if necessary, and will provide suitable shelter from

damage and will erect temporary structures where necessary.

32. CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES:

A. At points where the Contractor's operations are adjacent to other properties of railway, telegraph, telephone, and power companies, or are adjacent to other property, damage to which might result in very considerable expense, loss or inconvenience, work will not be commenced until all arrangements necessary for the protection there of have been made.

B. The Contractor will be solely and directly responsible to the Owners and operators of such properties for any damage, injury, expense, loss, inconvenience or delay, or for any suits, actions, claims of any character brought on account of any injuries or damages which may result from the carrying out of the Work to be done under this Contract, and, if required, he will give bond or furnish Protective Public Liability and Property Damage Insurance in an amount specified to each corporation, company, partnership, or individual owning or operating any of the properties affected in guarantee of this responsibility.

C. The Contractor will cooperate with the Owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may Progress in a reasonable manner, and that duplication of rearrangement work may be reduced to a minimum, and that services rendered by these parties will not be unnecessarily interrupted.

D. In the event of interruption to sewer, gas, water or utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor will promptly notify the proper authority. The Contractor will be financially responsible for the restoration of service and will cooperate with the said authority in the restoration of service as promptly as possible. In no case will the interruption be allowed to exist outside of working hours.

33. FURNISHING RIGHT-OF-WAY

A. The Owner will be responsible for securing all necessary Right-of-Way on private property.

34. LIABILITY OF PUBLIC OFFICIALS

A. In carrying out any of the provisions of these specifications, or in exercising any power or authority granted to them by or within the scope of the Contract there will be no liability upon Owner, Engineer, or their authorized representatives, either personally or as officials of the Owner, it being understood that in such matters they act solely as agents and representatives of the Owner.

35. NO WAIVER OF LEGAL RIGHTS

A. The Owner or the Engineer will not be precluded or stopped by any measurement estimate, or certificate made or given by either of them or by any representative or employee of the Owner or Engineer, before or after the completion and acceptance of the Work and payment therefore, pursuant to any measurement, estimate or certificate, from showing the true and correct amount and character of the Work performed and materials furnished by the Contractor; or from showing, at any time, that any such measurement, estimate, or certificate is untrue or incorrectly made in any particular instance; or from showing at any time that the Work or materials, or any part thereof, do not conform in fact to Specifications and Contract. The Engineer will have the right to reject the whole or any part of the aforesaid Work or materials should the said measurements, estimate or payment be found, or be known, to be inconsistent with the terms of

the Contract, or otherwise improperly given; and the Owner will not be precluded from demanding and recovering from the Contractor and his Surety such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Specifications and Contract. Neither the acceptance by the Engineer, or any representative, or employee; nor any certificate by the Engineer for payment of money; nor any payment for, nor acceptance of, the whole or any part of the Work by the Owner or Engineer, nor any extension of time; nor any possession taken by the Owner or Engineer or their representatives or employees, will operate as a waiver of any portion of the Contract or of any power herein reserved by the Owner or of any right to damages herein provided, nor will any breach of the Contract be held to be a waiver of any other or subsequent breach.

36. PROTECTION OF THE OWNER, AGENTS OF THE OWNER, WORKMEN AND THE PUBLIC

A. The Contractor and the superintendent are requested to carefully read the Articles of the General Conditions relating to protection of the Owner, agents of the Owner, workmen, and the public, such as Insurance; Indemnity; Licenses and Permits; Compliance with Laws, ordinances and Regulations; Safety; Public Convenience; etc. This request is made to stress the importance of safe prosecution of the Work, and does not imply that the Contractor and his Superintendent should not be completely familiar with all Articles of the General Conditions and all other provisions of the Contract Documents.

37. SUBLETTING OR ASSIGNING OF CONTRACT

A. The Contractor will not sublet, assign, transfer, convey, sell or otherwise dispose of any portion of the Contract, his right, title or interest therein, or his power to execute such Contract, to any person, firm or corporation without written consent of the Engineer and such written consent will not be construed to relieve the Contractor of any responsibility for the fulfillment of the Contract. Unless otherwise stipulated, the Contractor will perform with his own organization, and with the assistance of workmen under his immediate superintendence, work of a value not less than fifty (50%) per cent of the value of all work embraced in the Contract.

B. A subcontractor will be recognized only in the capacity of an employee or agent of the Contractor and his removal may be required by the Engineer, as in the case of an employee.

38. NOTICE TO PROCEED

A. After the Contract has been executed, the Engineer will issue the Contractor a written "Work Order". This "Work Order" will be issued within ten days from the time of Contract execution unless a longer time is mutually agreed upon by Owner and Contractor.

B. Time of Beginning Work: The "Work Order" will stipulate that the time limit under the Contract will begin ten (10) calendar days after date of issuance of "Work Order". The Contractor may begin work within this ten (10) day period or thereafter provided the proof of insurance requirements of these Specifications are met. The Contractor will not commence work until advised by the Engineer that the insurance policies are in order in accordance with the requirements of this Section.

39. CONTRACT TIME

A. The Contractor will be allowed for completion of work under this Contract, the number of consecutive Calendar days which are stated in Section 00800, which will be known as the "Contract Time". The Contract Time will begin as provided in "Notice to Proceed". The Project will be considered complete when the Engineer's final inspection shows no outstanding Work items.

40. EXTENSION OF THE CONTRACT TIME

A. Extension of Contract Time will be granted by the Engineer, with approval of Owner based on negotiations. Requests for Extensions of Contract Time resulting from events or situations beyond the control of the Contractor must be submitted to the Engineer within ten (10) days of the date of said event or situation.

41. FAILURE TO COMPLETE WORK WITHIN CONTRACT TIME

A. Time is an essential element in the Contract. Should the Contractor, or in case of a default, the Surety fail to complete the Work within the time stipulated in the Contract, or within such extra times as may be allowed herein above provided, liquidated damages in the amount stated in Section 00800 will be imposed upon the Contractor for failure to complete. This assessment will begin at the end of the Contract Time.

B. Liquidated Damages Defined: Liquidated damages, assessed as provided in these Specifications, is not a penalty, but is intended to compensate the Owner for the actual cost incurred by the Owner by reason of such delay in completing the Work in the Contract Time contemplated when the Contract Time was agreed upon in the Contract.

C. If the project is not completed within the Contract Time, as determined by the Engineer, the amount set out above will be deducted from the Contractor's net monthly estimate beginning with the end of the Contract Time.

D. In the event that any net monthly estimate of the Contractor will not be sufficient to pay the liquidated damages as provided herein, the Contractor herein agrees and will be required at the end of each monthly estimate period to deposit with the Trustees of the bank as specified by the Owner any deficit that is not covered by a deduction from the Contractor's net estimate. These deductions and deposits will continue to be made until the project is completed.

E. In the event that said deposits are not made by the Contractor then the Owner will call upon the Surety under this Contract.

42. PROSECUTION OF WORK

A . The Contractor will begin the Work to be performed under the Contract in accordance with the requirements set out above and he will give the Engineer definite notice of his intention to start work at least seven (7) days in advance of beginning work. During the Progress of the work the Contractor will notify the Engineer at least twenty-four (24) hours before he expects to be ready to undertake particular features of construction such as placing concrete in order that the Project Representative may be present.

B. The Contractor must continuously and diligently prosecute the work in logical order and manner. The Contractor will employ an ample force of men and provide construction plant and equipment properly adapted to the Work and of sufficient capacity and efficiency to accomplish the Work in a safe and workmanlike manner at the rate of Progress necessary to insure its completion within the time set forth in the Contract. Each class of work will be expected to Progress from the date it is begun until completed. All plant and equipment will be maintained in good working order and provision will be made for immediate emergency repairs.

C. All work in Progress will receive the personal attention either of the Contractor or of a competent and reliable superintendent who will have full and final authority to act for him. The Contractor will notify the Engineer in writing, stating the name of the person authorized to act as superintendent.

D. Should the prosecution of the Work be discontinued by the Contractor, with the consent of the Engineer, the Contractor will notify the Engineer in writing at least twenty-four (24) hours before resuming operations.

43. WORK SEQUENCE

A. The Contractor is cautioned that it may be necessary for the Contractor to construct the facilities out of an orderly sequence. No extra payment whatsoever will be allowed the Contractor for shut-downs, skips, or any other delays caused by the Owner. If, in the opinion of the Engineer, delays occasioned by the Owner through no fault of the Contractor are encountered, the time allowed for completing the system may be extended through negotiation. The Engineer's decision in such cases will be, and is hereby agreed to by the Contractor, final.

44. METHODS AND EQUIPMENT

A. The methods and appliances used, the labor employed and the machinery and equipment used, will be of sufficient size and in such mechanical condition as to meet the requirements and produce a satisfactory quality and quantity of work, and will be adequate to complete the Contract within the time specified in the Contract.

B. In case the actual Progress should fall behind the estimated Progress at any time, or should it become apparent that the Contractor will be unable to complete the Contract at the time and in the manner specified in the Contract, the Engineer may require that additional labor and equipment meeting with his approval be placed on the Work.

C. Should the Contractor fail to furnish suitable or sufficient tools, machinery, equipment or forces for the proper execution of the Work, the Engineer may withhold all estimates which are or may become due until his orders are complied with, or the Contract may be annulled as hereinafter provided.

45. TEMPORARY SUSPENSION OF WORK

A. The Engineer will have the authority to suspend Work wholly or in part for such period or periods as he may deem necessary, due to unsuitable weather, or other essential conditions, which he considers unfavorable for the suitable prosecution of the Work, or for failure on the part of the Contractor to carry out orders given, or to perform any provision of the Contract or on account of any other conditions, which in his opinion make it impracticable to secure satisfactory Work. No additional compensation will be paid the Contractor on account of such suspension. The Contractor will immediately respect the written order of the Engineer to suspend the Work wholly or in part. The Contractor will not suspend the Work wholly or in part. The Work will be resumed when conditions are favorable and methods are corrected, as ordered by the Engineer.

B. Should the Progress of the Work be stopped by a temporary injunction, court restraining order, process or judgment of any kind directed to the Contractor, then such period or delay will not be legal grounds for an extension of Contract time by the period of such delay nor will the Owner be liable to the Contractor on account of such delay or termination of the Work.

C. If for any reason it should become necessary to stop Work for an indefinite period, the Contractor will store all materials and equipment in such manner that they will not become damaged in any way, and throughout the period of suspension of Work he will put into effect the provisions of Section 01710 - Cleaning.

46. DEFAULT OF CONTRACT

A. If the Contractor fails to begin the Work under Contract within the time provided, or fails to perform the Work with sufficient workmen, equipment or materials to insure its prompt completion, or performs the Work unsuitably, or neglects or refuses to remove materials or perform anew such work as will be rejected as defective and unsuitable, or discontinues the prosecution of the Work, or from any other cause whatsoever does not carry on the Work in an acceptable manner, or becomes insolvent or is adjudicated a bankrupt, or commits any act of bankruptcy or insolvency, or allows any final judgment to stand against him unsatisfied for a period of ten (10) days, the Owner may give notice in writing by registered mail to the Contractor and the Surety of such delay, neglect or default. If within ten (10) days after such notice the Contractor does not proceed to remedy to the satisfaction of the Owner the fault specified in said notice, or the Surety does not proceed to take over the Work for completion under the direction of the Engineer, the Owner will have full power and authority, without impairing the obligation of the Contract or the Contract Bonds, to take over the completion of the Work; to appropriate or use any or all material and equipment on the ground that may be, in the opinion of the Engineer, suitable and acceptable; to enter into agreements with others for the completion of the Contract according to the terms and provisions there of or to use such other methods as in his opinion may be required for the completion of the Contract. The Contractor and his Surety will be liable for all costs and expenses incurred by the Owner, in completing the Work and also for all liquidated damages in conformity with the terms of the Contract. in case the sum of such liquidated damages and the expense so incurred by the Owner is less than the sum which would have been payable under the Contract if it had been completed by the Contractor or his Surety, the Contractor or his Surety will be entitled to receive the difference; and in case the sum of such liquidated damages exceeds the sum which would have been payable under the Contract, the Contractor and his Surety will be liable and will pay to the Owner the amount of such excess. Notice to the Contractor will be deemed to be served when delivered to the man in charge of any office used by the Contractor, his representative at or near the Work, or by registered mail addressed to the Contractor at his last known place of business.

47. CONTRACT GUARANTY

A. All work covered by the Proposal Items under this Contract, Supplementary Conditions and "Extra Work" as defined herein, will be fully guaranteed by the Contractor for a period of one year from the effective date of the final acceptance of the Project by the Owner. This guarantee will cover any and all defects in workmanship and/or materials that may develop in this specified time.

B. All equipment of any nature furnished by the Contractor and incorporated in the Work as defined above will carry the same guarantee as outlined above.

C. All defects and/or failures in workmanship, materials or equipment that develop within the guarantee period will be promptly repaired or replaced by the Contractor at his expense and to the full satisfaction of the Owner.

D. Where experience requirements for manufacture of specified items of equipment are waived during the bidding or shop drawing submittal stages of this contract, the approved supplier will be required to provide the Contractor/Owner with an extended guaranty of not less than three years instead of that provided for above.

END OF SECTION

SECTION 00800

SUPPLEMENTARY CONDITIONS

1. PROJECT DESCRIPTION

A. The Work to be performed by the Contractor for Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements will consist of Unit Price Base Bid Items and Lump Sum Base Bid Items as depicted in Section 00300. The Work will consist of the construction of the Base Bid Items described in Section 01152, 1.10 Explanation of Bid Items and Payment, please review before preparing the Base Bid for this Project.

B. The work to be done will consist of furnishing all materials, supplies and equipment; performing all labor and services incidental to or necessary for the complete construction of the project in accordance with the Drawings and Specifications, and the maintenance of each completed portion of the work until final acceptance of the entire project by the Owner.

C. The following Equipment will be furnished by the Owner for Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements.
   1. 240 GPM Package Lift Station from Pump & Process Equipment, Inc., including:
      a. 6' diameter x 21' deep Wetwell, 6' diameter x 4' deep Valve Vault, with all piping, valves & accessories.
      b. Two KSB Pumps Model KRT F 80-217/152XG2-S Submersible Pumps, 3450 RPM, 20 HP, 208 Volt, 3 Phase, 65' Power Cables.
      c. Duplex Control Panel 4X SS Enclosure, includes dead front, main breaker, pump breakers, pump safe relays, HOA's, run light, seal light, overload resets.
   2. 80 KW Generator & ATS from Cummins, Inc.
   3. 3" Sewage Surge Relief Valve & accessories from VAG USA Inc.
   4. 4" Mag Flux Flow Meter & Controls from CL2 Solutions, LLC.
   5. 6" HDPE DR 11 Force Main, 2" HDPE Water Line, 10" PVC SDR 26 Sewer Pipe, 8" PVC SDR 26 Sewer Pipe and Locate Tape.

2. CONTRACT PLANS

A. The work will be performed in accordance with these Specifications and Contract Drawings which are incorporated herein as part of the Contract and which are identified by the numbers and titles with addendums as shown on the Index of the Drawings.

3. DATES FOR FINAL COMPLETION

A. The Contractor will start work within ten (10) days after written notice is issued from the Owner to proceed, as specified in the General Conditions and will be substantially complete within **105** consecutive calendar days and will completely finish all work under this contract within **120** consecutive calendar days after the date specified in the Notice to Proceed. The Contractor should account for normal rain during the anticipated construction time period. No additional days will be granted for rain within the normal rainfall amount. If necessary, time extensions will be granted for delays above normal rainfall.

4. LIQUIDATED DAMAGES FOR FINAL COMPLETION

A. Time is of the essence in this Contract. Liquidated damages for failure to complete the work within the specified time defined in Paragraph 3.A. of this Section, as provided in the General Conditions are hereby and agreed upon at the rate of a thousand dollars ($1000.00) per day of delay of completion.

5. SAFETY AND HEALTH REGULATIONS

A. The Contractor will comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 9 1 -54).

6. SURFACE RESTORATION AND FINAL CLEAN-UP

A. Contractor will assume full responsibility for replacing surface features to their original, or better, condition. This is to include, but not be limited to, fences, shrubs, lawns, flowers, or any other landscaping materials, culverts, driveways, mailboxes, road signs, and utilities.

B. All damaged trees will be properly trimmed and all scars painted with an approved tree paint.

C. Throughout the progress of the work the Contractor will keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and will keep his materials and equipment in a neat and orderly manner. Immediately upon completion of any section or work and before payment has been made he will remove from the site all construction equipment, temporary structures, and debris and will restore the site to a neat, workmanlike condition.

D. The Contractor will make a final clean-up of the site. He will remove all rubbish and surface material and leave the ground in presentable shape at least comparable with condition in which it was prior to construction.

7. EROSION AND SEDIMENT CONTROL

A. The Contractor shall comply with the Soil Erosion and Sediment Control Plan per these Plans and Specifications and shall conform to all State of Georgia rules, regulations and laws governing Soil Erosion and Sediment Control.

B. The Contractor must continually maintain the Soil Erosion and Sediment Control measures throughout the construction time frame and will make all modifications and additions as required by the State of Georgia, Owner, and Engineer.

C. Any fines levied against the Owner for failure of the Contractor to properly maintain the required Soil Erosion and Sediment Control measures or any other related requirements will be deducted as set-offs from payments due the Contractor.

8. CONTRACTOR ACTIVITIES, CHARACTER OF EMPLOYEES AND EQUIPMENT

A. The Contractor will comply with all federal, state and local laws, regulations and ordinance governing the employment of labor and the payment of wages thereto for work performed under this Contract. In general, the Contractor will give preference to qualified local residents but in no case will he employ any person whose age or physical condition is such as to make his employment dangerous to the health or

safety of himself or of others employed on the work.

B. All workmen will have sufficient skill and experience to properly perform the work assigned to them. On any special or skilled work or in any trade, only qualified, careful and efficient mechanics will be used.

C. Any employee of the Contractor who may be adjudged by the Owner to be incompetent, untrustworthy or otherwise undesirable will be removed from the work immediately upon request of the Owner and will not be reemployed on the work thereafter.

D. The Contractor will furnish such equipment as is considered necessary for the prosecution of the work in an acceptable manner and at a satisfactory rate of progress.

9. TRAFFIC CONTROL

A. The Contractor will, at his own expense, maintain sufficient warning lights, traffic signs, traffic cones, etc. on or along any or all portions of any street or alley which, due to the Contractor's operations, are not in their normal condition to handle vehicular or pedestrian traffic. All traffic signs, cones, warning lights, barricades, detour signs, flagmen and their location(s), number, sequence, size, etc., will all be in accordance with the Georgia Department of Transportation Traffic Control Procedures.

B. The Contractor will maintain access for local residents, businesses, and emergency vehicles at all times. The Contractor will coordinate his work with the adjacent property Owners and businesses.

C. The Contractor will comply with all the traffic requirements of local and state governments. The cost of any traffic control and traffic maintenance by local or state governments will be considered incidental to the work.

10. EXISTING CONDITIONS AND EXISTING UTILITIES

A. The Engineer has attempted to shown on the Plans all pertinent surface features and utilities as existed at the time of the survey. The Contractor is urged to view the construction route and to identify any new or overlooked features. No claim for extra work will be allowed for any feature not shown on the plans.

B. Only approximate utility locations are shown on the Plans. The Contractor will be responsible for notifying the utility company, for determining the precise utility location and having the utility company mark the utility location in the field, and for coordinating his work with the utility company. The Contractor will notify the utility a minimum of 48 hours prior to doing any work in the area of the utility. No excavation work will proceed until all utilities have been located and marked. No extra payment will be made for any deviation from proposed alignment as shown on the Plans (or increased depth) to avoid existing utilities.

11. AGREEMENTS WITH PROPERTY OWNERS

A. Any agreement made by the Contractor with any property Owner in connection with construction of this project will be made in writing, a copy of which will be supplied to the Engineer. Upon satisfactory completion of the terms of the agreement the Contractor will obtain a written release from the property Owner, a copy of which will also be supplied to the Engineer.

12. CHEMICALS

A. All chemicals used during Project construction or furnished for Project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classifications, must show approval of either E.P.A. or U.S.D.A. Use of such chemicals and disposal of residues shall be in strict conformance with instructions of the chemical manufacturer.

13. MATERIALS AND EQUIPMENT FOR THE PROJECT

A. The Owner and Engineer have selected materials and equipment as made by certain manufactures to be used in the Project. These manufactures are named in the Detailed Specifications and their names are followed by the term, "or Approved Equal". The lump sum and/or unit price bids shown in the Proposal shall be for these materials and equipment of the specified manufacturers named in the Detailed Specifications.

END OF SECTION

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work comprises Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements located in LaGrange, Georgia for the City of LaGrange.

B. The Work to be done under the Agreement will consist of the complete construction of each and every unit described in the Advertisement for Bid and Contract Documents together with all authorized alterations. The Contractor will furnish, unless definitely and expressly provided to the contrary in the Contract Documents, all materials, implements, machinery, equipment, tools, supplies, transportation, and labor necessary to the prosecution and completion of the Work.

C. The Engineer may, without notice to the Surety and without change in the unit prices bid, make alterations in the Drawings or in the nature of the Work which he may consider necessary or desirable during the progress of the Work to complete fully and acceptably the proposed construction. Alterations provided for herein will not be considered as waiving any of the General Conditions or Supplementary Conditions or invalidating any of the provisions thereof. The Contractor will perform the Work as increased or decreased and no allowances will be made for anticipated profits. The Engineer may, under this reservation, increase or decrease any or all of the quantities of the unit-price items as set out in the bid. Such increases or decrease will not be considered as a waiver of any General Conditions, Supplementary Conditions, or Bonds.

D. The Engineer will not be responsible for the means, methods, techniques, sequences, or procedures of construction selected by the Contractor or the safety precautions and programs incidental to the work of the Contractor.

E. It is the sole responsibility of the Contractor to initiate, maintain and supervise all safety precautions and programs in connection with the Work.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract: Additional responsibilities of all parties.

1.03 CONTRACTS

A. Perform the Work under a separate lump sum and unit price contract with Owner.

1.04 WORK BY OTHERS - None.

1.05 WORK SEQUENCE - Not Used - See Specification Section 00800.

1.06 CONTRACTOR'S USE OF PREMISES

A. Contractor will limit his use of the premises for Work and for storage, to allow for:
   1. Work by other Contractors.
   2. Owner occupancy.

B. Coordinate use of premises under direction of Engineer.

C. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

D. Move any stored Products, under Contractor's control, which interfere with operations of the Owner or separate contractor.

E. Obtain and pay for the use of additional storage or work areas needed for operations.

F. Contractor will at all times conduct his operations so as to insure the least inconvenience to the general public including local property owners.

G. Rights-of-Way and Right-of-Way stipulations from local property owners will be constraints.

1.07 OWNER OCCUPANCY

A. None.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 CONSTRUCTION GRADES AND STAKES

A. The Engineer will establish bench marks and a base line for the proposed Improvements, all permanently and conveniently located, which will govern the elevations and locations of all portions of the Work as shown on the Drawings.

B. The Contractor will satisfy himself to the accuracy of all measurements before proceeding with the Work.

C. The Contractor will do all the detail survey layout work of locating the individual points, elevations, structures and other details for the construction of the proposed project.

1.02 CONTRACTOR'S RESPONSIBILITY FOR PRESERVING CONTROL POINTS

A. The Contractor will be held responsible for the preservation of all stakes and marks.

B. Any survey controls established by the Engineer that was destroyed by the Contractor, either carelessly or willfully, and requiring replacement will be restored by the Engineer's forces at his current surveying rate at the Contractor's expense.

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 STANDARD MEASURES AND WEIGHTS

A. All Unit Price work acceptably completed under the Contract will be measured by the Engineer according to United States standard measures and weights, unless otherwise provided on the drawings or in the Special Provisions. No local rules or customs will be adhered to or considered.

1.02 SPECIFIC PAYMENT ITEMS RELATING TO THIS CONTRACT

A. General
   1. This article is intended to clarify and describe the method of measurement and the basis of payment for the items listed in the Proposal. Item Number refers to the specific item as shown in the Proposal. When the word "include, includes, included or including" is used in this article, it will be defined as "includes, but not limited to."
   2. The Basis of Payment will be either Unit Price Bid or Lump Sum Bid as listed in the Proposal. It will be understood that the Unit Price Bid or the Lump Sum Bid will be considered as payment in full, for furnishing all labor, equipment, tools and supplies, and for furnishing and installing all materials necessary to do the Work for each Item in the Proposal.
   3. **Refer to Section 01152, Part 1.10 & Part 1.11 for an explanation of the various Bid Items and how payment will be determined.**

END OF SECTION

SECTION 01152

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Submit Applications for Payment to Engineer in accord with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.

1.02 RELATED REQUIREMENTS

A. Agreement Between Owner and Contractor: Lump Sum and Unit Prices

B. Conditions of the Contract: Progress Payments, Retainage, and Final Payment

C. Section 01153: Change Order Procedures

D. Section 01159: Schedule of Values

E. Section 01310: CPM Construction Schedules

F. Section 01700: Project Closeout

1.03 FORMAT AND DATA REQUIRED

A. Submit applications in the form required by Owner.

B. The application must be in a format which contains the Schedule of Values accepted by Engineer.

C. Submit applications for partial and final payment on forms which contain the following Contractor's Certificate:

CONTRACTOR'S CERTIFICATE

I,_____, the duly qualified and authorized agent of the Contractor, , on the above Project, do hereby certify that we have performed all of the Work set forth in strict accordance with the Contract Documents, laws, and ordinances applicable thereto, and do further certify that all materials and equipment listed herein have been paid for in full as allowed on all prior estimates and, if requested to do so, we will show evidence of payment for the same in writing before the final payment of this estimate. We further certify (if this is a final estimate) that the amount received hereunder is considered compensation and final payment in full for all Work performed under the Contract, including any amendments thereto and, upon payment of the said sum, hereby releases the Owner, its employees, agents and representatives in accordance with said Contract. We further certify that we fully guarantee all Work performed hereunder for a period of twelve months from the date of payment of the final estimates (in accordance with the terms of our original Contract and all amendments thereto), during which time all terms and conditions of the original Contract Documents will remain in full force and effect, including the insurance requirements, hold harmless provision and indemnity and insurance requirements as contained in said Contract Documents.

CERTIFIED TO FOR PAYMENT ON THIS _____DAYOF _____ , 2023.

_____

(Contractor)

BY_____ TITLE _____

WITNESS_____ TITLE _____

1.04 SCOPE OF PAYMENT

A. **QUANTITIES**: Quantities of separate items of Work listed in the Schedule of Values will serve as a guideline for payment for Work partially completed during a payment period, but payment for any item will not exceed the value assigned to the item, regardless of the actual quantity of the item in stalled.

B**.** **BASIS OF PAYMENT**: The Contractor will accept the compensation, as herein provided, as full payment for furnishing all materials, labor, tools, equipment and incidentals necessary to the completed Work, and for performing all Work contemplated and embraced under the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance, and for all risks of every description connected with the prosecution of the Work; also for all expenses incurred in consequence of the suspension of the Work as herein authorized.

C**.** **UNIT PRICE COVERAGE**: In cases where the "Basis of Payment" clause in the Specifications relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain Work or materials essential to the item. This same Work or material will not be measured or paid for under any other pay item which may appear elsewhere in the Specifications.

D. **REPAIR OR RENEWAL OF DEFECTIVE WORK**: The payment of any current estimate will in no way affect the obligation of the Contractor to repair or renew any defective parts of the construction, or to be responsible for all damages due to such defects.

1.05 PAYMENT FOR WORK PERFORMED

A. The Contractor will receive and accept payment for Work performed under his Contract as follows:
   1. ITEMS OF WORK: Items of Work performed which are covered by definite prices stipulated in the Contract.
   2. EXTRA WORK: Extra Work performed in accordance with the requirements and provisions of these Specifications will be paid for at the unit price or lump sum stipulated in the Change Order Agreement, or in lieu of such Agreement, the Engineer may require the Contractor to do such Work on a Cost Plus basis. Extra Work, whether Unit Price, Lump Sum, or Cost Plus, will be paid for as specified in Change Order Procedures, Section 01153.

1.06 PAYMENT FOR ALTERED QUANTITIES

A. When the actual quantities of Unit Price Work ordered and performed vary from the corresponding quantities, set out in the Bid Form, and whether or not there have been any changes in the drawings, the Contractor will accept as payment in full, so far as Contract Items are concerned, payment at the original Contract unit prices for the actual quantities of Work done. Alteration of drawings or character of Work involving extra Work will be paid for as stipulated in a Change Order prepared according to the requirements of Section 01153. Relocation of water or sewer lines from existing location to allow construction of new structures and/or new water, sewer or drainage lines will not be considered an alteration of the drawings.

1.07 PREPARATIONS OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application for payment will include an Application Form of the format which complies with the requirements of the Owner and Engineer. The application will also include a Stored Material Schedule and invoices to support this Schedule.

B. The Application Certification must be executed with the signature of a responsible officer of the Contracting firm.

C. Stored material for which payment is requested must be listed by pay item number in schedule form, complete with supporting invoices for new material added to the list monthly. Invoice totals and pay item numbers must be clearly shown on all submitted invoices. Only materials which fully comply with the Drawings and Specifications will qualify as Stored Material. If any material is paid for and later discovered to not fully comply with the Drawings and Specifications, the Stored Material total, and the next Application for Payment will be reduced by the appropriate invoice amounts. In allowing an estimate for materials stored on the Project site, the Contractor will be required to furnish the Engineer certified copies of the invoices or other evidence satisfactory for all prior months showing that they have been paid.

D. Retainage
The Owner may retain a portion of the amount otherwise due the Contractor, except as State law otherwise provides. The amount the Owner retains will be limited to the following:
1. Withholding of not more than ten percent (10%) of the payment claimed until Work is fifty percent (50%) complete.
2. When Work is fifty percent (50%) complete, no additional withholding of the payment claimed will be made provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding.
3. When the Work is substantially complete (operational or beneficial occupancy), the withheld amount may be further reduced to only that amount necessary to assure completion.
4. The Owner may reinstate up to ten percent (10%) withholding if the Owner determines, at its discretion, that the Contractor is not making satisfactory progress or there is other specific cause for such withholding.

E. Payment for Work under this Contract will be made by Owner in lawful money of the United States drawn against funds which are legally available for such Work.

1.08 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Final application must comply with the requirements as specified in Section 01700 - Project Closeout.

C. Procedure: Final payment will be in accordance with the Engineer's final estimate, properly executed and duly signed by the Contractor. Current estimates or partial payments are subject to correction in the final payment. Final payment to the Contractor will not be made until the Contractor has furnished in writing to the Engineer and Owner releases from all persons, firms, corporations or governing bodies upon whose Right-of-Way or property any Work was performed. These releases will state that all Work has been performed in accordance with the provisions of permits and is acceptable.

1.09 SUBMITTAL PROCEDURE FOR PROGRESS AND FINAL PAYMENTS

A. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.

B. Number: Four copies of each application, unless otherwise directed.

C. When Engineer finds application properly completed and correct, he will transmit certificate for payment to the Owner, with a copy to the Contractor

1.10 EXPLANATION OF BID ITEMS AND PAYMENT

A. Work under the following Base Bid Items shall include all labor, equipment, and materials necessary to construct, install, test and place into service each of the Base Bid Items as shown on the Contract Plans (A, B, C, E, G & S Sheets) and in accordance with the Contract Specifications and Documents.

1. Base Bid Item No. 1 – Grading and compaction required for the Project Area, including the Lift Station, Force Main, Sewer, 12' Access Road and Parking Area, as shown on Plan Sheet B-1, Complete per the Plans, Specifications & Contract Documents, per LS. Clearing is included the Erosion Control Bid Item.

2. Base Bid Item No. 2 – Grading and compaction required for the 10' Access Road, as shown on Plan Sheets B-1 & B-2, Complete per the Plans, Specifications & Contract Documents, per LS. Clearing is included in the Erosion Control Bid Item.

3. Base Bid Item No. 3 – Install 6" crushed aggregate base course to stabilize the 12' Access Road with Parking Area, as shown on Plan Sheet B-1, Complete per the Plans, Specifications & Contract Documents, per LS.

4. Base Bid Item No. 4 – Install 6" crushed aggregate base course to stabilize the 10' Access Road, as shown on Plan Sheets B-1 & B-2, Complete per the Plans, Specifications & Contract Documents, per LS.

5. Base Bid Item No. 5 – Install 6" crushed aggregate base course to stabilize the Lift Station Fenced Area, as shown on Plan Sheet B-3, Complete per the Plans, Specifications & Contract Documents, per LS.

6. Base Bid Item No. 6 – Construct 40 LF of 18" HDPE Storm Drain with two Precast Headwalls, as shown on Plan Sheet B-1, Complete per the Plans, Specifications & Contract Documents, per LF.

7. Base Bid Item No. 7 – Construct 20 LF of 8" HDPE Storm Drain with two Precast Headwalls, as shown on Plan Sheet B-1, Complete per the Plans & Details, per LF.

8. Base Bid Item No. 8 – Install the 6' diameter by 21' deep Packaged Lift Station Wet Well with Pre-Assembled Pipe, Fittings, and accessories, including the two KSB Pumps Model KRT F 80-217/152XG-S Submersible Pumps, 3450 RPM, 20 HP, 208 Volt, 3 Phase, 65' Power Cables and the Duplex Control Panel 4X SS Enclosure, all furnished by the Owner, as shown on Plan Sheets B-3, B-4 & B-5, in accordance with the Plans, Specifications & Contract Documents, per LS.

9. Base Bid Item No. 9 – Install the 6' diameter by 4' deep Packaged Lift Station Valve Vault with Pre-Assembled Pipe, Fittings, Valves and accessories, furnished by the Owner, as shown on Plan Sheets B-3, B-4 & B-5, in accordance with the Plans, Specifications & Contract Documents, per LS.

10. Base Bid Item No. 10 – Install the 6" Bypass Connect and piping from the Valve Vault, as shown on Plan Sheets B-3 & B-6, in accordance with the Plans, Specifications & Contract Documents, per LS.

11. Base Bid Item No. 11 – Install the VAG 3" Flanged Surge Relief Valve Assembly, furnished by the Owner, in accordance with the Assembly Details shown on Plan Sheets B-3 & B-6, including

the 4” Drain Line to the Wet Well, in accordance with the Plans, Specifications & Contract Documents, per LS.

12. Base Bid Item No. 12 – Install the 4” Mag Flux Flow Meter & Controls, furnished by the Owner, in accordance with the Flow Meter Vault Details shown on Plan Sheets B-3 & B-6, including all 4” & 6” Piping, Fittings & Valves & accessories, in accordance with the Plans, Specifications & Contract Documents, per LS.

13. Base Bid Item No. 13 – Install the 3/4” Non-Freeze Yard Hydrant, in accordance with the Plans, Specifications & Contract Documents, per LS.

14. Base Bid Item No. 14 – Install the 10’ by 10” Concrete Pads around the top elevation of the Lift Station Wet Well and the Lift Station Valve Vault, in accordance with the Plans, Specifications & Contract Documents, per LS.

15. Base Bid Item No. 15 – Install the Generator Pad, in accordance with the Plans, Specifications & Contract Documents, per LS.

16. Base Bid Item No. 16 – Install the 80 KW Cummins Generator and ATS, furnished by the Owner, in accordance with the Plans, Specifications & Contract Documents, per LS.

17. Base Bid Item No. 17 – Install all Electrical Work associated with the Hills & Dales Lift Station Project, in accordance with the Plans, Specifications & Contract Documents, per LS.

18. Base Bid Item No. 18 – Install the Chain Link Fence & Gates for the Hills & Dales Lift Station Site and install six Pipe Guards as directed, in accordance with the Plans, Specifications & Contract Documents, per LS.

19. Base Bid Item No. 19 – Perform all portions of the Hills & Dales Lift Station Improvements Project that is not contained in Bid Item Numbers 8-18.

20. Base Bid Item No. 20 - Install 450 LF of 6" HDPE DR11 (DIPS) Force Main, Min. 4' Cover, in accordance with the Plans, Specifications & Contract Documents, per LF. The Pipe & Locate Wire is furnished by the Owner.

21. Base Bid Item No. 21 - Construct 100 LF of 10” PVC SDR26 Sewer, in accordance with the Plans, Specifications & Contract Documents, per LF. The Pipe & Locate Wire is furnished by the Owner.

22. Base Bid Item No. 22 - Construct 340 LF of 8” PVC SDR26 Sewer, in accordance with the Plans, Specifications & Contract Documents, per LF. The Pipe & Locate Wire is furnished by the Owner.

23. Base Bid Item No. 23 - Construct 80 LF of 2” HDPE Water Line, in accordance with the Plans, Specifications & Contract Documents, per LF. The Pipe & Locate Wire is furnished by the Owner.

24. Base Bid Item No. 24 - Construct 5 EA Manholes, depths vary, in accordance with the Plans, Specifications & Contract Documents, per EA.

25. Base Bid Item No. 25 - Erosion Control Requirements per the Permit for the Erosion Control Clearing, Construction & Final Plan, per Lump Sum for the Total Plan.

a. Work under this item shall include all labor, equipment, and materials necessary to comply with the Soil Erosion and Sediment Control Plan as shown on the Plans and as Permitted. The Contractor shall conform to all State of Georgia rules, regulations and laws governing Soil Erosion and Sediment Control.
b. Work under the Erosion Control Clearing Plan includes all labor, equipment, and materials necessary for the complete removal of trees, shrubs, and the like within the clearing limit as shown on the Plans. Work shall include the clearing, grubbing, disposal, and other incidental work required to remove the existing vegetation and miscellaneous items not covered under other items. Trees and shrubs shall be removed by a forestry mulching machine to prevent excessive damage to the soil. Any debris deemed unsuitable for mulching shall be removed from the site. Payment for all clearing and grubbing shall be included in the lump sum bid item for the Erosion Control Plan.

c. The Contractor must continually maintain the Soil Erosion and Sediment Control measures throughout the construction time frame and will make all modifications and additions as required by the State of Georgia, Owner and Engineer.

d. Payment will be made per lump sum for the Erosion Control Plan, which includes the Clearing Phase, Construction Phase and Final Phase.

26. Base Bid Item No. 26 - Allowance for Mobilization, per Lump Sum.

27. Base Bid Item No. 27 - Allowance for Demobilization, per Lump Sum

28. Base Bid Item No. 28 - Allowance for Field Testing of Materials, Only if Required and Approved by Engineer, per LS
    a. The Field Testing required per the Contract Specifications will be determined and Approved by the Engineer and paid from the allowance on a monthly basis. The Contractor must submit Invoices monthly to support the Invoice Amount.

B. **The City of LaGrange will award the Contract to the "low, responsive, responsible Bidder" that submits the lowest Total Base Bid Amount.**

1.11 WORK ITEMS REQUIRED FOR NO ADDITIONAL PAYMENT

A. General

The items in the Bid Form are intended to provide full compensation to the Contractor for providing a complete and functional Project. Any major Bid Item which is found by the proposed bidder shall be called to the attention of the Engineer prior to the Bid. **Payment for any minor items necessary to satisfactorily complete the project which is not listed in the Bid Form shall be included in the prices bid for the items in the Bid Form. No additional payment will be made for these items. The following items are included as minor items:**

1. Traffic Control
   The Contractor shall provide all signage, materials, labor and equipment to ensure appropriate traffic control in accordance with the applicable provisions of the Manual on Uniform Traffic Control Devices for Streets and Highways. No additional payment will be made for traffic control.
2. Engineering Controls and Surveying
   The Contractor shall provide and maintain construction stakes, centerlines, right-of-ways, cut and fill cross-sections, construction grades and final grades for the proper prosecution of the work

under the Contract, all in accordance with the Specifications. No additional payment will be made for engineering controls and surveying.

END OF SECTION

SECTION 01153

CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Changes in the Scope of the Work, additive and deductive, will be documented as described hereinafter. Individual scope changes or groups of scope changes will be made a part of the Contract in the form of Change Orders.

B. Changes in the scope of the Work may be documented in the form of the following, as applicable:
   1. Proposal Requests
   2. Change Requests
   3. Construction Change Authorizations

C. Costs or credit for changes in the scope of the Work may be calculated by the following methods, as allowed by the Engineer and as applicable:
   1. Unit Price
   2. Lump Sum
   3. Cost-Plus or Time-and-Material

D. Throughout the prosecution of the Work, Contractor will:
   1. Provide full backup and other supporting documentation required to evaluate all Change Requests.
   2. Maintain detailed records of all authorized Work done on a Cost-Plus basis.
   3. Keep Construction Schedules, Schedule of Values, Application for Payment, Drawings Contract Documents, and Project Record Documents current with regard to approved Change Orders.

E. Owner will designate in writing the person who is authorized to execute Change Orders.

1.02 CHANGE INITIATION PROCEDURES

A. Owner or Engineer may initiate changes by submitting a Proposal Request to Contractor. The Proposal Request will include:
   1. Detailed description of the change, products, and location of the change in the Project.
   2. Supplementary or revised Drawings and Specifications.
   3. The projected time span for making the change.
   4. A specific period of time during which the requested price will be considered valid.

B. In lieu of Proposal Request, Engineer may issue a Construction Change Authorization for Contractor to proceed with a change for subsequent inclusion in a Change Order.
   1. Authorization will describe changes in the Work, both additions and deletions, with attachment of revised Contract Documents to define details of the change, and will designate the method of determining any change in the Contract Price and any change in Contract Time.
   2. Owner and Engineer will sign and date the Construction Change Authorization as authorization for the Contractor to proceed with the changes.
   3. Contractor will sign and date the Construction Change Authorization to indicate agreement with the terms therein.

4. Contractor will document costs for the authorized cost, in the manner designated by the Engineer, in a Change Request submitted to the Engineer.

C. Contractor will respond to Proposed Request, document costs associated with a Construction Change Authorization, or initiate changes by submitting a written Chance Request to Engineer, containing:
   1. Description of changes.
   2. Statement of the reason for making the changes.
   3. Statement of the effect on the Contract Price and the Contract Time.
   4. Statement of the effect on the work of separate contractors.
   5. Documentation supporting any change in Contract Price or Contract Time, as appropriate.

1.03 DOCUMENTATION OF CHANGE REQUESTS

A. Support Change Requests for anticipated Lump Sum changes and for new Unit Price items with cost backup data to justify additions or deductions to the Contract Amount and to the Contract Time:
   1. Labor; time and pay rates
   2. Equipment required.
   3. Products required.
      a. Recommended source of purchase and unit cost quotation.
      b. Quantities required.
   4. Taxes, insurance and bonds.
   5. Credit for work deleted from Contract, similarly documented.
   6. Fee (overhead and profit).
   7. Justification for any change in Contract Time and impact on Project Schedule.

B. Support each Change Request for additional work done on a Cost-Plus basis with documentation as required for a Lump Sum Change Requests, plus additional information:
   1. Name of the Owner's authorized agent who ordered the additional work, and date of the Order.
   2. Dates and times work was performed, and by whom.
   3. Time record, verified by Project Representative, summary of hours worked, and hourly rates paid.
   4. Receipts and invoices for:
      a. Equipment used, listing dates and times of use.
      b. Products used, listing quantities.
      c. Subcontracts.

1.04 LIMITATIONS

A. Change Requests involving previously-established Unit Prices will be limited to the subject Unit Prices multiplied by quantities agreed upon by Contractor and Engineer. Unit Prices include fee, so no additional fee may be added.

B. Pricing for Lump Sum or Cost-Plus Change Requests may include costs of materials, labor (including foremen), equipment use, subcontracts, taxes, insurance, bonds and fee (overhead and profit). Costs of supervision, management, office support, miscellaneous expendable items, small tool purchase and use, and incidentals will be considered to be overhead expenses, and thus covered under by fee.

C. Fee on additive Change Requests will be subject to the following limitations:
   1. For Work performed by subcontractors:
      a. performing subcontractor may add fee of not more than fifteen (15) percent of the total of eligible

costs.

b. each higher tier of subcontractor or contractor may add fee of not more than eight (8) percent of the performing subcontractor's total of eligible costs.

2. Contractor may add fee of not more than fifteen (15) percent of the total of all other eligible costs.

D. On deductive Change Requests, fee calculated at one-half (½) the rates prescribed for additive Change Requests will also be deducted as profit. The other half of fee may be retained for overhead expenses associated with processing the Change Request and Change Order.

1.05 APPROVAL

A. Contractor will not proceed with work described in Proposal Request(s) or Change Request(s) until Engineer accepts and approves the Change Request(s) concerned.

B. Contractor may proceed with work described in Construction Change Authorization(s) upon receipt of such authorization signed by the Owner and the Engineer.

1.06 PREPARATION OF CHANGE ORDERS

A. Periodically throughout the course of the Project, the Engineer will compile all approved Change Requests (except those Change Requests included in a previous Change Order) into a sequentially numbered Chance Order.

B. Change Orders will be itemized by Change Request number, change description, cost amount (additive or deductive) and effect on Contract Time.

C. Change Order will include revised Contract Documents as required.

1.07 IMPLEMENTATION OF CHANGE ORDERS

A. Upon approval of a Change Order, Contractor will revise the Schedule of Values to reflect the approved changes.

1. Each approved Change Request included in the Change Order will be listed as a separate new item in the Schedule of Values, and will be further broken down into component costs as approved in the Change Requests.
2. The Contract Amount will be revised to reflect the sum total of the approved Change Orders.

B. The revised Schedule of Values will then serve as the basis of all subsequent Applications For Payment.

C. Contractor will update the Construction Schedule to reflect Change Order items as described in Section 01310, Construction Schedules.

D. Upon completion of work under a Change Order, Contractor will enter pertinent changes in Record Documents.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MATERIALS

All materials and/or products furnished and installed under a Change Order will meet the requirements of similar materials and/or products specified in the original Contract Specifications. If the material and/or product was not specified in the original Specifications, then the material and/or product will meet the requirements of all Specifications made part of the Contract by Change Order.

PART 3 - EXECUTION

3.01 CONSTRUCTION OBSERVATION

Items of Work cited in the signed and dated Change Order will be done under the observation of the Project Representative or Engineer, and his decision will be final and binding. The Drawings, if any, to be followed for such work; the equipment to be used; and the amount and character of labor to be employed will meet with his approval. Nothing stated in this paragraph will be construed to prevent the Contractor from seeking court review.

END OF SECTION

SECTION 01159

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Submit to the Engineer a Schedule of Values allocated to the various portions of the Work, within ten days after award of Contract.

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, will be used only as the basis for the Contractor's Applications for Payment.

1.02 RELATED REQUIREMENTS

A. Section 00700: General Conditions

B. Section 01152: Application for Payment.

C. Section 01310: CPM Construction Schedules.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. The schedule of values shall Identify:
   1. Title of Project and Contract number.
   2. Name and address of Engineer.
   3. Name and address of Contractor.
   4. Date of submission.

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

C. Identify each line item with the number and title of the respective major section of the Specifications.

D. For each major line item list sub-values of major products or operations under the item.

E. For the various portions of the Work:
   1. Each item will include a directly proportional amount of the Contractor's overhead and profit.
   2. Submit a subschedule for each separate stage of work specified.

F. The sum of all values listed in the schedule will equal the total Contract Price.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. The Engineer shall schedule and administer Pre-Construction meeting, periodic Progress Meetings, and specially called meetings throughout progress of the work.
   1. Prepare agenda for meetings.
   2. Distribute notice of each meeting date.
   3. Make physical arrangements for meetings.
   4. Preside at meetings.
   5. Record the minutes; include significant proceedings and decisions.
   6. Distribute copies of minutes.

1.02 RELATED REQUIREMENTS

A. Section 01310: CPM Construction Schedules.

B. Section 01340: Shop Drawings, Produce Data and Samples.

C. Section 01720: Project Record Documents.

D. Section 01730: Operating and Maintenance Data.

1.03 PRE-CONSTRUCTION MEETING

A. Schedule date acceptable to Owner and Contractor, after the Notice to Proceed.

B. Location: A central site designated by Engineer.

C. Attendance:
   1. Owner’s Representative.
   2. Engineer and his professional consultants as needed.
   3. Contractor’s Representative.
   4. Major Subcontractors.

1.04 PROGRESS MEETINGS

A. Schedule regular monthly periodic meetings.

B. Location: A central site designated by Engineer.

C. Attendance:
   1. Owner’s Representative.
   2. Engineer and his professional consultants as needed.

3. Contractor’s Representative.
4. Major Subcontractors.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

SECTION 01310

CPM CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 GENERAL

A. The CPM Construction Schedule is the mutually-agreed construction plan which demonstrate to the Owner and Engineer that the Contractor has thought through all elements of the construction process, has conformed to the requirements of the Contract Documents, and can execute, including updates, the major construction elements and activities within the contractual time frames of the Contact Documents.

1.02 WORK INCLUDED

A. Prepare and submit to Engineer a CPM Construction Schedule for the Construction Project, with major elements of construction and related activities and sub-activities which are essential to its progress of the Construction Project per the Contract Documents.

B. Consider any recommended sequence of construction proposed in the Contract Documents during the preparation of the CPM Construction Schedule.

C. It is the Contractor's responsibility to develop a totally functional CPM Construction Schedule that will comply with the Project Plans and Contract Documents.

D. The Contractor shall develop the CPM Construction Schedule for the Contract B - 2023 Hills & Dales Lift Station, Force Main & Sewer Improvements Project. The Contractor must schedule and sequence all work associated with the Project to minimize any operational disturbance. All planned operational disturbances must be approved by the Owner.

1.03 CONTENT OF THE "CPM CONSTRUCTION SCHEDULES"

A. Consider any recommended sequence of construction proposed in the Contract Documents during the preparation of the CPM Construction Schedule.

B.. Organize the CPM by each major elements of construction, such as,

1. Erosion Control Installation
2. Clearing & Grading for the Project
3. Construction of the Lift Station (LS), Access Road & all LS components noted.
4. Construction of the 6" Force Main.
5. Construction of the 10" & 8" Sewer & Manholes.
6. Completion of the Project.

C. Identify each activity of all major elements of construction, such as,

1. Submittal Schedule
2. Procurement and Fabrication of Equipment and Materials
3. Delivery of Equipment
4. Construction and Installation Activities
5. Testing of Equipment
6. Completion of Activity

D. Show the dates for the beginning, and completion of each major element, activity and/or sub-activity of the CPM Construction Schedule.

E. Show projected percentage of completion for each item, as of the first day of each month.

F. Identify all Critical Portions of the CPM Construction Schedule required to comply with the Contract Documents.

1.05 REVISED SCHEDULES

A. Indicate progress of each of the major elements, activities and sub-activities to date of submission of the Revised Schedules.

B. Show changes occurring since previous submission of schedule:
   1. Major changes in scope.
   2. Activities modified since previous submission.
   3. Revised projections of progress and completion.
   4. Other identifiable changes.

C. Provide a narrative report as needed to define:
   1. Problem areas, anticipated delays, and the impact on the schedule.
   2. Corrective action recommended, and its effect.
   3. The effect of changes on schedules submitted.

1.06 SUBMISSION OF SCHEDULES

A. Submit initial schedules within 10 days after Award of Contract. Engineer will review schedules and return review copy within 10 days after receipt.
B. Submit revised schedules with each application for payment.
C. Submit four (3) copies which will be retained by the Engineer.

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Submit Shop Drawings, Product Data and Samples on all materials and equipment that are to be incorporated into the Project by the provisions of these Contract Documents.

B. Designate in the Construction Schedule, or in a separate coordinated schedule, the dates for submission of the Shop Drawings.

1.02 SHOP DRAWINGS

A. Shop Drawings will be presented in a clear and thorough manner. Details will be identified by reference to detail sheet or schedule shown on drawings.

B. Drawings for steel structures will consist of shop drawings showing layout, connection details, dimensions, sizes of material, elevation views and other information necessary for the complete fabrication of the metal Work.

C. Drawings for concrete structures will consist of detailing of the reinforcing steel.

D. Details for falsework, bracing, cribs, coffer dams, centering and form work, masonry layout and similar work are not required since they are the complete responsibility of the Contractor in all of their aspects.

E. Drawings for plant and yard piping will consist of details, dimensions, layout, and bill of materials necessary for the complete fabrication and installation of the piping and appurtenances.

1.03 PRODUCT DATA

A. Identify specification section, location on Project, size and quantities. Show performance characteristics and capacities and show dimensions and clearances required. Show wiring or piping diagrams and controls.

B. Manufacturer's standard schematic drawings and diagrams should provide information specifically applicable to the Work.

1.04 SAMPLES

A. Office samples will be of sufficient size and quantity to clearly illustrate the functional characteristics of the product, with integrally related parts and attachment devices. Provide full range of color, texture and pattern in the sample submittal.

1.05 CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings, Product Data and Samples prior to submission.

B. Determine and verify field measurements and conformance with Specifications.

C. Coordinate each submittal with requirements of the Work and of the Contract Documents.

D. Notify the Engineer in writing of any deviations in the submittals from requirements of the Contract Documents. Each deviation should be marked in "red" on the shop drawings.

E. If the Contractor fails to notify the Engineer of any deviation in the shop drawing submittals from the requirements of the Contract Documents and the deviations are not noted in the Engineers review, it becomes the Contractor's responsibility to correct any problems during construction, at no cost to the Engineer or Owner, resulting from the Contractor's failure to note deviations and have such deviations resolved during the shop drawing process. Contractor must compensate Owner for Engineer's expense to solve any field construction problems resulting from such deviations.

F. Begin no fabrication of Work which requires submittals until return of submittals with Engineer approval.

1.06 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule.

B. Number of submittals required:
   1. Submit the number required by the Engineer.

1.07 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by the Engineer and resubmit until approved.

1.08 ENGINEER DUTIES

A. Review submittals with reasonable promptness and in accordance with schedule.

B. Affix stamp and initials or signature, and indicate exceptions taken, if any, and requirements for resubmittal.

C. Return submittals to Contractor.

1.09 ENGINEER REVIEW

A. It is expressly understood that the review by the Engineer of the Contractor's Work on drawings relates to the general intended requirements and details. Such review will not relieve the Contractor of any responsibility for accuracy of dimensions and details.
B. The Contractor will be responsible for agreement and conformity of his working drawings with the Drawings and Specifications.

1.10 COMPENSATION

A. Compensation for preparing and furnishing all working drawings will be included in the lump sum price and/or unit prices bid for the Work and such drawings will be furnished by the Contractor without additional compensation.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Quality Control

B. Manufacturer's Field Services

1.02 QUALITY CONTROL

A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the drawings or from instructions by the Engineer.

B. Unless otherwise shown, all Work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The Work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the Work carefully and neatly together.

C. All equipment, materials and articles incorporated into the Work shall be new and of comparable quality as specified. All workmanship shall be first-class and shall be performed by mechanics skilled and regularly employed in their respective trades.

1.03 MANUFACTURERS' FIELD SERVICES

A. For proper installation and operation of the equipment or material specified in this Project, the Contractor shall arrange for the services of qualified service representatives from the companies manufacturing or supplying each type of equipment or material.

END OF SECTION

SECTION 01410

INDEPENDENT TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor will contract and pay for the services of an Independent Testing Laboratory selected by the Owner to ascertain compliance of materials with the requirements of the Contract Documents.

B. The Contractor will pay the Independent Testing Laboratory on a monthly basis from the Allowance set up on the Base Bid Form and included as part of the Contract.

1.02 RELATED REQUIREMENTS

A. Testing laboratory services as required by the respective Sections of the Contract Documents.

B. Certification of products as required by the respective Sections of the Contract Documents.

C. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

1.03 DUTIES OF THE INDEPENDENT TESTING LABORATORY

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction. Comply with specified standards and ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.

E. Perform additional tests as required by Engineer or the Owner.

1.04 LIMITATIONS OF AUTHORITY OF INDEPENDENT TESTING LABORATORY

A. Independent testing laboratory is not authorized to release, revoke, or alter the requirements of the Contract Documents. The independent testing laboratory cannot approve or accept any portion of the Work.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work, to Manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require requalification testing by the testing laboratory.

D. Furnish copies of products test reports as required.

E. Furnish incidental labor and facilities to provide access to Work to be tested and to obtain and handle samples at the Project site.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

H. Responsible for other testing which is to be supplied by manufacturer.

I. Provide other testing as required by Contract Documents.

END OF SECTION

SECTION 01430

CONTRACTOR SUPERVISION OF WORK

PART 1 - GENERAL

1.01 CONTRACTOR RESPONSIBILITIES

A. The Contractor will be responsible for planning, scheduling, organization and prosecution of the Work in accordance with the Drawings, Specifications and Contract Documents.

B. Observations, construction reviews, tests, recommendations or approvals by the Engineer, or by persons other than the Contractor, will in no way relieve the Contractor of his obligation to complete all Work in accordance with the Drawings, Specifications and Contract Documents.

C. All Work will be done under the direct supervision of the Contractor.

D. The Contractor will be responsible for construction means, methods, techniques and procedures, and for providing a safe place for the performance of the Work by the Contractor, by all subcontractors, by all suppliers, and by the employees of all of those heretofore named.

E. The Contractor will also be responsible for safe access to the Work, safe use of the Work, safe working conditions, and safe occupancy of the Work by and/or for all authorized persons.

1.02 SUPERINTENDENCE

A. The Contractor will maintain on the Project a qualified superintendent, who will provide the efficient supervision required for the successful and satisfactory completion of the Work.

B. The superintendent will have the authority to act in behalf of the Contractor.

C. All communication with the superintendent will be considered as communication with the Contractor.

D. The Contractor's superintendent will be present on the site of the Work at all times as required to adequately perform his supervisory duties.

1.03 SUBCONTRACTORS

A. The Contractor will coordinate and supervise all Work performed under this Contract by subcontractors.

B. The Contractor will be totally responsible for the quality of the subcontractor’s Work.

END OF SECTION

SECTION 01500

TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish, install and maintain temporary utilities as required for the Construction Project.

B. Remove all temporary utilities upon completion of the Work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable Federal, State and Local codes, standards and regulations.

2.02 TEMPORARY ELECTRICITY, AS REQUIRED

A. Arrange with utility company to provide all service required for power and lighting. Pay all costs for service and for power used.

B. All temporary electrical facilities shall be installed, maintained and utilized in a safe manner, meeting all applicable electrical codes and OSHA requirements.

2.03 TEMPORARY LIGHTING, AS REQUIRED

A. Provide and maintain lighting for construction operations as deemed necessary.

B. All temporary lighting facilities shall be installed, maintained and utilized in a safe manner, meeting all applicable codes and OSHA requirements.

2.04 TEMPORARY WATER SERVICE, AS REQUIRED

A. Make connections to existing facilities to provide water for construction purposes.

B. Pay all costs for installation, maintenance and removal, and service charges for water used.

2.06 TEMPORARY SANITARY FACILITIES, AS REQUIRED

A. Provide sanitary facilities for the use of the Contractor's employees as may be necessary to comply with the rules and regulations of the State Board of Health or of other authorities having jurisdiction. Pay all costs for installation, maintenance and service charges for sewer service used.

B. Service, clean and maintain facilities and enclosures.

END OF SECTION

SECTION 01530

BARRIERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish, install and maintain suitable barriers as required to prevent public entry onto the project site, and to protect the Work, existing facilities, trees and plants from construction operations.

B. Remove barriers when no longer needed, or at completion of Work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable Federal, State and Local codes, standards and regulations.

2.02 BARRIERS

A. To Contractor's option, materials as appropriate to serve each specified required purpose.

B. Install barriers of reasonable uniform appearance, structurally adequate for required purposes.

C. Maintain barriers during entire construction period.

D. Relocate barriers as required by progress of construction.

2.03 REMOVAL

A. Completely remove barricades when they are no longer needed, and when approved by Engineer.

B. Clean and repair damage caused by installation.

2.04 COST

A. The Contractor shall pay all cost for temporary barriers.

END OF SECTION

SECTION 01540

SECURITY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.

B. Provide an adequate and approved system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for taking proper security measures.

1.02 COSTS

A. Contractor shall pay all costs for protection and security systems.

END OF SECTION

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide and maintain vehicular access to site and within site to provide uninterrupted access:
   1. To temporary construction facilities, storage and Work areas.
   2. For use by persons and equipment involved in construction of Project.
   3. For use by emergency vehicles.

B. Provide and maintain temporary parking facilities for use by construction personnel.

C. Remove temporary construction materials and facilities when no longer needed, and restore areas.

1.02 SITE ACCESS ROADS

A. Provide site access for construction equipment and vehicles.

1.03 ON-SITE ROADS AND PARKING AREAS

A. Locate roads, drives, walks and parking facilities to provide uninterrupted access to construction offices, mobilization, work, storage areas, and other areas required for execution of the Contract.
   1. Location: as designated; consult with Contractor regarding any desired deviation therefrom.
   2. Size of parking facilities: Adequate to provide for needs of personnel. Provide additional off-site facilities if required.

B. Provide access for emergency vehicles to the Project site.

C. Maintain traffic free as possible of excavated materials, construction equipment and debris.

1.04 EXISTING PAVEMENTS

A. Designated existing on-site streets and driveways may be used for construction traffic. Provide temporary roads as needed for required construction access.

B. Do not allow existing parking facilities to be used by construction personnel or for Contractor's vehicles or equipment.

PART 2 - PRODUCTS

2.01 BASE AND TOPPING MATERIALS

A. For temporary construction which will be removed when no longer needed for construction purposes: At Contractor's option.

B. For earthwork and topping which will become a permanent part of the Work: Materials will comply with the respective Sections of Specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clear areas required for access roads and parking areas.

B. Fill, compact and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings.

C. Provide for surface drainage of facilities and surrounding areas. Provide and operate temporary pumps as required.

3.02 CONSTRUCTION

A. Construction methods for temporary facilities to be removed when no longer needed: At Contractor's option to provide the required results.

B. For Work, which will become a part of permanent Work, comply with respective sections of Specifications for preparation and construction.

3.03 MAINTENANCE

A. Maintain roads, walks and parking areas in a sound, clean condition. Repair or replace any portions damaged during progress of construction Work.

3.04 REMOVAL

A. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation.

B. Restore areas to original or to specified conditions at completion of Work.

3.05 COST

A. The Contractor shall pay for all costs associated with the requirements of these Specifications.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control.

1.02 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into the atmosphere.

1.03 WATER CONTROL

A. Provide methods to control surface water runoff to prevent damage to the site or adjoining properties. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff control devices.

1.04 DEBRIS CONTROL

A. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes. Provide containers for deposit of debris. Prohibit overloading of trucks to prevent spillages on access and haul routes.

1.05 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Perform special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.

1.06 EROSION CONTROL

A. Plan and execute construction and earth work by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.

B. The Contractor will comply with the Erosion Control Plan depicted in the Drawings and Specifications and will comply with the requirements to obtain a state and/or local agency approved Erosion Control Plan.

C. The installation of the erosion control measures to comply with the Contract Document as well as the State and/or Local Agency approved Erosion Control Plan will be installed prior to land-disturbing activities and will be maintained at all times.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide, operate and maintain equipment, services and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, on on-site access roads, and in parking areas.

B. Remove temporary equipment and facilities when no longer required. Restore grounds to original, or to specified conditions.

1.02 TRAFFIC CONTROL IN WORK AREAS

A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under Contractor's control or affected by Contractor's operations.

B. All traffic signs, warning lights, barricades and flagmen, as well as their number and placement, will be in accordance with the Department of Transportation "Manual on Uniform Traffic Control Devices for Streets and Highways," latest edition for the State in which the Project is located.

C. Comply with all traffic requirements of local and state governments.

1.03 FLAGMEN

A. Provide trained and suitably equipped flagmen to regulate traffic when construction operations encroach on public traffic lanes.

1.04 FLARES AND LIGHTS

A. Provide flares and lights during periods of low visibility. Clearly delineate traffic lanes and guide traffic.

B. Provide illumination of critical traffic and parking areas.

1.05 ROAD CLOSING, DETOURS, AND MAINTENANCE

A. No highway, road or street or section thereof will be closed to public traffic except with the written permission of the Agency governing and maintaining that road, street or highway. The Contractor will maintain all detours for traffic along or over the Work. Unless otherwise provided in the Supplementary Conditions, the road, street or highway upon which the improvement or installation is being made, will, except at times when deemed impracticable by the Engineer, be kept continuously open to public traffic and in passable and safe condition.

B. Where the Work to be constructed under this Contract follows the general route of an existing road which is wholly or in part used by the traveling public, the Contractor will, without extra compensation, repair and maintain in safe, passable and convenient condition all such part or parts of such existing roads as are being so used between extreme limits of the Work under this Contract during the entire time from the date of the Notice to Proceed on this Contract until the final acceptance of the Work hereunder.

C. The Contractor will be required to carry traffic over the roads or streets with the least inconvenience to traffic within the limits of the Right-of-Way and on detours for which he is responsible as hereinabove provided.

1.06 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.

B. Monitor parking of construction personnel's private vehicles. Maintain free vehicular access to and through parking areas. Prevent parking on or adjacent to access roads, or in non-designated areas.

1.07 HAUL ROUTES

A. Consult with governing authorities, and establish public thoroughfares which will be used as haul routes and site access.

B. Roads used by the Contractor for hauling materials and equipment will be maintained by the Contractor without extra compensation.

1.08 PAYMENT

A. No direct payment will be made for the traffic control requirements listed in this Section. Such costs will be included in the lump sum price or distributed among the bid unit prices on the Bid Form.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 MATERIALS, SAMPLES, INSPECTION, TESTING, INSTRUCTIONS

A. All material and equipment incorporated in the Work will be new and unused, unless specifically provided by the drawings or under provisions of the Contract Documents.

B. All material and equipment must conform to applicable specifications and comply with size, make, type and quality specified.

C. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

D. The sources of supply of each of the materials and pieces of equipment will be reviewed by the Engineer before delivery is started. If it is found after trial that sources of supply previously reviewed do not produce uniform and satisfactory products or if the product from any source proves unacceptable at any time, the Contractor will submit for review other sources of supply.

E. All materials and equipment to be incorporated in the Work will be subject to adequate inspection and testing in accordance with applicable, accepted standards. Materials of construction, particularly those upon which the strength and durability of the structure may depend, will be subject to inspection and testing to establish conformance with Specifications and suitability for uses intended.

F. The Contractor will furnish to the Engineer, certified copies of mill tests or affidavits of compliance, as applicable, on materials and equipment to be incorporated in the Work.

G. When Contract Documents require that installation of work will comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.

H. Handle, install, connect, and adjust products in strict accord with such instructions and in conformity with specified requirements.

I. Perform Work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.02 TRANSPORTATION AND HANDLING

A. Deliver products in accord with manufacturer’s instructions and in accordance with construction schedules.

B. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

C. Promptly inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

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

1.03 STORAGE AND PROTECTION

A. Store products in strict accordance with manufacturer's instructions, with seals and labels intact and legible.

B. Store sensitive products in weather tight enclosures.

C. All materials and equipment will be stored and handled in such a manner as to preserve their quality and fitness for the Work.

D. All expenses in connection with providing suitable storage facilities will be paid for by the Contractor.

E. For exterior storage of products, store products above the ground, on blocking or skids. Cover products which are subject to deterioration with impervious sheet coverings. Provide adequate ventilation to avoid condensation.

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

G. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

H. Provide coverings as necessary to protect installed products from damage from traffic and subsequent construction operations after product is installed. Remove when no longer needed.

1.04 PRODUCT AND MATERIAL GUARANTY

A. Products List: Within 10 days after Award of Contract, submit to Engineer a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. Before Work on a contract is started, the Contractor may be required to furnish a complete statement of the origin, composition, and manufacture of any or all materials and equipment proposed to be used in the construction of the Work together with samples. Samples may be subjected to the tests cited in the Specifications to determine their quality and fitness for the Work.

1.05 DEFECTIVE MATERIALS

A. All materials or equipment not conforming to the requirements of the Specifications will be considered as defective and will be rejected. All rejected materials and equipment must be removed immediately from the site of the Work.

1.06 MATERIALS AND EQUIPMENT FURNISHED BY OWNER

A. The Contractor will furnish all materials and equipment needed in the Work unless the Owner elects to purchase specified items. All specified items to be furnished by Owner, if any, will be depicted in Section 00800, "Supplementary Conditions".

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Contractor shall coordinate startup of various equipment and systems. Contractor shall notify Engineer at least three working days prior to startup of each item of equipment or system.

B. Contractor shall provide all chemicals, fuel, lube, oil and other startup materials and all labor required to perform the startup of each item of equipment or system.

C. Comply strictly with specified procedures in starting up of equipment or systems.

1.02 START-UP PROCEDURES

A. Bearings:
   1. Inspect for cleanliness, clean and remove foreign materials.
   2. Verify alignment.
   3. Replace defective bearings, and those which run roughly or noisily.
   4. Grease as necessary, and in accord with manufacturer's recommendations.

B. Drives:
   1. Adjust tension in V-belt drives, and adjust vari-pitch sheaves and drives for proper equipment speed.
   2. Adjust drives for alignment of sheaves and V-belts.
   3. Clean, remove foreign materials before starting operation.

C. Motors:
   1. Check each motor for amperage comparison to name plate value.
   2. Correct conditions which produce excessive current flow, and which exist due to equipment malfunction.

D. Pumps:
   1. Check mechanical seals for cleanliness and adjustment before running pump.
   2. Inspect shaft sleeves for scoring.
   3. Inspect mechanical faces, chambers, and seal rings, replace if defective.
   4. Verify that piping system is free of dirt and scale before circulating liquid through the pump.

E. Control Valves:
   1. Inspect both hand and automatic control valves, clean bonnets and stems.
   2. Tighten packing glands to assure no leakage, but permit valve stems to operate without galling.
   3. Replace packing in valves to retain maximum adjustment after system is judged complete.
   4. Replace packing on any valve which continues to leak.
   5. Remove and repair bonnets which leak.
   6. Coat packing gland threads and valve stems with a surface preparation after cleaning.
   7. Verify that control valve seats are free from foreign material, and are properly positioned for intended service.

F. Tighten flanges after system has been placed in operation. Replace flange gaskets which show any sign of leakage after tightening.

G. Inspect screwed joints for leakage. Promptly remake each joint which appears to be faulty, do not wait for rust to form. Clean threads on both parts, apply compound and remake joints.

H. After system has been placed in operation, clean strainers, dirt pockets, orifices, valve seats and headers in fluid systems, to assure being free of foreign materials.

I. Open steam traps and air vents, remove operating elements. Clean thoroughly, replace internal parts and put back into operation.

J. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.

K. Set and calibrate draft gages of air filters and other equipment.

L. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment when needed.

M. Check each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.

N. Inspect each pressure gage and thermometer for calibration. Replace items which are defaced, broken, or which read incorrectly.

O. Repair damaged insulation.

P. Vent gasses trapped in any part of systems. Verify that liquids are drained from all parts of gas or air systems.

Q. Check piping for leaks at every joint, and at every screwed, flanged, or welded connection.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this Section includes the general requirements in preparation for final acceptance, final payment, normal termination of the contract, occupancy by the Owner, and similar actions evidencing completion of the Work. The time of closeout is recognized to be directly related to Substantial Completion and therefore may be either a single time period for the entire Work or a series of time periods for individual parts of the Work which have been certified as substantially complete at different dates.

1.02 SUBSTANTIAL COMPLETION

A. Prior to requesting the Engineer observe the Work for Certification of Substantial Completion, complete the following:
   1. Submit the last partial-payment request with the Contractor's sworn statement showing one hundred percent (100%) completion of the Work.
   2. Submit a release of liens for all materials, labor and other Work incorporated in the Project.
   3. Submit a consent of surety.
   4. Submit special guarantees, warranties, final certifications and similar documents.
   5. Obtain and submit final inspection test certificates and similar releases enabling the Owner's full and unrestricted use of the Work and access to services and utilities.
   6. Submit record drawings, maintenance manuals, and similar final record information.
   7. Complete start-up testing of systems and instruct Owner's personnel of maintenance and operating procedures. Submit all start-up and training reports.
   8. Discontinue and remove from the site any remaining temporary facilities, fencing and services, along with construction tools and facilities, and similar elements.
   9. Complete the final cleaning to the satisfaction of the Engineer. Remove all debris, rubbish, and other waste materials from the Project site.
   10. Touch-up and otherwise repair and restore marred exposed finishes.

1.03 FINAL ACCEPTANCE

A. Prior to requesting the Engineer's final inspection for certification of final acceptance and final payment, complete the following:
   1. Submit a request for final payment with final releases not previously submitted and accepted. Include certificates of insurance for products and completed operations.
   2. Submit certified copy of the Engineer's final punch list of itemized Work to be completed or corrected stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by the Engineer.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall keep and maintain in good condition at the Project site, one (1) set of full size plan prints of the contract drawings.

B. The Contractor shall enter upon these prints, from day to day, the actual “as built” record of the construction progress. Entries shall be made in a neat and legible manner and these prints shall be delivered to the Engineer upon completion of the Project.

C. Approval for final payment will be contingent upon compliance with this Section of the Specifications.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Maintain at the site, for the Owner, one record copy of:
   1. Drawings
   2. Specifications
   3. Addenda
   4. Change Orders and other modifications to the Contract
   5. Engineer Field orders or written instructions
   6. Approved Shop Drawings, Product Data and Samples
   7. Field Test Records
   8. Construction Photographs

1.03 RECORDING

A. Label each document "PROJECT RECORD".

B. Record information concurrently with construction progress.

1.04 SUBMITTAL

A. At Contract close-out, deliver Record Documents to Engineer for the Owner.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
   1. Prepare Operating and Maintenance Data as specified in this Section and as referenced in other pertinent Sections of Specifications.

B. Instruct Owner’s personnel in the maintenance and operation of equipment and systems as outlined herein.

C. In addition to Operations and Maintenance Data, the Manufacturer’s Printed Recommended Installation Practice shall also be included. If not part of the Operations and Maintenance Manual, separate written installation instructions shall be provided.

1.02 RELATED REQUIREMENTS

A. Section 01340: Shop Drawings, Product Data & Samples.

B. Section 01700: Project Closeout.

C. Section 01720: Project Record Documents.

D. Section 01740: Warranties and Bonds

1.03 OPERATIONS AND MAINTENANCE MANUAL

A. Provide complete Operations and Maintenance Manuals for every item of equipment furnished and installed by the Contractor. The manuals shall be:
   1. Detailed in instructions for the Owner’s personnel.
   2. Bound for the Owner’s record.

1.06 SUBMITTAL SCHEDULE

A. Submit preliminary copies of manual for review by Engineer. Engineer will return a reviewed copy.

B. Upon approval of the preliminary manual, submit four (4) additional copies.

1.08 TRAINING OF OWNER’S PERSONNEL

A. Prior to final inspection or acceptance, fully train Owner's designated operating and maintenance personnel in operation, and maintenance of equipment and systems.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Compile all specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute warranties, bonds and contracts when so specified.

D. Review warranties, bonds and contracts to verify compliance with the requirements of the Contract Documents.

E. Submit two (2) original signed copies of the warranties, bonds and contracts to Engineer for review and submittal to owner.

F. All warranties and bonds will be from the date of Substantial Completion and for a duration of one (1) year, unless specified for a time period greater than one (1) year in other Sections of the Specifications.

1.02 FORM OF SUBMITTALS

A. Include submittal copies of each specified warranties, bonds, and service and maintenance contracts.

B. Submit record copies of all specified warranties, bonds, and service and maintenance contracts, compiled in a single three-ring binder.

1.03 TIME OF SUBMITTALS

A. Make submittals within ten days after date of substantial completion, prior to final request for payment.

B. For items of work where acceptance is delayed materially beyond date of substantial Completion, provide updated Submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.04 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in respective Sections of Specifications.

B. Provide a Summary List for all warranties and bonds, listing the start of each and duration for each, as specified in these Specifications.

END OF SECTION

DIVISION 2

SITEWORK

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work under this section includes, but is not limited to the following:
   1. Clearing and grubbing
   2. Topsoil removal
   3. Site grading
   4. Material disposal

B. Related work specified elsewhere:
   1. Section 02200 - Earthwork - General
   2. Section 02201 - Earthwork - Pipeline

1.02 JOB CONDITIONS

A. The Engineer will provide:
   1. Permanent base lines
   2. Property lines
   3. Easement lines
   4. Permanent bench marks

B. The Contractor will:
   1. Provide all construction layout
   2. Provide temporary bench marks
   3. Verify all dimensions in relation to existing facilities
   4. Comply with all Federal, State. and local laws and regulations.

PART 2 - PRODUCTS

2.01 CLEARING

A. The site will be cleared of all trees and other vegetation not specifically designated to remain.

B. The site will be cleared of all downed timber, snags, and rubbish.

2.02 GRUBBING

A. The site will have all stumps and roots 2 inches and larger removed to a depth of not less than 6 inches below the original ground surface.

B. Areas of structural excavation will have all visible stumps and roots 2 inches and larger removed.

2.03 TOPSOIL REMOVAL AND STORAGE

A. Topsoil will be removed, generally 2 to 6 inches, from all areas to be excavated or filled.

B. Topsoil will be stockpiled at a location approved by the Engineer.

2.04 SITE GRADING

A. The site will be graded during construction to eliminate unnecessary ponding of water and provide as dry as possible work site.

B. The finish grading will be accomplished after placement of 3 inches of topsoil in all disturbed areas.
   1. The finished grade will be within 0.10 foot of the grade shown on the Drawings in areas within 10 feet of any structure or paved area.
   2. The finished grade in other areas will be within 0.15 foot of the grade shown on the Drawings.

2.05 MATERIAL DISPOSAL

A. Salvageable items:
   1. All items of equipment and material salvaged will be the property of the Owner.
   2. The Contractor will carefully remove, clean, inspect and transport salvaged items to the place designated by the Owner.
   3. Salvaged materials are not to be used in the new work unless called for on the Drawings or authorized in writing by the Engineer.

B. Waste: No waste material will remain on the jobsite except as authorized in writing by the Engineer.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

A. Clearing, grubbing, topsoil removal, intermediate grading disposal will be accomplished by methods determined by the Contractor and will be the total responsibility of the Contractor.

3.02 FINISH GRADING

A. Finish grading may be accomplished by mechanical means.

B. Failure to achieve the grades as specified in Part 2.04B of this Section will result in the Engineer requiring the Contractor to use hand tools and labor.

END OF SECTION

SECTION 02200

EARTHWORK - GENERAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this section includes but Is not limited to the following:
   1. Excavation
   2. Drilling and Blasting
   3. Fills and Embankments
   4. Structural Backfill
   5. Borrow Material
   6. Structural Foundation Material
   7. Rip Rap
   8. Disposal of Materials
   9. Foundation drilling
   10. Sheeting, shoring and bracing

B. Related Work Specified Elsewhere:
   1. Section 02100 - Site Preparation
   2. Section 02930 - Grassing

1.02 JOB CONDITIONS

A. All excavation will be unclassified. No additional payment will be made for rock excavation.

B. The Contractor will be responsible for providing adequate sheeting and shoring and will repair, at no cost to the Owner, all damage resulting from failure to provide adequate support.

C. The Contractor will be responsible for damage to property and injury to persons caused directly or indirectly by blasting operations or inadequate sheeting and shoring.

1.03 EXCAVATION

A. Structural Excavation
   1. Excavation for structures will be sufficiently large for the proper placing of forms and concrete and for dewatering purposes, but will not be excessively large in horizontal area. It will be the Contractor's responsibility to dewater excavation and keep water level at least two feet below excavation for building. Banks may be sloped at a safe angle provided that such excavation does not, endanger or damage existing or proposed structures pipelines, etc. The bottom of the excavation will be true to the required shape and elevations shown on the plans. No earth backfilling will be permitted under structures unless specifically shown on the plans. Should the Contractor excavate below the elevations shown or specified, he will fill the void thus made with crushed stone acceptable to the Engineer and thoroughly compacted or with Class B concrete at his own expense.
   2. On unit price contracts the horizontal limits for structural excavation will be measured for payment between the vertical planes passing 12-inches beyond the outer vertical surface of the structure or beyond the outer edge of the structure footing, whichever is greater.
   3. All footing excavations will be tested per Section 01410 to determine if the material is suitable for the foundations. All unsuitable material will be removed per Part 1.03A.4., below.

4. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations are encountered which extend beyond the limits of the excavation, such materials will be removed only after approval of the Engineer and replaced with structural foundation material per Part 2.02 of this Section and thoroughly compacted, or with Class B concrete.
5. In all cases where materials are deposited along open excavation, they will be placed so that in the event of rain, no damage will result to the work or adjacent property.

B. Underwater Excavation:
1. Where the excavation area shown on the plans is under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the work thereafter; provided the method and equipment to be used results in completed work which complies with the specifications and is acceptable to the Engineer. In such cases, the excavation area will be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed. The cost of all temporary construction work necessary or incidental thereto, including the cost of installing and removing sand bags, coffer dams, sheet piling excavation and backfill, pumping and dewatering, will be considered as an integral part of the cost of excavation and no separate payment therefor will be allowed or made.

1.04 DRILLING AND BLASTING

A. Drilling and blasting methods used in rock excavation will be optional with the Contractor but will be conducted with due regard to the safety of persons and property in the vicinity of the work and in strict conformity with all laws, ordinances or regulations governing blasting and the use of explosives. Rock excavation near existing structures of all types will be conducted with the utmost care, and every precaution will be taken to prevent damage to such structures. Any damage or injury of whatever nature to persons or property caused directly or indirectly by blasting operations will be promptly repaired, replaced or compensated for by the Contractor at his own expense and to the entire satisfaction of the persons injured or the Owners of the property damaged.

B. Where future units are adjacent to structures requiring rock excavation, the rock will be drilled and blasted (not excavated) for a distance of approximately 10 feet from the present construction or as directed by the Engineer.

1.05 FILLS AND EMBANKMENTS

A. Fills and embankments will be constructed of rolled or compacted earth conforming to these specifications and to the lines and grades shown on the drawings.

B. The area to be occupied by the embankment will be stripped of all surface material to a depth of not less than 6 inches and this material will be removed and stockpiled for reuse as topsoil as specified elsewhere. The surface thus exposed will then be machine-graded to planes suitable for embankment foundations. Any materials such as large stones or stumps found embedded in the exposed surface that would interfere with proper compaction and consolidation of the starting layers of embankment will also be removed. Any material thus removed from the embankment area which is unsuitable for embankment construction will be disposed of in a suitable manner and will not be used in the work.

C. Material used for embankment construction will consist of a mixture of the available soils. It will be entirely free of brush, stumps, heavy sods, heavy growth of grass and other organic matter and will not contain any stones larger than 5 inches in greatest dimension. Material will be placed in the embankment in successive layers of not more than 12 inches in loose depth and then rolled and compacted as specified

herein. Starting layers will begin at the lowest points in the fill. All starting layers will be carefully placed and compacted in such manner as will provide a complete bond between the compacted fill and the natural ground on which it rests so as to prevent the development of planes of weakness. Successive layers will be approximately horizontal after compaction, and will be sloped slightly to the outside edge of the fill to provide proper drainage while the work is in progress. Material for successive layers may be dumped onto preceding layers; but it will then be spread, by the use of blade graders, bulldozers or similar equipment, so that when properly compacted it will form a layer of uniform thickness over the entire preceding layers.

D. The material will be distributed and mixed in each layer so that all parts of the finished will be a uniform composite mixture of all of the viable soils, and will be free of lenses, pockets, streaks or layers which differ materially in texture or density from adjoining layers. No pockets or clusters of stones will be permitted to form in the completed work.

E. The optimum water content and the maximum density produced by proper compaction of the available soils will be pre-determined by the Engineer and will govern the compaction operations throughout the progress of the work. The maximum density and optimum moisture content will be determined in accordance with the requirements of the Georgia Department of Transportation, Standard Specifications, Latest Edition. Material containing too much moisture, or which is frozen, will not be placed in the embankment. Its placement may be delayed until it has dried out to the proper moisture content, or it may be thoroughly mixed with a drier material to obtain the desired water content. Material with insufficient moisture will be wetted before compaction, the amount of water to be added to be determined in each instance by the Engineer. Adequate equipment for furnishing and sprinkling water will be kept available at all times during the progress of the work.

F. After the material has been properly spread in layers, it will then be compacted by rolling with tractor sheep's-foot roller or other types of tamping rollers until all parts of the layer have been compacted. The Contractor shall compact the roadbed layers to 100% of the maximum density determined in accordance with the requirements of the Georgia Department of Transportation, Standard Specifications, Latest Edition. The number of passes of the roller required to obtain the desired density will be as designated by the Engineer based upon soil testing performed under Section 01410. In no case will material for a following layer be placed until rolling operations have continued long enough to produce the required density. Earth-moving equipment may be routed over the work to assist in compaction.

G. The slopes and the top of the fill will be carefully trimmed so that after making proper allowance for shrinkage they will conform to the slopes and dimensions called for on the drawings. No material will be left on the outside surfaces of the fill which is at a steeper slope than that shown on the drawings.

H. The number, type, size and operating conditions of all equipment used in the work will be suitable for the work to be performed. Any unsuitable or inadequate equipment will be replaced.

1.06 STRUCTURAL BACKFILL

A. All forms, debris, foreign material, etc., will be removed prior to backfilling.

B. Moisture density determinations will be performed for each soil type to provide data for quality control, per Section 01410. The moisture content at the time of compaction will be within 3% above or below optimum moisture content which will allow the required compaction to be obtained.

C. Material used for backfilling will be suitable, job excavated material subject to the approval of the Engineer. It will be entirely free of large clods, brush, stumps, heavy sods or growths of grass, and other

organic matter and will not contain any stones larger than 5 inches in greatest dimension.

D. The dry, fine material will be placed in 6 inch layers and compacted to a minimum of 95 percent Standard Proctor maximum dry Density, based upon soil testing performed under Section 01410. Under pavements and floor slabs the compaction will increased to 98% of the Standard Proctor maximum dry Density for the upper 18 inches. In-place density tests should be performed every two (2) feet vertically and 2500 square feet horizontally. An experienced soil engineering technician under the supervision of the Engineer will observe the fill operations and perform sufficient in-place density tests.

E. Compaction will be accomplished by appropriate mechanical means which must be approved by the Engineer.

PART 2 - PRODUCTS

2.01 BORROW MATERIAL

A. Wherever the backfill or embankment requires a volume of material that is in excess of the volume of suitable material available from the authorized excavations, such excess volume will be obtained from other sources. Where borrow pits on the construction site are specifically designated on the plans, borrow excavation will be obtained therefrom; otherwise, the Contractor will provide suitable borrow material from areas accessible to the work. Before a borrow pit is opened the quality and suitability of the material to be obtained therefrom will be approved by the Engineer.

B. Borrow pits will not be opened until the original surface has been cross-sectioned so that the volume of material removed therefrom may be accurately determined at any time as the work progresses. Borrow pits will be properly cleared and grubbed and all objectionable matter will be removed from the borrow pit material prior to its placement in the backfills.

C. Borrow pits will be excavated so that the remaining surfaces and slopes will be reasonably smooth and even and will provide adequate drainage over the entire area. Drainage ditches will be constructed where necessary to provide outlets of water to the nearest natural channel so that the formation of pools in the borrow pit area will be avoided. Sides of borrow pit cuts will be left at two to one slope unless otherwise authorized by the Engineer.

2.02 STRUCTURAL FOUNDATION MATERIAL OR (CRUSHED STONE)

A. Structural foundation material (crushed stone) will be placed in a minimum layer of six (6) inches under all structures and a minimum of twelve (12) inches outside from all footings unless noted otherwise by the Special Conditions or where shown on the Plans.

B. Structural foundation material will be Type II quarry run crushed limestone or granite ranging in size from one (1) inch to a maximum size of one and one-half (1-1/2) inches. The material will be power tamped in six (6) inch layers.

C. Structural foundation material will be used under structures when specified in the Special Conditions or where shown on the Plans in local areas where unsuitable materials such as muck or, quicksand, soft clay, or swampy material make it necessary to provide a satisfactory foundation. No separate payment will be made for structural foundation material required by the Special Conditions or where shown on the Plans.

D. Structural foundation material used to replace unsuitable materials which were not identified by the

Special Conditions or shown on the Plans as described above will be measured for payment only in specific locations where its use is authorized in writing by the Engineer before this work is performed.

2.03 RIP-RAP

A. All stone for rip rap will be sound, durable pieces meeting the quality requirements of Class A or B coarse aggregate and will be resistant to the action of air and water, and in all other respects suitable for use as rip rap. Materials not meeting these requirements will be not used unless approved by petro graphic analysis. Flat, slabby and shaley pieces are not acceptable.

B. Stone Dumped Rip Rap: Stone for dumped rip rap will be processed in such a manner as to produce a quarry-run material including rock fines which will meet the gradation for the following:

1. The largest pieces of material will have a maxi mum approximate volume of one (1) cubic foot. At lease 35% of the mass will be comprised of pieces which weigh 15 pounds or more.

PART 3 - EXECUTION

3.01 DISPOSAL OF MATERIALS

A. All materials removed by excavation which are suitable for the purpose will be used whenever practical for fills, embankments, backfilling structures, and for such other purposes as may be shown on the plans or authorized by the Engineer. All materials not used for such purposes will be considered as waste materials and disposed of by the Contractor.

B. Waste materials may be deposited in spoil banks on the site of the work if space is available. Such on-site spoil bank locations will be authorized by the Engineer. Waste materials will not be left in unsightly piles but will by spread in uniform layers and neatly leveled and shaped. Spoil banks will be provided with adequate openings to permit surface drainage of adjacent lands.

C. On completion of any part of the work proper disposal will be made of all surplus or unused materials with in the construction limits of such work and the surface of the work left in a neat and workmanlike condition.

D. Disposal of excavated materials will be considered an integral part of the excavation work and no separate payment therefor will be allowed.

3.02 FOUNDATION DRILLING

A. When the excavation for foundations for buildings, tanks and other major structures is completed, the Contractor if ordered by the Engineer, will test drill these excavations. Where the foundation is in rock excavation, test holes will be drilled to a depth of not less than 6 feet below grade. In earth excavation, holes will be drilled to rock and 5 feet into such rock, except that no holes will be required to be drilled deeper than 15 feet below grade. Holes will be spaced approximately 25 feet apart. Should such drillings indicate the presence of cavities or other unsatisfactory foundation conditions; such areas will be excavated as authorized by the Engineer. Any such excavation authorized by the Engineer will be measured for payment.

3.03 SHEETING, SHORING, AND BRACING

A. The sides of all excavations will be sufficiently sheeted, shored and braced whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions that will, in any way, hinder or delay the progress of the work or endanger workmen. Wood or steel sheet piling of ample design and type will be used when necessary. All sheeting, shoring and bracing will have sufficient strength and rigidity to with stand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage.

B. Where excavations are made adjacent to existing buildings or other structures or in paved streets or alleys, the Contractor will take particular care to sheet, shore and brace the sides of the excavation adequately so as to prevent any undermining of or settlement beneath such structures or pavement. The Contractor will be liable for any damage to any structure or injury to any person that results from his operations.

C. Sheeting, shoring or bracing materials will not be left in place unless as shown by the plans or permitted by the Engineer. Such materials will be removed in such manner as will not endanger or damage the new structure or any existing structures or property, either public or private, in the vicinity, and so as to avoid cave-ins or slides. All trench sheeting and bracing will be left in place until the trench has been backfilled one foot above the top of the pipe.

D. Sheeting, shoring and bracing will be considered as an integral part of the work and no specific payment will be made.

END OF SECTION

SECTION 02201

EARTHWORK - PIPELINE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work:
   1. Excavation - Sanitary Sewer Pipeline
   2. Excavation - Water, Gas, Pressure Forcemain Pipeline
   3. Underwater Excavation
   4. Rock Excavation
   5. Pipe Foundation Backfill
   6. Trench Backfilling - Sanitary Sewer Pipeline
   7. Trench Backfilling - Water, Gas & Pressure Forcemain Pipeline
   8. Crushed Stone
   9. Pipe Foundation Material
   10. Disposal of Material
   11. Sheeting, Shorgin & Bracing

B. Related Work Specified Elsewhere:
   1. Site Preparation: Section 02100
   2. Grassing: Section 02930

1.02 JOB CONDITIONS

A. All excavation work will be unclassified excavation and no specific payment will be allowed for rock excavation.

B. The Contractor will be responsible for providing adequate sheeting and shoring and will repair, at no cost to the Owner, all damage resulting from failure to provide adequate support.

C. The Contractor will be responsible for damage to property and injury to persons caused directly or indirectly by blasting operations or inadequate sheeting and shoring.

1.03 EXCAVATION - SANITARY SEWER PIPELINE

A. Trench Excavation
   1. Trench excavation or excavation for pipelines will consist of excavation necessary for the construction of the pipeline (gravity sewer)and all appurtenant facilities, including manholes, fittings, valves, encasement pipe material and pipe protection as called for on the Plans. It will include backfilling and tamping of pipe trenches and around structures and the disposal of waste materials, all of which will conform to the applicable provisions of these specifications.
   2. Trench excavation will be open cut unless tunneling or boring is shown on the Plans. When practical the banks of the trenches will be cut in vertical, parallel planes equal distance from the pipe center line. Unless indicated otherwise on the Plans, the over all width of trench will be 24 inches for pipes 6 inches in diameter and smaller, 28 inches for pipes 8 inches in diameter, 30 inches for pipes 10 inches and 12 inches in diameter, and for pipes 15 inches in diameter and larger it will be determined from the formula 4/3d plus 12 inches, in which "d" is the inside diameter of the pipe in inches. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to

workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks will be cut to vertical planes as specified above for that part of the ditch below the level of 12 inches above the top of the pipeline. The bottom of the trench will be level in cross section and will be cut true to the grade of the pipe except where concrete cradles or pipe encasement materials are shown on the Plans, specified, or authorized by the Engineer, in which case the excavation will extend to the bottom of the cradle or encasement materials.

3. The depth of excavation will be sufficient to provide a minimum six inches under cut below the outside barrel of the pipe. Bell holes will be excavated to provide the same clearance, and will be installed at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. The space excavated below the barrel and bell holes will be backfilled with crushed stone, as shown on the Plans.
4. Unless otherwise directed, not more than 300 feet of trench will be opened in advance of, nor be left unfilled in the rear of, laying or jointing of any sewer line. The trench will be excavated full depth for at least 10 feet in advance of the construction of any sewer or of its foundation.
5. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade are encountered which extend beyond the limits of the excavation, such material will be removed and replaced with pipe foundation backfill or approved granular material.
6. Pipe trenches will not be excavated more than 300 feet in advance of pipe laying; and all work will be performed so as to cause the least possible inconvenience to the public. Temporary bridges or crosswalks will be constructed where necessary to maintain vehicular or pedestrian traffic. Crosswalks and bridges will have hand rails or other features necessary for safe use by the public.
7. In all cases where materials are deposited along open trenches they will be placed so that in the event of rain, no damage will result to the work or adjacent property.

1.04 EXCAVATION - WATER, GAS & PRESSURE FORCEMAIN PIPELINE

A. Trench Excavation:

1. Trench excavation or excavation for pipelines will consist of excavation necessary for the construction of the pipeline and all appurtenant facilities, including fittings, valves, encasement pipe material and pipe protection as called for on the Drawings. It will include backfilling and tamping of pipe trenches and around structures and the disposal of waste materials, all of which will conform to the applicable provisions of these specifications.
2. Excavation of trenches for laying the pipelines specified herein will follow as closely as possible the lines shown on the Drawings or directed by the Engineer. The normal dimensions of trenches for the various sizes of pipelines to be constructed will be as that described in detail on the Drawings. Unless existing field conditions govern otherwise, forty-eight (48) inches will be the minimum allowable depth as measured from the normal ground level to top of pipe. The Contractor will have the right to dig the ditch deeper than above specified should he desire to do so in order to facilitate construction, and no additional charge will be made to the Owner for such additional depth of ditch as approved by Engineer. Where pipe is laid within the right-of-way limits of highways, roads or railroads, the minimum cover will be as specified in the permit issued by the proper authorities controlling the right-of-way, should said cover exceed that specified herein, but no additional payment will be made for such additional depth of trench.
3. Trench excavation will be open cut unless tunneling, boring or horizontal directional drilling is shown on the Drawings. When practical the banks of the trenches will be cut in vertical, parallel planes equal distance from the pipe center line. When sheeting is used, the distance between vertical planes will be measured from the inside faces of the sheeting. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks will be cut to vertical planes as specified above for that part of the ditch below the level of twelve (12) inches above the top of the pipeline. The bottom of the trench will be level in

cross section and will be cut true to the grade of the pipe except where concrete cradles or pipes encasement materials are shown on the Drawings, specified or authorized by extended to the bottom of the cradle or pipe encasement materials.

4. Bell holes will be excavated at all locations of fittings, valves and other obstacles not shown on the Drawings along with couplings used in composite pipeline construction. Bell holes will be of sufficient depth to permit the pipeline to rest on firm trench bottom for the full length of the barrel with couplings, clear of contact with trench and bell hole bottoms.
5. At any draw, creek, gully crossing or other place where rough terrain prevails requiring a sag-bend or deflection of pipe greater than 2 ½˚, the trench will be graded to avoid the use of bends or deflections in excess of 2½˚ unless otherwise authorized by the Engineer. The minimum allowable cover for overbends will be forty-eight (48) inches.
6. Where the pipelines specified herein cross other pipelines, drain tiles, sewers conduits, or similar underground structures, the pipe will be laid so as to permit a minimum clearance of one (1) foot between the two structures, but no additional payment will be made for such additional depth of trench.
7. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or subgrade are encountered which extend beyond the limits of the excavation, such material will be removed and replaced with pipe foundation backfill or approved granular material.
8. In all cases where materials are deposited along open trenches, they will be placed so that in the that in the event of rain, no damage will result to the work or adjacent property.

1.05 UNDERWATER EXCAVATION

A. Where the excavation area shown on the plans is under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the work thereafter; provided the method and equipment to be used results in completed work which complies with the specifications and is acceptable to the Engineer. In such cases, the excavation area will be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed. The cost of all temporary construction work necessary or incidental thereto, including the cost of installing and removing sand bags, coffer dams, sheet piling excavation and backfill, pumping and dewatering, will be considered as an integral part of the cost of excavation and no separate payment therefore will be allowed or made.

1.06 ROCK EXCAVATION

A**.** All excavation work will be unclassified and no specific payment will be allowed for rock excavation, unless a Bid Item for Unclassified Rock Excavation is provided in the Bid Form. Rock shall be defined as any material, which occurs in its original position in ledges or bedded deposits of such hardness or texture that cannot be loosened, broken or removed without the use of drilling and blasting methods.

B. Rock encountered in trench excavation for pipelines will be removed for the overall width of trench and to a depth of 6 inches below the bottom of the pipe for pipes smaller than 24" in diameter and to a depth of 12 inches below the bottom of the pipe for pipes greater than 24" in diameter. The space excavated below the barrel will be backfilled with crushed stone as shown on the Plans. All of the applicable provisions of the above specifications for excavation and sheeting, shoring, and bracing will apply to rock excavation.

C. Drilling and blasting methods used in rock excavation will be optional with the Contractor, but will be conducted with due regard to the safety of persons and property in the vicinity of the work and in strict conformity with all laws, ordinances, or regulations governing blasting and the use of explosives. Rock

excavation near existing structures of all types will be conducted with the utmost care, and every precaution will be taken to prevent damage to such structures. Any damage or injury of whatever nature to persons or property caused directly or indirectly by blasting operations will be promptly repaired, replaced or compensated for by the Contractor at his own expense and to the satisfaction of the persons injured or the Owners of the property damaged.

1.07 PIPE FOUNDATION BACKFILL

A. If, after excavating the pipe trench in accordance with 1.03 and 1.04 of these Specifications, the Engineer determines the sub grade to have inadequate bearing capacity, the unstable material will be removed and replaced with pipe foundation material per 2.02 of these Specifications, until a stable sub grade is achieved. Pipe foundation material will be placed, for the full width excavated in horizontal layers not to exceed six inches. Each layer will be thoroughly compacted until the sub grade elevation is reached.

1.08 TRENCH BACKFILLING - SANITARY SEWER PIPELINE

A. Before backfilling is begun, all extraneous material (except bracing and sheeting) will be removed from the excavation. Backfilling will not be commenced over any sewer line or structure until such sewer line or structure or portion thereof has been approved for backfilling by the Engineer. Only suitable materials will be used for backfilling and the Engineer will be the sole judge of the suitability of materials and may require such selection of materials as may be necessary to insure a satisfactory backfill.

B. After the pipe has been placed on the prepared #57stone base, identical #57stone will be placed on both sides of the pipe to full width of the trench and thoroughly and carefully tamped or rammed around the pipe with approved power tools up to the top of the pipe for ductile iron pipe and to six (6) inches above the top of pipe for PVC pipe, refer to 2.01 A of these Specifications. Careful attention will be given to compacting the stone under the haunches of the pipe. Loose, fine earth or crushed stone, as called for on the Plans, will then be carefully deposited and compacted in six (6) inch layers to a plane twelve (12) inches over the top of the pipe. This earth material will be free of large clods, stones, vegetable matter, debris, and/or objectionable material. Particular care will be exercised to prevent damage to pipes and joints by tamping and compacting. The remaining backfill, except under paved streets or where noted on the Plans, may be pushed into the trench loose. Normally the trench will be backfilled so that there will be an eight (8) inch mound over the pipe above the surrounding ground, and the backfill must be trimmed in such a manner as to meet the approval of the Engineer.

C. Where the trench extends along or across streets, roadways, sidewalks or structures the trench will be backfilled above the pipe bedding with #8910 stone, refer to 2.01A of these Specifications. Backfilling will be done in layers not exceeding six (6) inches and each layer throughly compacted with vibratory compaction equipment before the succeeding layer is placed. As noted on drawings, pipe under structures will be encased in concrete in accordance with the Plans at no additional payment.

D. Where the pipe trenches are cut across or along pavement, the Contractor will construct a permanent replacement surface over the compacted Type I crushed stone backfill in accordance with Section 02500 - Pavement Replacement and SD 320 - Pavement Replacement Detail. Payment is based on the Contract, refer to Section 00300.

E. From a plane twelve (12) inches over the top of the pipe upward, except under streets, usable alleys, roadways, or sidewalks, the loosely placed backfill will consist of "trench spoil" except that a broken stone content of not more than fifty (50) percent by volume will be allowed of stones not exceeding six (6) inches maximum dimension, provided these stones are thoroughly mixed with earth.

F. Where excavation has been made within the limits of easements across private property, the top one (1) foot of backfill material will consist of fine loose earth free of large clods, vegetable matter, debris, stones, and/or objectionable materials.

G. Terraces and drainage ditches will be built in such places as the Engineer may deem necessary on hillside or steep inclines so as to keep the backfill and the right-of-way from eroding or washing. on hillsides, breakers built of suitable material such as sacks or poles will be placed in the ditch before backfilling to prevent water washing down the trench. These breakers are to be furnished and placed by the Contractor without cost to the Owner. Backfill will be completed in such a manner as to conform to the general drainage and improvements of the adjoining and existing right-of-way.

1.09 TRENCH BACKFILLING - WATER, GAS & PRESSURE FORCEMAIN PIPELINE

A. Immediately following the lowering of the pipe into the trench, each joint or section will be center filled in order to prevent floating of pipe in case water enters the ditch from any cause. The remaining backfill will be made as soon as possible thereafter so that a minimum amount of trench wherein the pipe has been lowered will remain open at any time. It will be carefully placed so as to not cause damage to the protective coating.

B. Where the trench extends along or across city streets, roadways, usable alleys, or sidewalks, the trench will be completely backfilled with #8910, refer to 2.01 A of the Specifications, as shown on the Drawings detail sheets. No separate payment will be made for the stone, concrete and paving replacement. The backfill will be deposited in six (6) inch layers (before compaction) and thoroughly compacted vibratory compaction equipment. See Part F this Section for trenches along State Highway right-of-way.

C. Unless otherwise specified in the Special Conditions or shown on the Drawings, other trenches will be backfilled with material consisting dry, fine earth free of large clods, stones, vegetable matter, debris, and/or other objectionable material. Backfilling of all pipe will be done in layers not exceeding six (6) inches and each layer thoroughly tamped before the succeeding layer is placed. See the Drawings for details on pipe trenches and backfilling. This method of backfilling will continue until backfill is a minimum of one (1) foot over the top of the pipe. The remaining backfill may be pushed into the trench loose. Normally the trench will be backfilled so that there will be not less than an eight (8) inch crown over the pipe above the level of the surrounding ground, and the backfill must be trimmed up in such a manner as to meet the approval of the Engineer.

D. Where excavation has been made within the limits of easements across private property, the top one (1) foot of backfill material will consist of fine loose earth free from large clods, vegetable matter, debris, stones, and/or other objectionable materials.

E. Where the pipe trenches are cut across or along pavement, the Contractor will construct a permanent replacement surface over the compacted Type I crushed stone backfill in accordance with Section 02500 - Pavement Replacement and SD 320 - Pavement Replacement Detail. Payment is based on the Contract, refer to Section 00300.

F. Terraces and drainage ditches will be built in such places as the Engineer may deem necessary on hillside or steep inclines so as to keep the backfill and the right-of-way from eroding or washing. on hillsides, breakers built of suitable material such as sacks or poles will be placed in the ditch before backfilling to prevent water washing down the trench. These breakers are to be furnished and placed by the Contractor without cost to the Owner. Backfill will be completed in such a manner as to conform to the general drainage and improvements of the adjoining and existing right-of-way.

PART 2 - PRODUCTS

2.01 CRUSHED STONE

A. Crushed stone will be limestone or granite. Pipe bedding crushed stone shall be #57 stone and trench backfill under roads, streets, etc. and above the pipe bedding will be #8910 stone.

2.02 PIPE FOUNDATION MATERIAL

A. Pipe foundation material will be Type II quarry run crushed limestone or granite ranging in size from one (1) inch to one and one and one-half inches. The material will be power tamped in six (6) inch layers.

B. Pipe foundation material will be used in local areas where unsuitable materials such as muck, quicksand, soft clay, or swampy material make it necessary to provide a satisfactory pipe foundation.

C. Pipe foundation material used as described above will be measured for payment only in specific location where its use is authorized in writing by the Engineer before this work is performed.

PART 3 - EXECUTION

3.01 DISPOSAL OF MATERIALS

A. All materials removed by excavation which are suitable for the purpose will be used when ever practical for fills, embankments, backfilling pipe trenches, and for such other purposes as may be shown on the plans or authorized by the Engineer. All materials not used for such purposes will be considered as waste materials and disposed of by the Contractor.

B. Waste materials may be deposited in spoil banks on the site of the work if space is available. Such on-site spoil bank locations will be authorized by the Engineer. Waste materials will not be left in unsightly piles but will be spread in uniform layers and neatly leveled and shaped. Spoil banks will be provided with adequate openings to permit surface drainage of adjacent lands.

C. On completion of any part of the work proper disposal will be made of all surplus or unused materials within the construction limits of such work and the surface of the work left in a neat and workmanlike condition.

D. Disposal of excavated materials will be considered an integral part of the excavation work and no separate payment therefore will be allowed.

3.02 SHEETING, SHORING AND BRACING

A. The sides of all excavations will be sufficiently sheeted, shored and braced whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions that will, in any way, hinder or delay the progress of the work or endanger workmen. Wood or steel sheet piling of ample design and type will be used when necessary. All sheeting, shoring and bracing will have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect ail persons and property from injury or damage.

B. Where excavations are made adjacent to existing buildings or other structures or in paved streets or alleys. the Contractor will take particular care to sheet, shore and brace the sides of the excavation adequately

so as to prevent any undermining of or settlement beneath such structures or pavement. The Contractor will be liable for any damage to any structure or injury to any person that results from his operations.

C. Sheeting, shoring or bracing materials will not be left in place unless as shown by the Plans or permitted by the Engineer. Such materials will be removed in such manner as will not endanger or damage the new structure or any existing structures or property, either public or private, in the vicinity, and so as to avoid cave-ins or slides. All trench sheeting and bracing will be left in place until the trench has been backfilled one foot above the top of the pipe.

D. Sheeting, shoring and bracing will be considered as an integral part of the Work and no specific payment will be made.

END OF SECTION

SECTION 02500

PAVEMENT REPLACEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work in this section includes, but is not limited to, the following:
   1. Bituminous pavement
   2. Concrete pavement including driveways and sidewalks
   3. Concrete curb and gutter
   4. Unpaved streets, driveways and alleys

B. Related Work specified elsewhere:
   1. Section 02100: Site Preparation
   2. Section 02200: Earthwork - General
   3. Section 02201: Earthwork - Pipeline
   4. Section 03300: Cast-In-Place Concrete

1.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Bituminous materials shall be delivered to the job site in accordance with the current applicable standard specifications of the State Highway Department of the State in which the Work is located.

B. Concrete materials shall be as per the concrete specification.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sub-base: crushed stone

B. Base course: water bound slag or crushed stone macadam

C. Bituminous prime coat: asphalt grade MC30 or MC70

D. Bituminous binder course: hot mixed bituminous pavement

E. Bituminous wearing course: hot mixed bituminous pavement

F. Tack coat: asphalt grade RC70

G. Preformed joints: AASHO designation M33 or M153

H. Walks: Class B concrete

I. Curbs and gutters: Class B concrete

2.02 MIXES

A. Base course:
   1. Course aggregate shall meet the following gradation:

Passing 2-1/2" sieve	100	percent
Passing 1-1/2" sieve	25-60	percent
Passing 3/4" sieve	0-15	percent

   2. Fine aggregate or choke material shall meet the following gradation:

Passing ½" sieve	100	percent
Passing No. 4 sieve	60-95	percent
Passing No. 10 sieve	30-60	percent

B. Bituminous binder course: Hot mixed bituminous pavement shall meet the current applicable standard specifications of the State Highway Department of the State in which the Work is located.

C. Bituminous wearing course: Hot mixed bituminous pavement shall meet the current applicable standard specifications of the State Highway Department of the State in which the Work is located.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Removing existing pavement.
   1. Prior to trenching, the Contractor shall saw-cut all pavement to be removed to widths approved by the Engineer. The Contractor shall make very effort to minimize the amount of pavement removed.

B. Backfilling trench.
   1. Acceptable job-excavated material which shall consist of dry, fine earth, free of large clods, stone, vegetable matter, debris or any other objectionable matter shall be carefully deposited in 8 inch layers and thoroughly tamped, or
   2. Full depth, 100% crushed stone backfill shall be deposited in 6-inch layer and thoroughly compacted at locations shown on the Plans or as directed by the Engineer, or
   3. Trench backfill material and installation shall comply with the requirements of the local or State highway having jurisdiction for subject pavement, or
   4. Trench backfill material and installation shall comply with requirements stated on highway permit.

C. Base
   1. Base shall be at least 6 inches thick, or the same thickness as the original base material, or as shown on the Plans.
   2. If the base is more than 6 inches thickness, it shall be installed in two layers.

D. Pavement: All pavements shall be at least as thick as listed below, or the same thickness as the original pavement, or as shown on the Plans.
   1. Bituminous pavement: 2 inches minimum, (1 inch binder course, 1 inch wearing course)

2. Concrete pavement: 6 inches minimum
3. Concrete sidewalks and driveways: 4 inches minimum
4. Concrete sidewalks subject to traffic: 6 inches minimum
5. Concrete curb and gutter: 6 inches minimum; section shall conform to original section
6. Concrete pavements including sidewalks, driveways and curb and gutters shall be placed on the tamped subgrade (trench backfill). No base shall be required. The top 12 inches of the subgrade shall be thoroughly compacted.

E. Other pavements:
1. Other pavements shall be replaced in kind to a condition equal to or better than the original pavement and to the original thickness.

F. Unpaved streets:
1. Chert, gravel, slag or other unpaved streets, alleys or driveway surfaces shall be replaced in kind to a condition equal to or better than the original condition.
2. The top 12 inches of the subgrade shall be well compacted crushed stone.
3. The granular material shall be at least 12 inches thick per the Plan Details.
4. No separate payment shall be made for replacing granular material on unpaved streets, alleys or driveways. Such costs shall be considered incidental to installing the pipeline.

G. Traffic restoration:
1. The Contractor shall backfill the trench and restore traffic as quickly as possible.
2. He shall either install a temporary bituminous pavement or the binder course, and maintain the temporary surface under traffic for at least 30 days.

3. After subjecting to traffic, he shall remove the temporary pavement and install the wearing course accurately finished to the street grade.

H. Warranty:
1. The Contractor shall warrant all replaced pavements and unpaved streets, driveways or alleys for a period of one (1) year after the completion of the project.
2. The Contractor shall repair any settled pavements or unpaved areas at his own expense to the satisfaction of the Owner.

I. Local or State Requirements:
1. The Contractor shall comply with all the requirements of the local or State highway department having jurisdiction.
2. Should the local or State requirements be different from the requirements stated herein, no extra payment will be made to comply with their requirements.

3.02 FIELD QUALITY CONTROL

A. Compaction tests:
1. Field test: density AASHO Method T-147
2. Lab test:
   a. Density: AASHO Test T-99
   b. Density: AASHO Test T-180
   c. Density: AASHO Test T-134

END OF SECTION

SECTION 02600

MANHOLES AND ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install all precast concrete manholes (bases, risers, transitions and cones), lids, steps, boots and accessories shown, specified or required by job conditions.

1.02 RELATED WORK

A. Section 01340: Shop Drawings, Product Data and Samples

B. Section 02201 - Earthwork - Pipeline

C. Section 02700 - Pipeline Construction

1.03 QUALITY ASSURANCE

A. The precast reinforced concrete manhole manufacturer shall be NPCA Certified. The certification shall be submitted along with the manhole submittals.

B. Precast reinforced concrete manholes - ASTM C478, latest edition.

C. Joints and gaskets - ASTM C443 or ASTM C-361.

D. The following information will be clearly marked on each manhole section:
   1. Manhole number
   2. Date of manufacture
   3. Name or trademark of the manufacturer

1.04 JOB CONDITIONS

A. Manholes will be constructed to the sizes, shapes, and dimensions and at the locations shown on the Drawings.

B. Manholes will be 48 inches in diameter unless otherwise noted on Drawings or as specified.

C. Openings in manhole sections will have diameters not larger than 70% of the manhole inside diameter.

D. All manholes will be precast reinforced concrete manholes.

1.05 DROP MANHOLE

A. Where the difference in the invert elevation of two or more sewers 18 inches in diameter or smaller intersecting in one manhole is 2 feet or more, a drop manhole will be constructed in the manner shown on the Drawings.

B. Drop Manhole will be similar in construction to the standard manhole except that a drop connection of pipe and fittings of the proper size and material will be constructed outside the manhole and supported by Class B concrete as indicated on the Drawings.

PART 2 - PRODUCTS

2.01 PRECAST MANHOLES

A. Concrete quality:
   1. Minimum compressive strength - 4000 psi
   2. Absorption will not exceed 9%

B. Base Section:
   1. Base section will have monolithically cast bottom.
   2. Minimum bottom thickness will be 6" for all manhole diameters unless otherwise shown on the Drawings.

C. Riser section:
   1. Minimum wall thickness of the manhole riser sections will be as follows:

      36" I.D. 4"
      48" I.D. 5"
      60" I.D. 6"
      72" I.D. 7"

D. Cone Section:
   1. Eccentric in shape, unless otherwise noted on Drawings.

E. Joints:
   1. Joints for the precast sections will be tongue and groove type with Isoprene gasket and expansion waterstop sealant.
   2. The tongue length will not be less than the wall thickness.
   3. A suitable rectangular recess will be formed in the tongue of each manhole section to contain the Isoprene gasket, such that when the joint is made, the gasket will be confined on all four sides.
   4. The Isoprene gaskets will be a Tylox SuperSeal pre-lubricated gasket by Hamilton Kent to meet the requirements of ASTM C361, ASTM C425 and ASTM C443.
   5. The expansion waterstop sealant shall be ConSeal CS-231-3/8".

F. Openings:
   1. Suitable openings for the inlet and outlet sewer pipe will be cast into the base section, or riser section for drop manholes.
   2. Openings will be true size, circular and located as required for each manhole.
   3. Pipes will be sealed in openings with flexible connectors as shown or specified.

G. Lift holes:
   1. Two tapered lift holes will be cast into each cone or riser section for the purpose of handling and laying.

H. Manhole Treatment for Waterproofing
   1. Xypex is a chemical treatment for waterproofing, protection and improvement of concrete. Add Xypex Admix C-1000 to the concrete mix at the time of batching. The admix will result in concrete that is permanently sealed against the penetration of water or liquids from any direction.

The concrete is also protected from deterioration due to harsh environmental conditions. **Only the Admix method of adding Xypex or approved equal, to the manholes will be acceptable.**

2.02 FRAMES AND LIDS

A. Manhole frames and lids will be of the type, size, weight and dimensions as shown on the Drawings.

B. Frame and lid castings will conform to ASTM A48-74 class 50B.

C. Tolerances will be accepted foundry standards not to exceed plus/minus 1/16 inch per lineal foot of major dimension. Side play between cover and matched frame will not exceed 1/8 inch per lineal foot in any vertical direction. The seating surfaces of cover and grating will be machined to insure a continuous fit.

D. Castings will be free from cracks, blowholes, moldpull, risers, fins, or other imperfections that may impair serviceability. The surface of the castings will be reasonably smooth and free of fused sand and dross.

E. Castings will have asphalt dip coating. Coating will be smooth, tough and non-tacky.

2.03 MANHOLE STEPS

A. Provide pre-installed reinforced plastic steps, Model No. PSI-PF, as manufactured by M.A. Industries or approved equivalent.

2.04 FLEXIBLE MANHOLE CONNECTOR

A. Pipes 18" or Less in Diameter:
   1. For pipes 12" or less in diameter entering manholes, seal opening with premolded flexible connector sleeves with expansion rings.
   2. Acceptable manufacturer: KOR-N-SEAL Co., A-Lok Products, Inc.., Press Seal Gasket Corp., Interpace Corp. or approved equivalent.

B. **Pipes 15" or Larger in Diameter:**
   1. For pipes 15" or larger in diameter entering manholes, seal opening with flexible pipe to manhole connectors which are designed to produce a guaranteed watertight seal between the pipe and manhole.
   2. **Acceptable manufacturer: A-LOK X-CEL Connector by A-Lok Products, Inc. or approved equivalent with guaranteed watertight seal.**

PART 3 - EXECUTION

3.01 INSTALLATION OF PRECAST MANHOLES

A. Manholes will be installed to the line and grade as shown on the Drawings. Provide standard sections to bring the top section or cone to within 6" of finished grade.

B. Precast Manholes will be bedded on a twelve (12) inch thick layer of crushed stone which extends twelve (12) inches outside the base of the manhole.

C. Clean dirt and debris from interior surfaces of all joints. Install joint gaskets in accordance with manufacturer's recommendation. Grout inside and outside of all joints with non-shrinking hydraulic

cement such as Water Plug or approved equal.

D. Install incoming and outgoing pipes. Seal openings between pipes and manhole walls with non-shrinking hydraulic cement, unless flexible sleeves or connectors are used.

E. Install manhole steps, if not installed by manhole supplier. Steps will be 16 inches o.c. unless otherwise shown on Drawings.

F. Manhole inverts will be constructed of cement mortar and will have the same cross section as the invert of the pipes which they connect. The invert will be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the manhole will be made to a true curve with as large a radius as the size of the manhole will permit.

G. Set cast iron frame for cover at the required elevation on cement mortar bed and properly bond frame to manhole cone with cement mortar. Where manholes are located in pavement, the top of the cover will conform to the exact slope, crown and grade of the finished pavement. Make up any gap between section or cone top and frame with rings of concrete bricks and mortar.

H. Where frame and covers are cast integral into precast flat top manhole, or where they are installed in cast-in-place slabs, the top of the frame will extend ½ inch above the surrounding surface.

3.02 VACUUM TESTING MANHOLES

A. All manholes shall be vacuum tested in accordance with the specifications. All manholes shall be free of visible water leakage and shall successfully complete a vacuum test prior to acceptance.

B. Plug all inlets and outlets, excluding the manhole top access, to perform the test. The Engineer shall be notified at least 48 hours before tests are conducted.

C. Furnish all necessary testing equipment and perform the tests in a manner satisfactory to the Engineer. All testing shall be witnessed by the Engineer. The vacuum pump shall evacuate the manhole to five (5) pounds per square inch vacuum (5 psigv)(10 inch Hg). Monitor the vacuum gage pressure for the test period specified in the following table. The manhole will be considered acceptable if the vacuum drops less than one-half pound per square inch (0.5 psigv)(1 inch Hg) within the given test time.

Depth (Feet)	Time (Seconds) 48 Inch Diameter	Time (Seconds) 60 Inch Diameter	Time (Seconds) 72 Inch Diameter
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	65
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

D. Repair or replace and retest, in a manner approved by the Engineer, any manhole not meeting the vacuum test requirements, at no cost to the Owner.

END OF SECTION

SECTION 02700

PIPELINE CONSTRUCTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included with this section includes, but is not limited to furnishing all materials, equipment and labor required to completely construct the various buried pipelines required for the project. Pipe, accessories, trenching, bedding and backfill, and other items necessary to complete the work are included.

B. Related Work Specified Elsewhere
   1. Section 01340: Shop Drawings, Product Data and Samples
   2. Section 02201: Earthwork - Pipeline
   3. Section 02600: Manholes and Accessories
   4. Section 03300: Cast-In-Place Concrete
   5. Section 15060: Pipe and Pipe Fittings

1.02 SUBMITTALS

A. Submit shop drawings as specified in section 01340:

B. Submit product data as specified in Section 01340:

C. Submit pipeline test results for each pipeline as specified below.

1.03 GENERAL INSTRUCTIONS

A. Pipe shall be stored or strung along the route of the work only in such quantity as will be sufficient to maintain continuous laying operations and prevent delays due to shortages of materials. The Contractor shall avoid stringing or storing pipe in locations that might cause inconvenience to the public operation of businesses, or hindrance to traffic such as across driveways, entrances and fire lanes or adjacent to fire hydrants and shall avoid stringing pipe in locations that would interfere with drainage.

B. Where pipe lines are to be constructed in easements, the Contractor shall confine his operations to such easements or temporary work strips as might be made available adjacent to the easements. The Contractor shall make his own arrangements for storage of pipe or other materials on property outside of public ways, easements, or temporary work strips; and use of such areas shall be at his own responsibility.

1.04 HANDLING PIPE AND ACCESSORIES

A. Proper equipment, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Pipe, fittings, and other accessories shall at all times be handled with care to avoid damage.

B. The Contractor shall carefully examine all pipes and other materials immediately before placing them in the trench; and if any such pipe or materials are found to be defective, the Contractor shall notify the Engineers and shall replace all such materials.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. See Part 1.01B of the Specification Section for reference to all products and materials to be provided.

PART 3 - EXECUTION

3.01 GRAVITY LINE ALIGNMENT CONTROL

A. All sewers shall follow accurately the grade and alignment shown on the Drawings or as directed by the Engineer. The Drawings show elevations at convenient intervals along the proposed alignment. The Drawings also show changes in direction of alignment or points of intersections.

B. All reference points and bench marks shall be protected during the preparation of the site and all subsequent construction operations. All P.I.'s requiring replacement to original location through negligence of the Contractor covering any period of construction will be replaced by the Engineer at the Contractor's expense.

C. Lines, grades and templates shall be provided by the Contractor.

D. Before laying of sewers, the Contractor shall calculate all proposed sewer grades. Start all levels from established bench marks, and "tie-in" the close of the run to the point of beginning and to the inverts of all existing sewers to which the new sewers connect. Errors in pipe laying due to failure to run levels properly shall be corrected by the Contractor at his own expense by relaying of pipe, as directed.

E. Do not execute Work required by shop Drawings until approval of Drawings is given.

F. As-Constructed Plans shall be the responsibility of the Contractor. The Contractor shall be responsible for keeping an accurate record of manholes, services, plus the lengths of all service pipes. Upon completion of construction, the Contractor shall survey all lines installed to accurately identify alignment, grade, centerline stations, manhole stations, angle of change of directions, service stations and other field information to properly document line location. Upon completion of the project and when so directed, prepare and deliver to the Engineer a copy of this record. During installation, do not cover up any item until properly recorded.

G. From the alignment and bench mark information described above, the Contractor, with his own forces, shall perform the detailed layout work required to construct the sewer and appurtenances to the required alignment and grades.

3.02 GRAVITY LINE PIPE LAYING

A. Pipe Laying
   1. Before sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed. Exact line and grade shall be established by using a laser beam. Each pipe shall be accurately placed to the exact line and grade called for on the Plans.
   2. Pipe laying shall proceed up-grade, starting as the lower end of the grade and with the bells up-grade. Trench bottoms found to be unsuitable for foundations after pipe laying operations have started shall be corrected and brought to exact line and grade with foundation material in accordance with Part 2.01 of Section 02201 of these specifications.
   3. Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut not more than five joints ahead of pipe laying. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length.
   4. As the Work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
   5. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed and inspected and accepted by the Engineer. Trench backfilling shall be accomplished in accordance with Section 02201 of these specifications.

B. Joints
   1. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow line. The inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.
   2. Joints for sewer gravity pipe shall be installed according to the pipe manufacturer's specifications and recommendations.
   3. After the joints have been completed they shall be inspected by the Engineer before they are covered up. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe which has been disturbed shall be taken up, the joint cleaned and remade and the pipe relaid at Contractor's expense.
   4. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the joints are completed or before the trench has been backfilled. The Contractor shall not open up any more trench than his available pumping facilities are able to dewater.

C. Connecting To Existing Sewers
   1. Connections shall be made to all existing sewer lines in the vicinity of the Work, as shown on the Plans or as authorized by the Engineer. Connections shall be made into existing manholes, or by the construction of a new manhole as shown on the Plans.
   2. Connections to existing manholes shall be made by cutting a hole in the wall of the existing structure, inserting a length of sewer pipe into the hole, filling around the same with concrete or mortar and troweling the inside and outside surfaces of the joint to a neat finish. As specified elsewhere, the bottom of the manhole shall be shaped to fit the invert of the sewer pipe.
   3. Connections will be considered as an incidental part of the Work and a specified payment will be allowed therefor, except where new manholes are built.

3.03 PRESSURE LINE PIPE JOINING

A. Pipe joining procedure shall be in accordance with these Specifications and in accordance with the recommendations of the Manufacturer of the particular type of joint.

B. Mechanical Joint Pipe
   1. The joining of mechanical joint pipe shall be performed in accordance with AWWA Standard C600-77. Mechanical joints shall be complete with rubber gaskets, glands and bolts, all in accordance with American National Standards Institute Specification ANSI A21.11; and method of installation shall be in accordance with above said AWWA C600-77.

C. Push-On Joint Pipe
   1. The joining of push-on joint pipe shall be performed in accordance with the AWWA Standard C600-77 for the Installation of Ductile Cast Iron Water Mains. Instructions for assembly of push-on joints may vary according to the particular manufacturer. The procedure for joining pipe equipped with push-on joints must therefore be in accordance with the manufacturer of particular joint finished.
   2. The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the socket.
   3. A thin coat of gasket lubricant shall be applied to either the inside surface of the gasket or outside surface of the spigot, or both. Gasket lubricant shall be as supplied by the particular manufacturer and approved by the Engineer.
   4. The spigot end of the pipe shall be carefully inserted into the socket so that the joining surfaces will not come in contact with the ground, trench bed, or trench sides. The joint shall then be completed by forcing the spigot end to the bottom of the socket with a forked tool, or jack-type tool, or other device recommended by the particular manufacturer and approved by the Engineer. All pipe shall be furnished with a depth mark to indicate a “full home” assembly.
   5. The Contractor will not be permitted to cut nipples from stock classes of pipe in order to make connections or closures. If the Contractor desires to cut lengths in the field to make closures, he shall have on hand an adequate number of lengths of pipe of the various classes having the interior of the barrel gauged to fit the socket of pipe to the particular class.

3.04 PRESSURE LINE PIPE LAYING

A. Pipe shall be installed so as to conform to the alignment and grade shown on the Drawings.

B. Minimum depth of cover shall be 48" unless otherwise shown on the Drawings. The Contractor shall excavate the trenches to such depths so as to obtain the cover specified hereinabove or as indicated on the Drawings.

C. Ductile iron pipe shall be laid so that the invert elevations will correspond to those shown on the Drawings for the particular stations along the pipe line; and difference in elevation between any two consecutive grade points (elevation control points or stations) shall be uniformly and proportionately distributed between the pipe lengths comprising the section of pipe line between such control points. Whenever permission of the Engineer is obtained to deviate horizontally from a straight line, the maximum deflection for a particular size and length of pipe shall be in accordance with the following table:

Nominal Pipe Diameter	Maximum Permissible Mechanical Joint Pipe		**Deflection Per Length Push-On Joint Pipe**	
	18 Ft.	**20 Ft.**	**18 Ft.**	**20 Ft.**
6"	27"		19"	21"
8"	20"		19"	21"
10"	20"		19"	21"
12"	20"	22"	19"	21"
14"	13½"	15"	11"	12"
16"	13¼"	15"	11"	12"
18"	11"	12"	11"	12"
20"	11"	12"	11"	12"
24"	9"	10"	11"	12"
30"	9"	10"	7½"	8"
36"	8"	9"	7½"	8"

For lengths of pipe shorter than shown on the Table, the maximum permissible deflection shall be the proportioned parts of the deflection shown in the Table.

D. Proper and suitable tools and appliances for the safe and convenient handling of the pipe shall be used. The bottom of the trench shall be prepared as described under Section 02201. The pipe shall not be laid on rock but shall have a six inch cushion of approved bedding material. The pipe shall be accurately laid to the lines and grade shown on the Drawings, and after being properly positioned, then shall be blocked in place.

E. Joining of pipe shall be performed as described in Article 3.03. Whenever a length of pipe requires cutting to fit the lines, it shall be done as to leave a smooth end at right angles to the axis of the bore, and the Contractor shall not receive extra compensation for this Work. Open ends of the unfinished pipe line shall be securely closed when the Work is stopped temporarily at night or other times.

F. Trench backfilling shall be accomplished in accordance with Section 02201 of these Specifications.

G. Bracing and Pipe and Fittings

1. Where changes of direction occur in pipelines or where branches are installed from mains, the pipe and fittings shall be securely braced against hydraulic thrust. Bracing shall be constructed of concrete, plain and/or reinforced as indicated on the Drawings. All concrete used in construction of bracing shall have a 28-day compressive strength of not less than 3000 psi. General purpose bracing shall be in accordance with typical details shown on the Drawings. Special bracing for particular locations shall be in accordance with details shown on the Drawings, and shall be complete with reinforcing steel and miscellaneous iron work.

3.05 GENERAL REQUIREMENTS FOR GRAVITY LINES AND PRESSURE LINES

A. Underwater Excavation: Where the excavation area shown on the Plans falls under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the Work thereafter; provided the method and equipment to be used have received prior approval of the Engineer. In such cases, the excavation area shall be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed to the satisfaction of the Engineer. The cost of all temporary construction work necessary or incidental thereto, including the cost of installing and removing sand bags, coffer dams, sheet piling, excavation and backfill, pumping and dewatering shall be considered as an integral part of the cost of excavation, and no separate payment therefor shall be allowed or made.

B. Removal of Water: The Contractor shall at all times during the construction period provide and maintain adequate means to promptly remove and dispose of all water encountered in the excavations and shall keep the excavation as reasonably dry as possible until the Work is completed. Such water shall be disposed of in a suitable manner without damage to adjacent property owners or pipelines and without stream siltation. Under no conditions shall a pipeline be laid or jointed in water, nor shall water be allowed to rise in the trench unless the joints have been properly made.

C. Surface Obstructions: The Owner will secure right-of-way where required through private lands but the Contractor is to give due notice to tenants therein and shall be held responsible for damage to property therein. Each building, wall, fence, pole, bridge, railroad, tree, lawn or other property or improvement encountered, whether public or private, shall be treated as herein specified for underground obstructions.

D. Surface Drainage: Every drain, gutter, culvert or pipe for surface drainage encountered in the construction operations shall be kept open for both temporary and permanent use, or if necessary to close, other adequate provisions shall be made. Insofar as possible, no interference shall be made with natural drainage of the surrounding ground.

E. Underground Obstructions: Test holes are to be made when required for locating underground obstructions. Every pipe for water, gas, drainage, or other use and every conduit, foundation or other underground structure encountered in trenching, is to be carefully protected from injury or displacement. All damage to underground obstructions shall be repaired at the sole expense of the Contractor and to the satisfaction of the Engineer.

F. Encasement Pipe
   1. Installation of casing and carrier pipe under railroads and highways shall conform to the requirements of the responsible railroad or highway agencies. Casing shall be installed by jacking or tunneling to such minimum limits as may be allowable by railway or highway authorities; casing extending beyond such minimum limits may be placed in the open trench method. Any excavations necessary for approach trenches shall be sheeted and otherwise adequately braced to withstand all possible loads, including traffic loads.
   2. Jacking methods and procedures shall be as recommended by the manufacturer. Jacking operations shall begin at the low end of the pipeline and proceed up-grade, care being taken to install the casing as near to the line and grade as possible.
   3. Tunneling operations and installation of liner plates shall be in accordance with the recommendations of the liner manufacturer. Care shall be taken to avoid loss of ground beyond the tunnel lining and to insure bearing against the ground all around the tunnel. Any space outside the liner plates shall be filled by pneumatically placed pea gravel, by grouting, or by other suitable

backfill material as may be approved by the appropriate authority.

4, Only personnel thoroughly experienced in performing jacking and tunneling operations shall be employed for this Work. Construction operations must not interrupt or interfere with highway or railway traffic. Roadways shall be kept clear at all times.

G. Pipe Protection
1. Pipe which, when completed, will have less than 1½ feet of cover shall be provided with concrete protection, or shall be constructed of ductile iron pipe, as shown on the Plans or as authorized by the Engineer. Pipe protection, when used, will be paid for at the respective contract unit prices.

3.06 PIPE SYSTEM TESTING

A. General
1. All pipelines will be tested and meet minimum test requirements before they will be accepted by the Owner. All tests shall be made in the presence of the Project Representative.
2. Submit test reports on standard form for all pipelines, per the requirements of Section 01340.
   a. Identify line size, service, type, location, and section being tested, and other pertinent information.
   b. Show date of test, start time and end time.
   c. Identify test type (hydrostatic, pneumatic).
   d. List test results.
   e. Have report signed by Contractor and Project Representative.
   f. Submit reports immediately upon completion of passed test.
3. Flush all lines prior to testing.
4. Contractor will provide all equipment, materials, plugs, labor, instruments, water and incidentals necessary to completely, safely and accurately test the pipelines.
5. All defects in the piping systems shall be repaired and/or replaced and retested until acceptable to the Engineer.

B. Gravity Lines
1. Test gravity lines between manholes or other pipe-end structures.
2. The sewer shall be lamped and inspected for true alignment and grade and for foreign matter which may be detected.
3. All PVC pipe installed shall also be tested for deflection by pulling a “Go-No-Go” mandrel through the length of pipe. Pipe found to be deflected beyond (5) percent shall be replaced at the Contractor’s expense.
4. The gravity lines shall be pressure tested by the following procedure:
   a. Seal ends of section being tested.
   b. Pressurize pipeline section to 4 psig
   c. Allow line pressure to stabilize between 3.5 psig and 4.0 psig for at least 5 minutes, adding air as required to maintain pressure above 3.5 psig. (test pressure gage will have a range of 0-5 psig, divisions of 0.10 psig, and minimum accuracy of plus or minus 0.04 psig.)
   d. After stabilization period, close air valves and allow pressure to drop to 3.5 psig.
   e. When line pressure reaches 3.5 psig, begin timing with stopwatch.
   f. Record the time required for the line pressure to drop to 2.5 psig.
   g. Test which meet or exceed the times listed in the chart below for the specified pressure drop will have passed the test, and the test may then be discontinued:

Pipe Size (inches)	Time per 100' Pipe (min:sec)
4	1:00
6	1:00
8	1:30
10	2:00
12	2:30
18	3:00
21	3:30
24	4:00
27	4:30
30	5:00

h. Tests which take less than the specified minimum for the specified pressure drop will have failed the test. The pipeline must be repaired and retested until it passes the test before it will be accepted.
i. For pipelines beneath surface water or groundwater, the pipeline test pressure will be increased by 0.433 psig for each vertical foot that the pipe invert is below the water surface.

5. Television Inspection:
   a. The Contractor shall have all gravity mains and laterals inspected with television equipment by an approved television inspection contractor. The inspection shall be recorded on tape and submitted to the Engineer and Owner for review and approval. All defects noted by the inspection shall be repaired at the Contractor's expense.

C. Pressure Lines
1. All newly-laid buried pressure lines will be hydrostatically pressure tested after installation before they will be accepted.
2. Test pressure lines after backfilling of pipe and after concrete thrust blocks, if required, have cured for:
   a. 5 days, if regular cement is used.
   b. 2 days, if high-early strength cement is used.
3. Expel all air from section being tested and slowly fill section with water.
4. Pressurize the section (at the lowest point, and corrected to the elevation of the test gage) to the following test pressures:
   a. Potable or domestic water - 200 psig
   b. Force mains, service, process lines - 150% of working pressure or 200 psig minimum.
5. Once the system test pressure has stabilized, maintain the pressure to within a 5 psig maximum variation for a period of two (2) consecutive hours. Offset any pressure drops by metered addition of water.
6. Total leakage of the section will be considered to be equal to the total amount of water added during the test period.
7. No leakage is acceptable for glued, threaded, welded, flanged, or other rigidly connected pipe.

Leakage detected will be considered as failure of the test.

8. No pipe installation will be accepted if leakage is greater than that determined by the following formula, based on AWWA C600:

$$L = SD\sqrt{P} / 148{,}000$$

where
- L = is the maximum acceptable leakage rate, in gallons per hour, for the entire section tested.
- S = is the length of pipeline tested, in feet.
- D = is the nominal internal diameter, in inches, of the tested pipeline.
- P = is the average test pressure during the leakage test, in pounds per square inch gauge.

9. Tests which exceed the specified leakage rates will have failed. The pipeline must be repaired and pass the leakage test before the section of pipeline will be accepted by the Owner.

3.07 WARRANTY

A. All pipelines constructed will be guaranteed to be free from defects in material and workmanship for one (1) year from the date of Owner's acceptance of the project.

3.08 DISINFECTION OF WATER MAINS

A. The Contractor shall disinfect the pipe, pipe fittings, valves, and hydrants installed in the system. In general, disinfection shall be in accordance with AWWA Standard for “Disinfecting Water Mains” C 601-68.

B. The interior of the pipe fittings and accessories shall be kept clean and free from dirt; pipe shall be cleaned before installation; and shall be protected during laying to prevent earth entering the pipe. During periods when pipe laying is not in progress, open-ends of laid pipe shall be protected by the means of a water-tight plug or other means approved by the Engineer. All joints of pipe in trench shall be made up tightly before stopping Work at night.

C. After the mains are laid and pressure tested, they shall be thoroughly flushed, either through fire hydrants or by means of taps at the end of the mains (the taps to be large enough to insure a velocity of at least 2.5 fps in the mains).

D. The mains shall be chlorinated (after flushing) with sufficient liquid chlorine or HTH to provide 50 ppm available chlorine to the water in the mains. The chlorine solution shall remain in the pipe for at least 24 hours and then flushed until the main is filled with water having normal chlorine residual. Samples for bacteriological examination by the State Health Department shall be taken by the Contractor and delivered to the State Health Department; and if the water quality does not meet the standard of the Health Department, the disinfection process shall be repeated until satisfactory water is obtained. Samples shall be taken at the ends of all lines and at one (1) mile intervals on major transmission lines.

E. The Contractor shall furnish all chemical feed pumps, generator sets, valves, connections, materials, labor, and equipment required for proper disinfection of the mains. The Contractor shall bear all the costs of disinfecting the main water.

END OF SECTION

SECTION 02830

CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install all galvanized chain link fencing, including, but not limited to, fence fabric, posts, rails, gates, barbed wire, fittings and accessories, where shown on the Drawings or specified.

1.02 QUALITY ASSURANCE

A. Installer must have a minimum of three years' experience in installations of similar size and scope. Submit references to the Engineer upon request. Installer must be approved by the fencing material manufacturer.

B. Acceptable Company's:
   1. West Georgia Custom Fence
   2. Chattahoochee Fence Company
   3. Or approved equivalent

1.03 SUBMITTALS

A. Submit product data and samples as specified in Section 01340:
   1. Submit manufacturer's product data for fence system proposed. Identify applicable materials, sizes, coatings, etc.

PART 2 - PRODUCTS

2.01 GALVANIZED FENCING

A. Chain link fabric will be galvanized steel wire conforming to ASTM-A392, Class 2 (2.0 oz. per SF of surface area). Fabric will be woven from 9 gauge (Coated size) wire in 2" mesh. Fabric 60" high or more will be knuckled at both selvages and twisted and barbed at the other. Fabric 72" higher more will be knuckled at one salvage and twisted and barbed at the other.

B. Posts will be either roil-formed C-Sections or schedule 40 galvanized steel pipe.
   1. Line posts will be C-sections of steel per ASTM-A570, Grade 45, 1.875" x 1.625", with bending strength of 247 lb. under 6' cantilever load, continuously coated with 2.0 oz. GALFAN alloy per ASTM-A875; or 2⅜" OD galvanized steel pipe, with bending strength of 201 lb. under 6' cantilever load, with 2.0 oz hot dipped zinc per ASTM F1 083.
   2. Terminal Posts will be C-Sections, 3.5" x 3.5", with minimum bending strength of 486 lb. under 6' cantilever load, coated with 2.0 oz. hot-dipped zinc per ASTM-A123; or 2-7/8" OD galvanized steel pipe, with bending strength of 381 lb under 6' cantilever load, with 2.0 oz. hot-dipped zinc per ASTM-F1083.
   3. Gate posts will be galvanized steel posts per the following schedule:

Leaf Width	Post Size	Minimum Unit Wt.
to 6'	C, 3½"x3½"	4.85
	or 2⅞" O.D.	5.79
6' to 13'	4" O.D.	9.11
13' to 18'	6⅝" O.D.	18.97
over 18'	8⅝ O.D.	28.55

C. Top Brace Rails will be either 1⅝" x 1¼" channel shaped rail or 1.66" O.D. galvanized steel pipe. Channels will have vertical bending strength of 237 lb. on a 10' continuous span, coated with 2.0 oz. GALVAN alloy per STM-A875. Pipe will have vertical bending strength of 201 lb. on a 10' continuous span, coated with 2.0 oz. hot dipped zinc per ASTM-F1083. Top rail couplings, 6" minimum in length will be spaced at maximum 21' centers.

D. Barbed Wire will be aluminum-coated double strand 12½ gauge twisted wire with 14 gauge 4-point round aluminum barbs spaced on approximately 5" centers, per ASTM-A585.

E. Fittings will be pressed steel or malleable iron, hot-dip galvanized per ASTM-A153. Tie wires will be 11 gauge galvanized steel.

F. Gates will be fabricated from 1.90" O.D. galvanized steel pipe with welded or riveted comers. Provide braces and truss rods as required to prevent sagging.

Hitches will be pressed steel or malleable iron, one pair per leaf. Latches will be forked-type for double gates, with padlock eye to permit operation from either side of gate.

Provide keepers for each leaf over 5' 0" wide, to hold gate in full open position.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
1. Do not begin prior to completion of final grading. Drill holes for post footings in firm, undisturbed or compacted soil. Holes will have a diameter equal to 3 times the diameter of the post, minimum diameter of 12 inches for gate, end, corner and pull posts; and not less than 9 inches for all other posts. Excavate hole depths approximately 8 inches deeper than post bottom, with bottom of corner posts set no less than 50 inches below surface and all other posts set not less than 24 inches below surface when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils and for posts with heavy lateral loads.
2. Place concrete around posts in a continuous pour. Tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
3. Trowel finish tops of footings and slope or dome to direct water away from posts. Extend footings for gate posts to the underside of bottom hinge. Set keepers, stops, sleeves and other accessories into concrete as required.
4. C-section line costs may be mechanically driven to a depth of 3' 0", instead of concrete set.

B. Post Spacing; Posts will be spaced not more than 10 feet on centers.

C. Fence height will be 6' to top of fabric, 7' to top of barbed wire, unless shown or specified otherwise.

D. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

E. Tension Wire: Install tension wires before stretching fabric and tie to each post with ties or clips.

F. Fabric: Leave approximately 2 inches between finished grade and bottom salvage, except where bottom of fabric extends into concrete. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.

G. Stretcher Bars: Thread through fabric and secure to posts with metal bands spaced not over 15 inches OC.

H. Barbed Wire: Install 3 parallel wires on each extension arm on security side of fence, unless otherwise shown. Pull wire taut.

I. Gates: Install gates plumb, level and secure for full opening without interference. Install groundset items in concrete for anchorage, as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

J. Tie Wires: Use U-shape clip or wore, securely fastened around pipe to which attached, clasping pipe and fabric firmly. Bend ends of wire to minimize hazard to persons or clothing.

K. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side.

3.02 CLEANUP

All surplus fencing materials and debris resulting from installation of the fencing will be carefully collected and promptly removed from the site.

END OF SECTION

SECTION 02930

GRASSING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this section includes, but is not limited to:
   1. Grassing Right-of-Way
   2. Restoring sodded lawns and grassed areas
   3. Shrubbery and ornamental Trees

B. Related Work specified elsewhere:
   1. Section 02100 - Site Preparation

1.02 SUBMITTALS

A. Submit to the Engineer, prior to planting grasses, an affidavit from the nursery supplying the materials that all materials supplied comply with the grade standards, type and species as specified.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Take all necessary precautions not to disturb or damage subsurface improvement such as underground cables, utility lines, tanks, drainage lines, etc. All damage to underground utilities or subsurface improvements shall be repaired at the Contractor's expense.

B. Planting may be done whenever the weather and soil conditions are favorable or as otherwise authorized by the Owner or his representative and with the consent of the Contractor.

1.04 JOB CONDITIONS

A. Protect newly seeded areas from all traffic by erecting temporary fences and signs. Protect slopes from erosion. Properly and promptly repair all damaged work when required.

B. At the time of final inspection of work, but before final acceptance, remove all debris, rubbish, excess materials, tools and equipment from landscaped areas.

1.05 GUARANTEE, MAINTENANCE, AND RESEEDING

A. Guarantee: In addition to the guarantees specified in the General Conditions, comply with the following requirements:
   1. All seeding shall be guaranteed by the General Contractor to be in a vigorous growing condition.
   2. All seeding (grass) shall be guaranteed for one growing cycle including one summer and one winter season.
   3. All necessary reseeding shall be made at the first succeeding planting season and carry the guarantee of 1.05.A.1 and 1.05.A.2 of this Section. Any Work damaged during replacement operations shall be restored and all paved and sidewalk areas cleaned.

B. Maintenance
   1. Maintenance shall begin immediately after each area is seeded and shall continue for a period extending through one full growing season after the last plant is installed.

C. Replacement: During the maintenance-guarantee period grassed areas which die or which, in the opinion of the Engineer, are in an unhealthy or badly growth condition shall be reseeded by the Contractor just as soon as is reasonably possible after their unsatisfactory condition is evident. No reseeding will be required in any season definitely unfavorable for seeding the kind of grasses involved.

PART 2 - PRODUCTS

2.01 TOPSOIL:

A. Stockpiled topsoil from the jobsite.

2.02 LIMESTONE:

A. Limestone shall be agricultural grade dolomitic lime stone ground sufficiently fine so that at least 50 percent will pass a No. 8 sieve and shall contain not less than 50 percent calcium carbonate equivalent. Moisture content, at time of delivery shall not exceed 8 percent.

2.03 FERTILIZER

A. Commercial fertilizers shall be in compliance with the State fertilizer laws, rules, regulations, etc. Fertilizer numerical designations indicate the respective minimum percentages of total nitrogen, available phosphoric acid, and water-soluble potash, contained in the fertilizer.

B. Fertilizer shall be Type 1 with a chemical designation of 5-10-5 unless otherwise approved by the Engineer. At least 50 percent of the nitrogen content shall be from a nonwater-soluble organic source or, from a urea-formaldehyde source provided it is not derived from a waste product of the plastic industry.

2.04 MULCH

A. Mulch for seeded areas shall be high-quality, air dried straw or hay, consisting of oat, rye, or wheat straw, and shall be free from noxious weeds and weed seeds detrimental to growth of the specified plants. only undeteriorated mulch which can be readily cut into the soil shall be used.

B. Other mulching materials shall not be used without written approval of the Engineer.

2.05 WATER

A. Water to be used in grassing operations shall be free of excess and harmful chemicals, acids, alkalies, oils or any substance which might be harmful to plant growth or obnoxious to residents or operating personnel. Salt water shall not be used.

2.06 GRASS SEED

A. All grass seed shall meet the requirements of the State Department of Agriculture and all applicable state laws. The seed shall be of the best grade and of known vitality, purity, and germination and shall be delivered in standard sealed containers bearing seed tags as required by law showing percentage of germination, purity of seed, and percentages of weed content. All seeds shall be reasonably free of noxious weeds and total weed content shall not exceed one percent. Seed which has become wet, moldy or otherwise damaged in transit or storage will not be acceptable.

B. Seeding for all areas (except slopes steeper than 3:1) shall be applied at a rate of pounds per acre according to following seasonal limitation table:

Seeds	Feb**.15 - Apr.15**	**Apr.16 - Aug.31**	**Sep.1 - Nov.15**
Common Burmuda Grass (Hulled)	4	4	--
Common Burmuda Grass(Unhulled)	4	4	--
Tall Fescue	--	--	50
Weeping Lovegrass	--	--	20
White Dutch Clover	6	--	6
Pensacola Bahia	50	50	--
Korean Lespedeza	20	--	--

C. Seeding for all slopes steeper than 3:1 shall be applied at a rate of pounds per acre according to following seasonal limitation table:

Seeds	**Feb.15-Jun.30 (lbs/acre)**	**Jul.1 -Aug.31 (lbs/acre)**	**Sep.1-Nov.15 (lbs/acre)**
Virgata Lespedeza	50	75	75
Common Bermuda Grass (Hulled)	--	8	--
Common Bermuda Grass(Unhulled)	--	--	8
Tall Fescue	--	--	30
Weeping Lovegrass	4	4	4

PART 3 - EXECUTION

3.01 PREPARATION

A. Stockpiled topsoil shall be evenly spread on the disturbed area to a minimum depth of 3 inches.

B. Loosen topsoil by tilling or disk harrowing to a suitable depth and smooth out all surface irregularities resulting therefrom. Leave area free of rocks, hard soil clods, etc., which will not pass through the tines of a standard garden rake.

3.02 APPLICATION

A. Seed: Seed shall be applied at a rate in pounds per acre and with the seasonal limitation shown in the tables shown in Part 2.06.B. and Part 2.06.C. or these specifications.

B. Fertilizer and Limestone
   1. The County Agricultural Agent for the County in which the project is located shall be contacted for his recommendations regarding application of fertilizer and limestone and his recommendation shall be followed.

C. Lawns
   1. Sodded lawns and areas: In areas where sodded lawns are maintained, the Contractor will remove the sod with topsoil and replace it after construction. The Contractor will be responsible for maintaining and protecting the sod until it has been relaid or the Contractor shall purchase sod of the same grass and relay it solid after backfilling. The Contractor shall water the grass a minimum of three (3) times weekly until the sod is rerooted or for a period of two (2) months. All hybrid and special grasses shall be removed as sod.
   2. Lawns and Grassed Areas: Where lawn grass cannot be removed as sod, the Contractor shall remove the topsoil during construction and stockpile it. After construction, the Contractor shall spread the topsoil over the construction area. The Contractor shall seed the lawn with the same kind of grass as the original lawn during the appropriate planting period for that grass. The grass shall be maintained by the Contractor and watered a minimum of three (3) times weekly until a stand is well established or for a period of two (2) months.
   3. All lawns and grassed areas shall be restored to a condition equal to or better than the original conditions and to the satisfaction of the property owner.

3.03 SHRUBBERY AND ORNAMENTAL TREES

Any shrubbery or ornamental tree removed or damaged by the Contractor shall be replaced in kind to the satisfaction of the Owner.

3.04 PAYMENT

A. Payment for grassing (including all preparation and associated materials) will be included in the Lump Sum Bid. No separate payment will be made for restoring lawns, sodding lawns, or replacing shrubbery and ornamental trees. Such costs will be included in the Lump Sum.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03100

WOOD FORMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Definitions:
   1. Concrete Surfaces: Formed surfaces where appearance is not of major importance.

B. Related Work Specified elsewhere
   1. Section 01340 - Shop Drawings, Product Data and Samples
   2. Section 03200 - Reinforcing Steel
   3. Section 03250 - Concrete Accessories
   4. Section 03300 - Cast-in-Place Concrete

1.02 QUALITY ASSURANCE

A. Design Criteria:
   1. General: Conform to ACI 347, Chapter 1 - Design.
   2. Plywood: Conform to tables for form design in APA Form V 34S, including strength.

B. Requirements of Regulatory Agencies: Erect forms to meet requirements of Standard Building Code.

C. Allowable Tolerances:
   1. Concrete: Conform to ACI 347, 2.4.

1.03 SUBMITTALS:

A. Product Data
   1. Submit manufacturer's product data on forming accessories.

1.04 JOB CONDITIONS

A. Unless noted otherwise on Drawings or elsewhere in these Specifications, all formwork will conform to non-architectural concrete requirements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Conform with ACI 347, Chapter 3, Materials and Form Work

B. Lumber:
   1. Softwood framing lumber: Kiln dried, PS 20.
   2. Boards less than 1½ in. thick and 2 in. wide, used for basic forms and form liners: Kiln dried.
   3. Grade marked by grading rules agency approved by American Lumber Standards Committee.
   4. Light framing or studs for board or plywood forms, 2 in. to 4 in. in width and thickness. Construction standard grade.

5. Boards for basic forms or form liners: Construction standard.
6. Board surface: smooth.

C. Plywood:
1. Exterior type softwood plywood, PS 1.
2. Each panel stamped or branded indicating veneer grades, species, type, and identification.
3. Overlay plywood for concrete surfaces:
   a. Panel veneer grades: B - B.
   b. Mill-oiled sides and mill-sealed edges of panels.

D. Corner Formers:
1. Profile type: chamfered.
2. Material: wood.

E. Ties:
1. Material: Carbon steel
2. Type: Snap ties.
3. Depth of breakback: 1".
4. Maximum diameter: ¼ in.

F. Form Coatings:
1. Non-staining.

G. Sealant: As recommended by form manufacturer.

H. Steel Form Systems: May be allowed as an alternative to other systems.

PART 3 - EXECUTION

3.01 GENERAL:

A. Conform to ACI 347, Chapter 2, Construction

B. Framing, Bracing, and Plywood Form Liners: APA Form V 345.

END OF SECTION

SECTION 03200

REINFORCING STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work under this section includes, but is not limited to the following:
   1. Steel bar reinforcing
   2. Welded wire fabric reinforcing.

B. Related work specified elsewhere:
   1. Section 01340: Shop Drawings, Product Data and Samples
   2. Section 01410: Testing Laboratory Services
   3. Section 03100: Wood Forms
   4. Section 03250: Concrete Accessories
   5. Section 03300: Cast in Place Concrete

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers: Manufacturers of reinforcing steel who are regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.

B. Installer Qualifications:
   1. Three years experience in installation of steel bar and welded wire fabric reinforcing on projects of similar size and scope.

C. Requirements of Regulatory Agencies: Conform to requirements of Standard Building Code.

D. Allowable Tolerances:
   1. Fabrication:
      a. Sheared length: ± 1 inch.
      b. Depth of truss bars: ± 0 - ½ inch.
      c. Stirrups, ties, and spirals: ± ½ inch.
      d. All other bends: ± 1 inch.
   2. Placement:
      a. Concrete cover to form surfaces: ± ¼ inch.
      b. Minimum spacing between bars: 1 inch or 1 bar diameter (for bars greater than 1 inch).
      c. Top bars in slabs and beams:
         1) Members 8 inch deep or less: ± 1/¼ inch.
         2) Members more than 8 inch but not over 2 ft. deep: ± ½ inch.
         3) Members more than 2 ft. deep: ± 1 inch.
      d. Crosswise of members: Spaced evenly within 2 inch of stated separation.
      e. Lengthwise of members: Plus or minus 2 inch.
   3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.

E. Source Quality Control: Mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered. Testing required per Section 01410, Testing Laboratory Services.

1.03 SUBMITTALS

A. Submit shop drawings as specified in Section 01340.
   1. Submit reinforcing plans conforming to ACI SP-66, "ACI Detailing Manual".
   2. Show and list bar sizes, directions, mats, spacing, lengths, bends, laps, splices, dowels, etc.
   3. Show elevations of all walls.
   4. Show all construction and expansion joints.
   5. Show all openings through concrete structures, and all extra reinforcement required for such openings.
   6. Show outlines of walls, slabs, beams, or other structures being reinforced. Show major structure dimensions and elevations.

B. Submit manufacturer's product data as specified in Section 01340.
   1. Submit product data for all reinforcing accessories. Indicate model numbers, sizes, features, and options selected.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bars:
   1. Deformed billet steel: ASTM A 615, Latest Revision, Grade 60.
   2. Deformed rail steel: ASTM A 616, Latest Revision, Grade 60.
   3. Deformed axle steel: ASTM A 617, Latest Revision, Grade60.

B. Wire: Cold drawn steel, ASTM A 82 - Latest Revision.

C. Wire Fabric: Welded Steel ASTM A 185 - Latest Revision.

D. Tie Wire: FS QQ-W - 61-A, Latest Revision, annealed steel, black, 16 ga. minimum.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar type supports complying with CRSI specifications.
   1. For slabs-on-grade and foundations, use presoaked concrete bricks or supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.02 FABRICATION

A. Fabricate all reinforcing steel in accordance with CRSI Manual of Standard Practice.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Placement:
   1. Bar supports: Comply with CRSI 65.
   2. Reinforcing bars: Comply with CRSI 63.

B. Steel Adjustment:
   1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
   2. Do not move bars beyond allowable tolerances with out concurrence of Engineer.
   3. Do not heat, bend, or cut bars without concurrence of Engineer.

C. Splices:
   1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
   2. Do not splice bars except at locations shown on Drawings without concurrence of Engineer.
   3. Minimum Lap: 36 bar diameters, unless specifically shown on the Drawings.

D. Wire Fabric:
   1. Install in longest practical length.
   2. Lap adjoining pieces one full mesh plus 2 inches, and lace splices with 16 gage wire.
   3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
   4. Offset end laps in adjacent width to prevent continuous laps.

E. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

F. Protection During Concrete Placement: Keep reinforcing steel in proper position during concrete placement.

END OF SECTION

SECTION 03250

CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work under this Section includes, but is not limited to the following:
   1. Waterstop
   2. Joint fillers and sealing compound
   3. Dovetail Anchors

B. Related work specified elsewhere:
   1. Section 01340: Shop Drawings, Product Data and Samples
   2. Section 03100: Wood Forms
   3. Section 03200: Reinforcing Steel
   4. Section 03300: Cast-ln-Place Concrete

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Molded Rubber Waterstop:
      a. Servicised Products Corp.
      b. W. R. Meadows, Inc.
      c. Or approved equivalent
   2. Joint fillers and sealing compound:
      a. W.R. Grace Construction Products Co.
      b. W.R. Meadows, Inc.
      c. Or approved equivalent
   3. Vapor barrier:
      a. Sisalkraft"Moistop"
      b. Rubber and Plastic Compound Co.
      c. Or approved equivalent
   4. Dovetail Anchors:
      a. Southern Slag Products
      b. Heckmann Building Products
      c. Or approved equivalent

1.03 SUBMITTALS

A. Submit manufacturer's product data as specified in Section 01340.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Molded PVC Waterstop:
   1. At Construction Joints.
      a. Provide minimum ⅜" thick x 6" wide waterstop.
      b. Type shall be either two-bulb ("dumbell") or ribbed with center bulb.

2. At Expansion Joints
    a. Provide minimum ⅜" thick x 9" wide waterstop.
    b. Type shall be either three-bulb or ribbed-with-center bulb.

B. Joint fillers and sealing compound:
    1. Joint filler - preformed PVC foam.
    2. Sealing Compound - polysulfide polymer

C. Dovetail Anchor Slot
    1. Material: Galvanized Steel
    2. Thickness: 20 ga. or thicker
    3. Slot width: 1"

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify waterstop is clean and free of dirt and oil and joints are sealed watertight per manufacturer's recommendations.

B. Check that areas to receive joint fillers are clean.

3.02 INSTALLATION

A. Waterstop, joint filler, and sealing compound shall be placed in strict accordance with manufacturers recommendation.

B. Dovetail anchor slot shall be installed on 24" centers on all concrete surfaces to receive brick masonry.

3.03 PROTECTION OF COMPLETED WORK

After installation all accessories shall be protected from damage and displacement.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this section includes, but is not limited to the following:
   1. Concrete materials
   2. Concrete
   3. Mixing, placing and curing cast-in-place concrete
   4. Finishing concrete

B. Related work specified elsewhere:
   1. Section 01340: Shop Drawings, Product Data and Samples
   2. Section 01410: Testing Laboratory Services
   3. Section 02200: Earthwork-General
   4. Section 03100: Wood Forms
   5. Section 03200: Reinforcing Steel
   6. Section 03250: Concrete Accessories
   7. Section 03600: Grout

C. Design, the material, and workmanship will be in accordance with Specifications and the current edition of the following standards, unless otherwise modified on the Drawings or in the Specifications:
   1. ACI 318 Building Code requirements for reinforced concrete
   2. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structure
   3. ACI 301 Specifications for Structural Concrete for Buildings
   4. CRSI Recommended Practice for Placing Reinforcing Steel

1.02 QUALITY ASSURANCE

A. The Engineer will have access to and have the right to observe the premises and materials of suppliers or manufacturers providing products under these Specifications.

B. Unless otherwise noted on the Drawings, all concrete will be Class A concrete.

C. Quality control testing during construction:
   1. Owner will employ a testing laboratory to perform tests and to submit test reports. See Section -01410 for further requirements.
   2. Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer.
      a. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
      b. Slump: ASTM C 143; one test at point of discharge for each load of concrete; additional tests when concrete consistency seems to have changed.
      c. Air Content: ASTM C 231 pressure method for normal weight concrete; one for each of compressive strength test specimens.
      d. Concrete Temperature: Test hourly when air temperature is 4O˚ F (4˚C) and below, when 80˚ F (27˚ C) and above, and each time a set of compression test specimens is made.
      e. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test

specimens except when field cure test specimens are required.

f. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

g. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

3. Test results will be reported in writing to Engineer, Owner, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests will contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
4. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor will pay for such tests when unacceptable concrete is verified.
5. Concrete structures that are to contain water, sludge, or other liquids, such as settling or digestion tanks, coagulation basins, reservoirs, filter basins and similar structures will be hydrostatically tested for leakage. Testing will consist of filling each structure with water so that the Engineer can observe any leaks when the structure has been full of water from 24 to 48 hours. When practical, such tests will be made before backfill is placed around the structure. All leaks in the structure are to be repaired in an approved manner. Patching or caulking or any other method of repair on the outside or dry side of walls will not be permitted. Damp areas or spots on permanently exposed walls, such as in filter galleries, will be considered leaks. For structures below finished grade, hydrostatic testing may be omitted when specifically authorized by the Engineer.

D. Work determined by the Engineer to be unsatisfactory or damaged will be removed and replaced by the Contractor.

E. All concrete trucks will meet ASTM Standard and ACI Concrete Inspection. Counters, meters, water gauge, etc. will be in proper working order.

F. Allowable Tolerances: Flatwork true to plan 1/8" in 10 feet.

1.03 SUBMITTALS

A. Submit product data as specified in Section 01340.
1. Submit concrete mix design.
   a. Break down material content per cubic yard of concrete.
   b. Show dry weight of cement.
   c. Show saturated, surface-dried weights of fine and coarse aggregate.
   d. Show weight of water.
   e. List quantities, types, and names of admixtures.
2. Submit trial mix laboratory reports.
3. Submit product data on each admixture proposed.
4. Submit certification of aggregate quality. Include statement for an independent lab that aggregates used are not reactive.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Cement: Store in weather tight enclosures and protect against dampness, contamination, and warehouse set.

B. Aggregates: Stock pile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stock pile.

C. Admixtures: Store to prevent contamination, evaporation, or damage. Protect liquid admixtures from freezing or harmful temperature ranges. Agitate emulsions prior to use.

D. Batching: Concrete batching equipment used on the jobsite will have a minimum capacity to produce 250 cubic yards of concrete in an eight (8) hour period.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Allowable Concrete Temperatures: concrete will be placed only when the temperature is above 40˚ F. The concrete will be maintained at a temperature of not less than 50˚ F nor more than 90˚ F for a period not less than 72 hours.

B. Do not place concrete during rain, sleet, or snow unless protection is provided.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement
   1. All Water Bearing Structures: Type I/II ASTM C150 including optional tables -Latest Revision. Tricalcium Aluminate will not exceed 5%.
   2. Non Water Bearing Structures: ASTM C1SO Type I may be used.
   3. Use one brand of cement throughout project unless otherwise acceptable to Engineer.

B. Fly Ash: ASTM C 618, Type C or Type F.

C. Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.
   1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spell-causing deleterious substances.
   2. Local aggregates not in compliance with the soundness and durability requirements of this standard will not be used except with prior written approval of the Engineer, and provided it can be shown by special testing or a record of past performance that these aggregates produce concrete of adequate strength and durability. Aggregate soundness testing for fine and coarse aggregates will be in accordance with ASTM C88 using a sodium sulfate solution.

D. Fine Aggregates: ASTM C 33. Content of material passing a number 200 sieve will not exceed 4%. Use only clean, sharp, natural sand.

E. Coarse Aggregate: Use only natural gravels, a combination of gravels and crushed gravels, crushed stone, or a combination of these materials containing no more than 15% flat or elongated particles (long dimension more than five times the short dimension). Content of material passing a number 200 sieve will not exceed 0.5%.

F. Water will be clean and potable.

G. Admixtures, General: Provide concrete admixtures which contain not more than 0.1% chloride ions.
   1. Water-Reducing Admixture: ASTM C494, Type A.
   2. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
   3. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G.
   4. Water-Reducing, Accelerating Admixture: ASTM C494, Type E.
   5. Water-Reducing, Retarding Admixture: ASTM C494, Type D.

2.01 RELATED MATERIALS

A. Granular Base: Provide evenly graded mixture of fine and coarse aggregates with maximum particle size of 1" to provide, when compacted, a smooth and even surface below slabs on grade. Granular base will be 6" thick.

B. Sand Cushion: Provide 2" of clean, manufactured or natural sand between vapor barrier and underside of slab.

C. Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E154. Vapor retarder will consist of a polyethylene sheet not less than 6 mils thick.

D. Absorptive Cover: Provide burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2, where required.

E. Moisture-Retaining Cover: Provide one of the following complying with ASTM C171, where required:
   1. Waterproof paper
   2. Polyethylene-coated burlap

F. Liquid Membrane-Forming Curing Compound: Provide liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A where required. Moisture loss will not exceed 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

G. Water-Based Acrylic Membrane Curing Compound: ASTM C309, Type I, Class B.

H. Bonding Compound: Polyvinyl acetate or acrylic base.

I. Epoxy Adhesive: ASTM C881, two-component material suitable for use on dry or damp surfaces. Provide material Type, Grade, and Class to suit project requirements.

J. Sealer: The Ashford Formula, as manufactured by Curecrete Chemical Company, Inc., or equal.

K. Forms will be new material at project start. Undamaged forms, meeting the requirements of allowable tolerances, may be reused in accordance with Paragraph 3.10.

2.03 PROPORTIONING AND DESIGN OF MIXES

A. An independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs will prepare design mixes for each type and strength of concrete by laboratory trial batch methods as specified in ACI 301. The testing facility will not be the same as used for field quality control testing.

B. Design mixes will provide normal weight, air-entrained concrete with the following properties, as indicated on Drawings and schedules, per ASTM C94 latest revision or its equivalent.
   1. Cement: Type I/II ASTM C150 including optional tables - Latest Revision. Tricalcium Aluminate for all water bearing structures and surfaces will not exceed 5%. Type I may be used for non-water bearing structures.
   2. Admixtures:
      a. Air entraining: ASTM C 260 - Latest Revision
      b. Pozzolans: ASTM C 618 - Latest Revision
      c. Admixtures other than air-entraining agents and pozzolans will be used only when authorized in writing by the Engineer.
   3. Coarse Aggregate: Size number 57, ASTM C33 - Latest Revision.
   4. Fine Aggregate: ASTM C33 - Latest Revision.
   5. Slump: 3 - 5 inches.
   6. Air Content: ASTM C94 - Latest Revision. 6% Air Entrainment + 1 %.
   7. Mix Proportioning: One Cubic Yard

Item	Class A	Class B
a. Minimum 28 day compressive strength(psi)	4,000	3,000
b. Cement content (lbs./CY concrete) Minimum Maximum	 517 N/A	 423 517
c. Pozzolan/fly ash (lbs./CY concrete)	100	N/A
d. Max. Water content (gal./CY concrete)	*	7.5
e. Air entrainment in fresh mix	ASTM C94	0

* water to cement (w:c) for all water bearing structures and surfaces will be in the range of 0.45 to O.48

C. For concrete surfaces designated to receive a Heavy Duty Concrete Floor Surfacing (as specified in Section 03320), the mix design will be subject to the following additional constraints:
   1. Slump will not exceed 3".
   2. Air content will not exceed 3%.
   3. Calcium chloride, or admixtures containing calcium chloride, will not be used.
   4. Admixtures which tend to increase bleeding will not be used.

2.05 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as specified.

B. Mix concrete only in quantities for immediate use.

C. Do not retemper or use set concrete.

D. Type I/II cement will be used for all sewage-containing structures.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer.

B. Provide keyways as shown in the Drawings details in construction joints in walls and slabs and between walls and footings.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops in accordance with manufacturer's printed instructions.

F. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as equipment bases and elsewhere as indicated.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

C. Chamfer: All exposed formed concrete edges will have ¾" chamfer unless otherwise noted.

3.04 PREPARATION OF FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.

B. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.05 CONCRETE PLACEMENT

A. Inspection: Prior to the Contractor placing order for concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. In addition to other equipment required for placement, the Contractor will provide standby vibrators (minimum of two (2) units) during all concrete placement.

B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while the preceding layer is still plastic, to avoid cold joints. When placing concrete, use of aluminum pipe or other aluminum conveying devices will not be permitted. Maximum height of concrete free fall will not exceed 5 feet. Use placement devices such as chutes, pouring spouts, and pumps as required. Concrete which has contained its water content for more than 50 minutes will not be placed unless a variance is approved by the Engineer.
   1. Consolidate placed concrete by hand held mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309. Form vibrators are prohibited.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
   1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or derbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
   3. Maintain reinforcing in proper position during concrete placement.

F. Cold-Weather Placing: Comply with provisions of ACI 306, and as follows: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40˚ F (4˚ C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50˚ F (10˚ C) and not more than 80˚ F (27˚ C) at point of placement.
   1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   2. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

3. The concrete will be maintained at a temperature of not less than 50˚ F nor more than 90˚ F for a period not less than 72 hours.

H. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90˚ F (32˚ C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
   2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
   3. Use water-reducing or set retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Engineer.

3.06 FINISH OF FORMED SURFACES

A. Rough Form Finish will be acceptable for formed concrete surfaces not exposed to view in the finish work or concealed by other construction. The concrete surface may show the texture imparted by the form-facing material used. Tie holes and defective areas will be repaired and patched and fins and other projections exceeding ¼ " in height rubbed down or chipped off.

B. Smooth Form Finish will be given to formed concrete surfaces to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, veneer plaster, painting, or other similar system. The as-cast concrete surface will be obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Rubbed or float finish treatment will be given to all interior and exterior surfaces exposed to normal operating access. This will apply to waterholding structures to a level of two (2) feet below normal water level.
   1. Cure 5 days minimum before rubbing.
   2. Complete rubbing within 10 days of concrete placement.
   3. Remove all burrs and form marks using a No. 16 Carborundum stone.
   4. Remove all swirl marks, surplus material, and obtain a smooth uniform finish and color using a No. 50 Carborundum stone.

3.07 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.
   1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface planes to a tolerance not exceeding 1/8" in 10 feet when tested with a 10 foot straightedge. Cut down high spots and fill in low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view.
   1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface

by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances not exceeding 1/8" in 10 feet when tested with a 10 foot straightedge.
2. Slabs which are designed and detailed to drain to a floor drain will in fact adequately drain regardless of tolerances and the contractor will be fully responsible to achieve this important function in the finished structure.

C. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete slabs and elsewhere as indicated. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

1.08 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep concrete surface continuously moist for not less than 7 days.

C. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

D. Provide moisture curing by following methods.
1. Keep concrete surface continuously wet by covering with water.
2. Use continuous water-fog spray.
3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

E. Provide moisture-cover curing as follows:
1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs as follows unless noted otherwise.
1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
3. Provide sealer to interior slab on grade in accordance with manufacturer's recommendations.

G. Curing Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, toppings, and other flat surfaces, by application of appropriate curing method.

3.09 REMOVAL OF FORMS

A. Forms will not be removed without the authorization of the Engineer. Removal will be accomplished in such manner as will prevent injury to the concrete. Forms will be left in place for the following minimum durations:
   1. Elevated Slabs 14 days
   2. Monolithic Pipe 7 days
   3. Columns and Walls 3 days
   4. Other Concrete 3 days
   5. Slabs on Grade (edge forms) 3 days

3.10 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Engineer.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work or other trades is in place. Mix, place, and cure concrete as herein pacified, to blend with in-place construction. Provide the miscellaneous concrete filling shown or required to complete work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

3.12 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.
   1. Cut out honeycomb, rock pockets, voids over ¼" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
   2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spells, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
   1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of

concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified.
   1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01" wide (or that penetrate to reinforcement or completely through nonreinforced sections regardless of width), spelling, popouts, honeycomb, rock pockets, and other objectionable conditions.
   2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
   3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.
   4. Repair defective areas, except random cracks and single holes not exceeding 1" in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of some type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

D. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of crack and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of 1 part Portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

E. Perform structural repairs with prior approval of Engineer for method and procedure, using specified epoxy adhesive and mortar.

F. Repair methods not specified above may be used, subject to acceptance of Engineer.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work under this section includes, but is not limited to the following:
   1. Grout
   2. Grout materials

B. Related work specified elsewhere:
   1. Section 03200: Reinforcing Steel
   2. Section 03300: Cast-in-Place Concrete

1.02 QUALITY ASSURANCE

A. Class I grout will be subject to the same quality assurance requirements as appear in Section 03300 - Cast-In-Place Concrete.

B. Class II Grout and Class III Grout:
   1. Acceptable manufacturers
      a. U.S. Grout Corp.
      b. Master Builders
      c. or approved equivalent

1.03 SUBMITTALS

A. Submit product data as specified in Section 01340
   1. Submit manufacturer's product data
   2. Submit analysis of grout content (mix design)
   3. Submit test results. Show compressive strength, slump, etc.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Class I Grout: Delivery will be by the same method as specified in ASTM C 94 - Latest Edition for delivery of ready mix concrete.

B. Class II Grout and Class III Grout: Delivery, storage and handling will be in accordance with the manufacturer's recommendation.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Placement Temperatures: Place grout only when the temperature is above 50ºF.

B. Weather Conditions: Do not place grout exposed to the weather during rain, sleet, or snow.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Class I Grout:
   1. Cement: Type I ASTM C 150 - Latest Revision
   2. Fine aggregate: ASTM C 33 - Latest Revision
   3. Slump: 6-inches
   4. Mix proportion: 1 part cement to 3 parts sand.

B. Class II and Class III Grout: Grouts will be a manufactured grout delivered in bags for mixing with water.

PART 3 - EXECUTION

3.01 USE OF CLASS I AND CLASS II GROUT

A. All mechanical equipment sitting on concrete will be grouted in place following final setting with Class II grout.

B. Unless otherwise stated all other references on the Drawings will be Class I grout.

C. In all locations on plans where the note "Drill and Grout" is used, this language will require the use of an approved Type III Non-Shrink Grout. All drilled holes will be 1½ times the diameter of the bar to be grouted.

3.02 INSPECTION

A. Assure that the surfaces are clean and free of deleterious material.

3.03 INSTALLATION

A. In accordance with manufacturer's recommendations.

3.04 PROTECTION OF COMPLETED WORK

A. Protect the grout from disturbance, loading, shock or vibration for the period recommended by the manufacturer.

END OF SECTION

DIVISION 4

MASONRY

SECTION 04040

MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Concrete block masonry.

B. Brick masonry.

C. Mortar for masonry.

D. Reinforcement and Anchorages.

E. Form control joints.

1.02 RELATED WORK

A. Section 03300: Cast-In-Place Concrete.

B. Section 05550: Miscellaneous Metals.

1.03 QUALITY ASSURANCE

A. Perform masonry work in accordance with requirements of ANSI A41.1 unless indicated otherwise herein.

B. Perform mortar work in accordance with requirements of ASTM C476 unless indicated otherwise herein.

1.03 WARRANTY

A. The Contractor guarantees the masonry work for one year from date of Owner acceptance, against leakage due to improperly laid units, mortar mix, pointing, and other defects in workmanship.

B. All corrections of the masonry and other damage within the period shall be made at the Contractor's expense.

PART 2 - PRODUCTS

2.01 MASONRY

A. Concrete Blocks and Split-face Concrete Block:
   1. Concrete blocks and Split-face Concrete block shall be 8" x 16" nominal face size. The block thickness shall be as shown on the Plans.

B. Face Brick:
    1. Non-load bearing burned clay or shale, ASTM C216 type FBS grade MW; standard size.

2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C150 - Type I, gray color.

B. Masonry Cement: ASTM C91, Type II.

C. Aggregates: Standard masonry sand per ASTM C144, free from foreign matter.

D. Hydrated Lime: ASTM C207, Type S.

E. Water: Clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.

F. Plasticizer: Add plasticizer to mortar mixes per manufacturer's instructions and ASTM 270 at locations on drawings where "Epoxy Mortar" is called for; Master Builders "OMICRON" or equal.

2.03 MORTAR MIX

A. Mortar:
    1. For load bearing walls: Type "M", ASTM C-270, of one (1) part Portland Cement; one-fourth (1/4) part lime and three (3) parts sand, by volume, or one (1) part Mason's cement and two (2) parts sand, by volume.
    2. For non-load bearing walls: Type "S", ASTM C-270, of one (1) Portland cement and ½ part lime and 4 ½ parts sand; or ½ part Portland, one (1) part Mason's cement and 4 ½ parts sand, by volume.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure items built-in by other trades for this Work are properly located and sized.

B. Establish lines, levels and coursing. Protect from disturbances.

3.02 WORKMANSHIP AND INSTALLATION

A. Place masonry in accordance with lines and levels indicated.

B. Do not shift or tap masonry after mortar has taken initial set.

C. Job site cutting of masonry with proper power tools to provide straight and true.

D. Ensure masonry courses are of uniform height. Make vertical and horizontal joints equal and of uniform thickness. Lay in full bed of mortar, properly jointed with other work.

E. Remove excess mortar and projections. Take care to prevent breaking masonry corners.

F. Lay concrete block in running bond. Course 1 block unit and 1 mortar joint to equal 8 inches. Form concave mortar joints.

G. Lay brick in common bond. Course 3 brick units and 3 mortar joints to equal 8 inches. Form concave mortar joints.

H. Cut mortar joints of concrete block flush, where resilient floor base is scheduled.

3.03 CLEANING

A. Remove excess mortar and smears upon completion of masonry work.

B. Point or replace defective mortar. Match adjacent work.

C. Clean soiled surfaces using a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners. Use non-metallic tools in cleaning operations.

END OF SECTION

DIVISION 5

METALS

SECTION 05550

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this section includes, but is not limited to the following:
1. Iron Castings
2. Structural Steel Work
3. Structural Aluminum Work
4. Grating Work
5. Trench Drain Grating
6. Anchor Bolts
7. Stair Nosings
8. Metal Stairs
9. Manhole Steps

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01340: Shop Drawings, Product Data and Samples

B. Section 09900: Painting

PART 2 - PRODUCTS

2.01 IRON CASTINGS

A. Casting will be of the type, size, weight and dimensions as shown on the Drawings.

B. Cast Iron will conform to ASTM A48-74 Class 30B.
1. Castings will be sound, smooth, clean and free from blisters and other defects. No plugging of defective castings will be permitted.
2. All unfinished edges will be neatly cast with suitable round corners and all inside angles will have ample fillets.
3. Surfaces will be finished to such smoothness and accuracy of dimension as to insure good workmanship when assembled. All castings will be annealed to remove internal stress before being machined.
4. All castings will have the mark number and heat number cast on them.
5. All parts called for on the Drawings as galvanized will be coated to conform to the requirements of ASTM Specification A123.

C. Malleable Iron Castings will conform to ASTM A 197.
1. Castings will be free form cracks, blowholes, moldpulls, risers, fins or other imperfections that may impair serviceability. The surface of the castings will be reasonably smooth and free of fused sand and dross.
2. Tolerances will be accepted foundry standards not to exceed plus/minus 1/16 inch per linear foot of major dimension. The seating surfaces of cover and grating will be machined to insure a

continuous fit.

3. Castings will have asphalt dip coatings. Coatings will be smooth tough and non-tacky.

2.02 STRUCTURAL STEEL, RIVET STEEL AND OTHER METALS

A. American Institute of Steel Construction Specifications for the Design, Fabrication and Erection of Structural Steel Buildings

B. Steel Frames and Covers: Types and size as shown on the Drawings.

2.03 STRUCTURAL ALUMINUM: ALCOA ALLOY 6063-T5

2.04 GRATINGS

A. Aluminum I-Bar Type Grating as shown on the Drawings

B. Allowable Deflection: 1/240 of the span under 150 pound per square foot live load.

C. Openings: All openings for pipes, etc. will be banded and fabricated in sections of such size that each section may be removed without disassembling the pipes which pass through it.

D. Aluminum gratings and solid planks will have end closure strips.

E. Steel grating will be galvanized after fabrication.

F. Acceptable Manufacturers
   1. Borden Metal Products
   2. Washington Aluminum
   3. Thompson Fabricating Company

G. Spans for grating will be limited to values as tabulated on drawings - typical details. For clear spans greater than tabulated values, grating manufacturer will design and furnish support beam layout to limit clear span of grating to tabulated values, unless noted otherwise on the drawings.

2.05 TRENCH DRAIN GRATING

A. All trench drain grating on drawings will be heavy duty trench frame type "X" and grating, Neenah R-4990, type A opening, or approved equal.

2.06 ANCHOR BOLTS

A. Minimum size: ½ inch

B. Material:
   1. Submerged: 304 stainless steel
   2. Equipment anchor bolts: 304 stainless steel
   3. Other: galvanized steel:

C. Type: cast-in-place with sufficient embedment to develop the full tensil strength in accordance with the latest ACI standards.

D. Anchor bolts for use with equipment will be furnished by the equipment manufacturer.

2.07 STAIR NOSINGS

A. Abrasive aluminum, minimum 3" wide, Woodter Alumogrit Type 116, or Equal.

2.08 STEEL STAIRS

A. Steel stairs will be constructed of structural steel shapes using manufacturers standard details. Design for 1OO pounds live load.

2.09 MANHOLE STEPS

A. Reinforced plastic step, Model No. PS-1, as manufactured by M.A. Industries or approved equal.

PART 3 - EXECUTION

3.01 CASTINGS

A. Frames and covers will be of the types and sizes shown on the Drawings. They will be installed as shown on the Drawings with surfaces accurately set to line and grade unless otherwise shown.

B. Castings to be embedded in concrete will be firmly and properly supported until the concrete has been placed around them and hardened.

C. Casting to be embedded in brick masonry will be inserted as the work progresses.

D. Care will be exercised in bolting castings to prevent misalignment or springing of any of the parts.

3.02 FABRICATION AND WORKMANSHIP FOR STRUCTURAL STEEL

A. Fabrication and workmanship for structural steel, including welding, will conform to the requirements of Part V, Fabrication, of the American Institute of Steel Construction Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
   1. Bearing surfaces will be planed to true beds.
   2. All columns and bearing stiffeners will be milled to give full bearing over the cross section.
      a. Column base plates 2-inches or less in thickness may be used without planing.
      b. Plates between 2-inches and 4-inches in thickness may be straightened by pressing, or they may be planed.
      c. Plates over 4-inches thick must be planed.
      d. It will not be necessary to plane bottom surfaces of plates on grout beds.

B. Methods of erecting structural steel will conform to the requirements of Section 7, Erection, of the American Institute of Steel Construction Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
   1. Column bases and beam plates 12-inches x 12-inches and larger will be set on steel wedges or angle screeds to accurate elevations approximately 1½ inches clear of masonry and will be grouted in place.
   2. Wooden wedges will not be used.
   3. All base plates over 20-inches will be set on angle screeds.
   4. Base plates over 30-inches square will have two 2-inch grout holes.

C. Steel surrounding elevator shafts will be allowed a variation of 1:1,000 from plumb.

D. All other steel will be level or plumb within a tolerance of 2:500.

E. Loose lintels will be placed in masonry or formed in concrete as the work progresses.

F. Field errors will not be corrected by burning unless specifically so authorized by the Engineer.

3.03 STRUCTURAL ALUMINUM LADDERS AND SAFETY CAGES

A. Structural aluminum ladders and safety cages will have bolted connections using stainless steel bolts, nuts, and washers.

3.04 GRATINGS

A. Where gratings are installed in concrete, it will be supported by anchored bearing angles on all sides. Bearing angles will be of the same material as the grating.
   1. The width of the horizontal leg of the bearing angles will be equal to at least twice the depth of the grating it supports.
   2. Completed sections will be level and true so as to rest firmly on the bearing angles along the entire contact surface. Bearing angles and anchors will be accurately set to the line and grade shown on the plans, leveled and rigidly supported by suitable means until the concrete has been placed around them and has hardened.
   3. Where aluminum angles are to be in contact with concrete, the contact surfaces will be painted with a protective coating in accordance with Specification Section 09900.
   4. Where adjustable fastening devices, clips, etc. are required for connections to I-beams or other work, such fastenings or devices will be installed as detailed on the approved shop drawings.

END OF SECTION

DIVISION 9

FINISHES

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section covers the painting of all surfaces throughout the project.

B. The Contractor will furnish all material, labor and equipment required to prepare surfaces and to complete all painting.

1.02 RELATED WORK SPECIFIED ELSEWHERE

1. Section 01340: Shop Drawings, Product Data and Samples
2. Section 01740: Warranties and Bonds
3. Division 3 through Division 16 technical sections

1.03 RELATED DOCUMENTS

A. Steel Structures Painting Council (SSPC)
   1. SSPC; Good Painting Practice; Volume 1
   2. SSPC; Systems and Specifications; Volume 2
   3. SSPC SP1; Solvent Cleaning
   4. SSPC SP3; Power Tool Cleaning
   5. SSPC SP COM.; Surface Preparation Commentary
   6. SSPC-VIS 1- Visual Standard for Blast Cleaned Steel
   7. SSPC SP6; Commercial Blast Standard
   8. SSPC-PA COM.; Commentary of Paint Application
   9. SSPC-PA; Shop, Field 8 Maintenance Painting
   10. SSPC-PA2; Measurement of Dry Paint Thickness with Magnetic Gages
   11. SSPC-PA Guide 3; A Guide to Safety in Paint Application

B. American Society for Testing and Materials (ASTM)

   1. ASTM; Paint-Tests for Formulated Products and Applied Coatings; Volume 06.01

1.04 QUALITY ASSURANCE

A. Include on label of containers:
   1. Manufacturer's name
   2. Type of paint
   3. Manufacturer's stock number
   4. Color
   5. Instructions for reducing, where applicable

B. Sampling of Materials:
   1. When requested by the Engineer, obtain test samples from materials stored at project site or source of supply.

2. Furnish from materials designated by the Engineer:
    a. 1 Quart - from batches of 50 gallons or less.
    b. 2 Quarts - from batches over 50 gallons.
3. Select samples at random from sealed containers.

C. Field Quality Control:
1. Request review of first finished room, space, or item of each color scheme required by the Engineer for color, texture and workmanship.
2. Use first acceptable room, space or item as a project standard for each color scheme.
3. For spray application, paint surface not smaller than 100 square feet as project standard.

1.05 SUBMITTALS

A. Submit shop drawings as specified in Section 01340:
1. Submit a Painting Schedule similar in format to the schedule in this section.
2. Cross-reference product numbers of all products proposed for each application.
3. Cross-reference equivalent product specified in schedule.

B. Submit product data as specified in Section 01340:
1. Submit manufacturer's product data for all products required and listed in the Painting Schedule submitted.
2. Include product name and number.
3. List applicable specifications and test standards.
4. Describe typical uses and restrictions.
5. List theoretical coverage rates.
6. Provide manufacturer's preparation/application instructions.
7. Certify that paint products submitted meet or exceed the requirements of the Specifications.

C. Submit samples as specified in Section 01340:
1. Submit color samples for paint system proposed for selection of colors by Owner.

1.06 PRODUCTS, DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to Project site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Name or title of material
2. Manufacturer's stock number and date of manufacture
3. Manufacturer's name
4. Contents by volume, for major pigment and vehicle constituents
5. Thinning instructions
6. Application instructions
7. Color name and number
8. Handling instructions and precautions

B. Storage of Materials
1. Store in a suitable location
2. Restrict storage to paint materials and related equipment.
3. Comply with health and fire regulations and with precautions on the Material Safety Data Sheets (MSDS) for each product.

1.07 PROJECT CONDITIONS

A. General: Air, material, and surface temperatures must be between 50˚ F. and 120ºF. during application, drying and curing, and metal surfaces must be at least 5˚ F. above the dew point.

B. Environmental Requirements:
   1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
   2. Do not apply finish in areas where dust is being generated.

C. Regulatory Requirements:
   1. Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

D. Protection:
   1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

1.08 WARRANTY

A. Guarantee all painting work to be free from defective workmanship or materials for one year from Owner's acceptance.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Tnemec. Inc.

B. or Approved Equivalent

2.02 MATERIALS

A. Materials selected for coating systems for all surfaces on this project will be the product of a single manufacturer. This will include all shop-applied prime and finish coats.

B. Coordinate shop prime and paint coats with all material suppliers to ensure conformance with this section. Identify proposed prime and/or paint systems on all submittals.

C. Products specified are as manufactured by Tnemec Coatings, Inc. Equivalent products of acceptable manufacturer's listed in Article 2.01 may be furnished in lieu of those listed, upon submittal to and approval by the Engineer.

D. Painting Schedule:

ITEM	**PRIME COAT(S)**	**FINISH COAT(S)**
1. Masonry Walls - Interior Dry Areas	Tnemec 130 EnviroFill @ 60 - 80 square feet per gallon	
2. Masonry Walls- Interior Non-Submerged: Moist Areas	Tnemec 130 EnviroFill @ 60 - 80 square feet per gallon	Intermediate: Tnemec 27 W.B. Typoxy @ 4.0 - 6.0 mils Finish: Tnemec 297 Enviro-Glaze @ 2.0 - 3.0 mils DFT.
3. Masonry Walls - Exterior Above Grade	Tnemec 130 EnviroFill @ 60 - 80 square feet per gallon	Tnemec 156 Enviro-Crete 2 coats @ 6.0 - 8.0 mils DFT per coat
4. Masonry Walls Submerged A. Water Treatment Works - Including Structures in contact with raw water	Tnemec 218 MortarClad @ 1/16" minimum	Tnemec 22 Pota-Pox 100 @ 20 - 30 mils DFT.
B. Sewage Treatment Works - None	Tnemec 218 MortarClad @ 1/16" minimum	Tnemec 435 Perma-Glaze @ 40.0 - 60.0 mils DFT.
5. Wood Surfaces- Interior & Exterior	Tnemec 10-99W Primer @ 2.0 - 3.0 mils DFT	Tnemec: (2) coats 1028 Enduratone @ 2.0 - 3.0 mils DFT per coat
8. Gypsum Board Ceilings Flat Finish	None	115 UniBond DF 2 coats @ 2.0 - 3.0 mils DFT per coat.
9. Gypsum Board Ceilings Textured (if scheduled)	None	115 UniBond DF 2 coats @ 2.0 - 3.0 mils DFT per coat.
10. Gypsum Board Walls	None	6 Tneme-Cryl 2 coats @ 2.0 - 3.0 mils DFT per coat.
11. Ferrous Metals Non-submerged	1 Omnithane Primer @ 2.5 - 3.5 mils DFT	Intermediate: N69 Epoxoline II @ 3.0 - 5.0 mils DFT Finish: 1074 Endura-Shield II @ 2.0 - 3.0 mils DFT.

12. Ferrous Metals Submerged A. Water Treatment Works Including Structure in Contract with Raw Water	1 Omnithane Primer @ 2.5 - 3.5 mils DFT	N140 Pota-Pox Plus 2 coats @ 5.0 - 7.0 mils DFT per coat.
B. Sewage Treatment Works and other Structures	1 Omnithane Primer @ 2.5 - 3.5 mils DFT	446 Omnithane 2 coats @ 7.0 - 9.0 mils DFT per coat
13. Ductile Iron Pipe Non-Submerged	N140 -1211Pota-Pox Primer @ 6.0 - 8.0 mils DFT per coat.	Intermediate: N69 Epoxoline II @ 3.0 - 5.0 mils DFT Finish: 1074 Endura-Shield II @ 2.0 - 3.0 mils DFT
14. Ductile Iron Pipe Submerged A. Water Treatment Works Including Structure in Contract with Raw Water	N140 -1211Pota-Pox Primer @ 6.0 - 8.0 mils DFT per coat.	N140 Pota-Pox Plus 2 coats @ 5.0 - 7.0 mils DFT per coat.
B. Sewage Treatment Works and other Structures	N140 -1211Pota-Pox Primer @ 6.0 - 8.0 mils DFT per coat.	446 Omnithane 2 coats @ 7.0 - 9.0 mils DFT per coat.
C. Lift Stations, wet wells and other areas subjected to high levels of H2S and H2S04	N140 -1211Pota-Pox Primer @ 6.0 - 8.0 mils DFT per coat.	Tnemec 435 Perma-Glaze @ 30.0 - 40.0 mils DFT.
13. Non-Ferrous Metal Non-Submerged	N140 -1211Pota-Pox Primer @ 3.0 - 5.0 mils DFT per coat.	1074 Endura-Shield @ 2.0 - 3.0 mils DFT.
14. Non-Ferrous Metal Submerged	N140 -1211Pota-Pox Primer @ 3.0 - 5.0 mils DFT per coat.	Use appropriate finish coat for submerged surfaces

2.03 LEAD & CHROMATES

A. Primers and finish coats must be free of lead and chromate hazards.

2.04 VOLATILE ORGANIC COMPOUNDS (VOC)

A. Products (Primers, Intermediate and Finish Coats) must meet State and County voc emission regulations in the locale where the paints are being applied.

2.05 COLORS

A. Colors of paints and stains will be selected by the Owner during submittal review.

2.06 MIXING AND TINTING

A. Deliver paints and enamels ready mixed to job site.

B. Perform job mixing and job tinting only when acceptable to the Engineer.

C. Mix only in mixing pails placed in suitably sized nonferrous or oxide resistant metal pans.

D. Use tinting colors recommended by manufacturer for the specific type of finish.

PART 3 - EXECUTION

3.01 GENERAL

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Apply primer and finish coats only when environmental conditions are within the parameters established in the manufacturer's product data.

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION OF SURFACES

A. Wood:
   1. Clean soiled surfaces with alcohol wash.
   2. Except where rough exterior surface is specified, sand to smooth and even surface then vacuum off.
   3. Apply knot sealer to all knots, pitch and resinous sapwood before priming coat is applied.
   4. Fill nail holes, cracks, open joints and other defects with wood filler after priming coat has dried. Color will match finish color.

B. Gypsum Wallboard
   1. Fill narrow, willow cracks and small holes with speckling compound.
   2. Rake deep, wide cracks and deep holes.
      a. Dampen with clear water and fill with thin layers of drywall joint compound.
   3. Allow to dry.
   4. Sand smooth. Do not raise nap of paper on wall board.

C. Concrete, Masonry and Cement Stucco:
   1. Fill cracks and irregularities with Tnemec Series 218 MortarClad to provide uniform surface texture.
   2. Brush with heavy wire brush to remove all loose particles. Blow off with air to remove dust.
   3. Fill concrete masonry unit surfaces with block filler.

D. Ferrous Metal Surfaces:

   1. Grind smooth all welds, beads and protuberances. Remove all rust, scale, oil, grease and dirt from metals as follows:
      a. Submerged Metal: SSPC-SP10-63
      b. Non-Submerged Metal: SSPC-SP6-63
      c. Machinery and Equipment: SSPC-SP2-63

E. Galvanized Metal:

1. Clean surface with in accordance with SSPC-SP 1.. Abrade surface in order that adequate profile is produced for the specified coating system..

F. Aluminum:

1. Clean surface with in accordance with SSPC-SP 1.. Abrade surface in order that adequate profile is produced for the specified coating system.

3.03 APPLICATION

A.. Contractor will follow manufacturer's instructions regarding temperature and humidity as they affect application of materials.

B. No painting will be done when the atmospheric temperature or the paint temperature is below 5Oº F.

C. Contractor will be the sole judge of the method of application provided such method assures an acceptable job and is acceptable to the paint manufacturer.

D. Comply with recommendations of product manufacturer for drying time between succeeding coats.

E. The paint will be applied in a manner which will produce a system free of holidays, voids and pinholes.

F. Coverage rates for masonry and concrete stated as square feet per gallon are approximate. Appearance will be the deciding factor.

G. Coverage rates for metal surfaces are given in dry mil thickness. Testing devices will be used to determine if sufficient material was applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Coat back surfaces of interior and exterior woodwork with primer paint.

J. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 11, Division 15 and Division 16 for painting requirements of Electrical and Mechanical pipe and equipment.

B. Paint shop primed equipment. Touch-up paint on shop prefinished items.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint exposed pipes, boxes, and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

E. Replace identification markings on mechanical or electrical equipment when painted accidentally.

F. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

G. Paint exposed conduit and electrical equipment occurring in finished areas.

H. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

I. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated.

J. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.05 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed, or splattered paint from all surfaces.

C. Do not mar surface finish of item being cleaned.

D. Leave storage space clean and in condition required for equivalent spaces in project.

3.06 PAINTING REQUIRED

A. Ferrous Metals: paint ail ferrous metals unless specifically excluded

B. Non-Ferrous Metals: paint only items required by technical specifications or shown or the Drawings.

C. Masonry: paint where indicated Drawings or in Finish Schedule.

D. Interior Finishes: paint where indicated in the Finish Schedule.

E. Wood: paint or stain all wood surfaces as shown or specified.

END OF SECTION

DIVISION 15

MECHANICAL

SECTION 15100

PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work under this section includes, but is not limited to the following:

1. Ductile iron pipe & Fittings
2. Ductile iron pipe coatings
3. Cast iron soil pipe
4. Reinforced concrete storm sewer pipe
5. Steel pipe
6. Polyvinyl chloride pipe and fittings
7. Polyvinyl chloride sewer pipe and fittings
8. Polyethylene plastic pipe and fittings
9. Copper pipe and tubing
10. Polyethylene drainage pipe
11. Corrugated steel pipe
12. Stainless steel pipe
13. Insulation

B. Related Work Specified Elsewhere:
1. Section 01340: Shop Drawings, Product Data and Samples
2. Section 09900: Painting
3. Division 11 - Equipment
4. Division 15 - Valves

1.02 QUALITY ASSURANCE

A. All sewer pipe and materials used in its manufacture shall be tested and inspected by an approved commercial testing laboratory prior to delivery to the site and all materials which fail to conform to these specifications shall be rejected. After delivery to the site, any material which has been damaged in transit or are otherwise unsuitable for use in the Work, shall be rejected and removed from the site. Certified copies, in duplicate, of the inspection and acceptance report from the testing laboratory shall be supplied to the Engineer prior to use of the materials. Each joint of pipe delivered to the Work shall be stamped or marked to indicate the testing laboratory's acceptance or approval. Laboratory tests of other materials may be required if deemed necessary by the Engineer. The testing and inspection shall conform to Section 01410.

1.03 GENERAL APPLICATION

A. Metal Pipe: Unless otherwise indicated on the Plans:
1. Metal pipe 3 inches in diameter and larger shall be ductile iron.
2. Metal pipe smaller than 3 inches in diameter shall be galvanized steel unless otherwise indicated on the Plans.
3. Buried ductile iron pipe shall have push-on joints with mechanical joint ductile iron fittings unless otherwise indicated on Plans.

4. Exposed ductile iron pipe shall have flanged joints with ductile iron flanged fittings.

B. Sanitary Sewers: Unless otherwise indicated on the Plans:
   1. Sewers 21 inches and smaller shall be ductile iron pipe or PVC sewer pipe.
   2. Sewers 24 inches in diameter and larger shall be ductile iron pipe.

C. Storm Drain Sewers: Unless otherwise indicated on the Plans:
   1. Storm Drain Sewers shall be reinforced concrete pipe.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. During loading, transporting, and unloading, exercise care to prevent damage to materials.

B. Do not drop pipe or fittings.

C. Store all materials on site in enclosures or under protective coverings to keep clean and dry.

D. Do not store materials directly on ground.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ductile Iron Pipe:
   1. Pipe: ANSI A21.50 and ANSI A21.51
   2. Joints:
      a. Flanged: ANSI A21.15 and ANSI A21.10
      b. Push-on and mechanical: ANSI A21.11
      c. Restrained Joint Pipe: ANSI A21.51, ANSI A21.10, ANSI A21.11 and ANSI A21.53
   3. Class: per ANSI A21.51 Table 51.3, rated working pressure and maximum depth of cover per pipe size and class
   4. Pressure Rating: 350 psi for pipe 20 inches and smaller
      250 psi for pipe 24 inches and larger
   5. **Ductile Iron Pipe Class or Pressure Rating depicted on Drawings shall govern.**
   6. Flanged Fittings: ANSI A21.10 and ANSI B16.42
   7. Compact MJ Fitting: ANSI A21.53
   8. All MJ Fittings require mega-lugs
   9. **All Ductile Iron Pipe shall be color coded per Class of pipe.**

B. Ductile Iron Pipe Coatings:
   1. Cement-mortar lining:
      a. ANSI 21.4
      b. Required except on air pipe lines and unless noted otherwise on the Plans.
   2. Glass lining:
      a. Thickness: 0.008 inch minimum
      b. Hardness knoop scale: 400
      c. Corrosion resistance: pH 3 to pH 10 at 125 F
      d. Instantaneous thermal shock: 300 F
      e. Maturing temperature: greater than 1400 F
      f. Maturing period: sufficient time to develop a smooth vitreous lining

3. Bituminous coating - ANSI A21.6, A21.8 or A21.10

C. Cast Iron Soil Pipe:
   1. Pipe: ANSI 112.5.1, service weight type
   2. Lead: FS QQ-C-40, Type I, Grade AA
   3. Jute packing: FS HH-P-117, Type II

D. Reinforced Concrete Pipe:
   1. Storm sewers or surface drains:
      a. ASTM C76, AASHTO M170, or AASHTO M206
      b. Class III with Wall Type B; mesh reinforcement; bell and spigot ends.
         1. Fittings: Reinforced concrete
         2. Joints: ASTM C443 rubber compression gaskets.

E. Steel Pipe (Black or Galvanized)
   1. Pipe: ASTM A53 Grade B
   2. Wall thickness:
      a. 10 inch and smaller: Schedule 40
      b. 12 inch and larger: 0.375 inch wall
   3. Fittings:
      a. 2 inch and smaller: 125# standard malleable iron, ASTM A197
      b. 2½ inch and larger: Carbon steel, butt welding type with wall thickness to match pipe, ASTM A234 or 125# cast iron flange.
   4. Flanges: 125# ASTM A181, Grade II
   5. Joints:
      a. 3½ inch and smaller: screwed or mechanical type coupling
      b. 4 inch and larger: butt weld, flanged, or mechanical joint as shown on the Plans.
   6. Black steel pipe for underground service: all black steel (black iron) pipe for underground service shall be coal tar epoxy coated to a dry thickness of 93.75 mils minimum.

F. Polyvinyl Chloride Pipe and Fittings:
   1. Pipe:
      a. ASTM D3033
      b. ASTM D1784 Type I, Grade I or II
      c. ASTM D1784, Appendix: cell classification of 12454 Borc
   2. Pipe Installation: ASTM 2321
   3. Wall thickness:
      a. 4 inch ASTM 3033 SDR 33.5
      b. larger than 4 inch: ASTM 3033 SDR 41
      c. All chloride solution piping - Schedle 80

G. Polyvinyl Chloride Sewer Pipe and Fittings:
   1. Pipe: ASTM D3034, latest revision, Classification SDR 26.
   2. Minimum Stiffness For Pipe and Fittings: 46 PSI when tested in accordance with ASTM D2412
   3. Joints:
      a. Flexible gasketed joints shall be compression type conforming to ASTM D3212
      b. Gasket shall comply with ASTM F477
   4. Pipe Installation: ASTM D2321

H. Polyethylene Plastic Pipe and Fittings:
   1. ASTM 1248
   2. ASTM D2239 and D2447, Type III Grade 2013, Designations 3206 or 3306
   3. Wall thickness:
      a. 1¼ inch and less: Schedule 80, unless otherwise indicated on the Plans.
      b. 1½ inch and longer: SDR7-PR160 psi, unless otherwise indicated on the Plans.

I. Copper Pipe and Tubing:
   1. Copper pipe: ASTM B42
   2. Copper tube: ASTM B88

J. Polyethylene Drainage Pipe:
   1. ASTM D3350, AASHTO M252
   2. Corrugated, with smooth interior.
   3. Fittings: Polythylene
   4. Joints: AASHTO M252

K. Corrugated Steel Pipe:
   1. Corrugated Steel Pipe: AASHTO —36 or M-190 latest revision.
   2. Fabricated Steel Pipe: ASTM A444 or AASHTO —218 for steel sheets
   3. Pipe Thickness: 10 gauge minimum
   4. Pipe Ends and Joints: Pipe ends shall be annularly corrugated with 24 inch wide fully corrugated bands with 4 rod and lugs or hugger type bands. Helically corrugated ends shall be acceptable. All joints shall be gasketed Neoplene gaskets.
   5. Coating: All corrugated steel pipe for storm sewers shall be double dip asphalt coated in accordance with AASHTO —190.

L. Stainless Steel Pipe:
   1. ASTM A778, Type 304L
   2. 1 inch to 4 inch - Schedule 40
   3. 6 inch to 30 inch - Schedule 5
   4. Carbon Steel Flanges
   5. Cadmium Plated Bolts

M. Insulation
   1. All outside exposed piping shall be covered with 4 lb. Density fiberglass sectional pipe covering 1" thick, having presized ASJ jacket, 0.024"minimum thickness, with 3 mil polysurlyn moisture barrier factory heat laminated to the interior surface of the metal jacketing by ITW Insulation Systems or equal. and stapled in place. Fittings on covered piping shall be covered with factory premolded fitting covers of same thickness as adjacent covering with glass fab jacket pasted on and finished with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas to receive piping for:
   1. Defects such as weak structural components, that adversely affect execution and quality of work.
   2. Deviations beyond allowable tolerances for piping clearances.

B. Start work only when conditions are corrected satisfactorily.

3.02 INSTALLATION

A. Refer to Section 02201 and Section 02700 of these Specifications.

3.03 WARRANTY

A. All materials furnished and supplied under this Section shall be warranted for a period of one (1) year by the Contractor and the Manufacturer. The warranty period shall be (1) year from the date of the Owner Acceptance of Contract A 2022 Hills & Dales Force Main Improvements as Specified by this Section.

B. The materials shall be warranted to be free from defects in workmanship, design and materials. If any material of this specification should fail during the warranty period, it shall be replaced and restored.

END OF SECTION

SECTION 15105

HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS (PRESSURE PIPE)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install high density polyethylene (HDPE) pipe and fittings complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Section 01340-Shop Drawings, Product Data and Samples.

B. Section 02700-Pipeline Construction.

C. Division 15-Mechanical.

1.03 SUBMITTALS

A. Submit the name and address of pipe manufacturer.

B. Submit complete description of method of pipe installation.

C. Submit, in accordance with Section 01340, completely detailed working drawings and schedules of all high density polyethylene (HDPE) pipe and fittings required.

D. Submit description of the method of testing the pipe.

F. Submit the manufacturer's recommendations for handling, storing and installing the pipe and fittings.

G. Submit certification that the stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacturing of the pipe for this contract in accordance with ASTM D2837.

I. Prior to each shipment, submit certified test reports that the pipe and fittings for this contract were manufactured and tested in accordance with the ASTM and AWWA Standards specified herein.

J. Submit the name and qualifications of the technician proposed to perform the heat fusion of the pipe joints.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A276
2. ASTM A307
3. ASTM D2239
4. ASTM D2774
5. ASTM D2657
6. ASTM D2837
7. ASTM D3350
8. ASTM F2620
9. ASTM F714

B. American Water Works Association (AWWA)

1. AWWA C600

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 DELIVERY, STORAGE AND HANDLING

A. The delivery, storage and handling of the pipe and fittings shall be done in accordance with the manufacturer's recommendations.

B. Pipe shall be stored on clean, level ground to prevent any scratching or gouging of the pipe. The handling of the pipe shall be done in a manner to avoid dragging the pipe over any hard or sharp objects to avoid cutting of the pipe's exterior. Any cut or gouge deeper than 5 percent (5%) of the pipe's wall thickness shall be removed from the site.

C. Handling of the pipe shall be done in a manner to avoid all undue stress in the pipe caused by bending of the pipe.

D. The interior and exterior of the pipe shall be free of cuts, gouges and scratches.

1.06 QUALITY ASSURANCE

A. All HDPE pipe and fittings shall be manufactured in strict accordance with ASTM F714 and shall be from a single manufacturer who is fully experienced, reputable and qualified in the

manufacture of the polyethylene pipe and fittings to be furnished. All HDPE pipe and fittings shall be supplied by a single distributor who is fully experienced, reputable, and qualified with the distribution of the pipe and fittings to be furnished. The pipe shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications.

B. All pipes under this contract shall be manufactured from a polyethylene resin that has been specifically stress regression tested to provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.

C. Inspection of the pipe may also be made by the ENGINEER or other representatives of the OWNER after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specified requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

1.07 WARRANTY

A. All HDPE Pipe and accessories furnished and supplied under this Section shall be warranted for a period of one (1) year by the Contractor. The warranty period shall be (1) year from the date of the Owner Acceptance of Contract A 2022 Hills & Dales Force Main Improvements as Specified by this Section.

B. The HDPE Pipe Manufacturer shall provide a warranty against manufacturing defects of material and workmanship for a period of ten (10) years after the final acceptance of the project by the OWNER. The manufacturer shall replace, at no additional cost to the OWNER, any defective pipe material within the warranty period.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. HDPE pipe resins shall be high molecular weight, high density polyethylene with a cell classification number of 445574C cell classification in accordance with ASTM D3350.

B. Pipe and Fittings

1. The pipes shall have the nominal dimensions shown on the Drawings, and shall conform to the dimension requirements of the DIPS Sizing System (ANSI B16.l). Pipe shall meet the requirements of Dimension Ratio (DR) 11.

2. All polyethylene pipes shall meet the requirements of ASTM F714.

3. Pipe shall be furnished in standard laying lengths not exceeding 50 feet.

4. Joining system: The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657. Where required, mechanical joint connections and butt connections using bolted mechanical couplers shall be provided from a polyethylene mechanical joint adaptor. Mechanical connections shall be provided from a polyethylene mechanical joint adaptor and restraining gland designed to resist pull out forces. Back-up flanges shall be primed and painted in a corrosion protected paint recommended and supplied by the manufacturer. All bolts, nuts and hardware shall be Type 316 stainless steel.

5. All mechanical joints and fittings shall be approved types designed specifically for HDPE pipe systems. They shall be supplied with all necessary couplings, rings, nuts, bolts, washers; rubber rings/sealing gaskets and restrainers/stiffeners.

2.02 PIPE IDENTIFICATION

A. At 5 feet intervals along the pipe, the pipe shall be marked with the name of the manufacturer, size and class (pressure and DR), and manufacturing reference to ASTM F714.

B. A color coded strip(s) shall be marked along the entire length of the pipe.

PART 3 -EXECUTION

3.01 INSTALLATION

A. All pipe and fittings shall be installed in accordance with the manufacturer's instructions and Section 02700.

B. The contractor performing the joining shall by a distributor of the pipe material supplied. All fusion joints shall be done by a factory qualified technician as designated by the manufacturer with a minimum of five years' experience with the fusion equipment to be used.

C. Joining of the pipe by heat fusion shall be done in accordance with ASTM F1962. Prior to the start of pipe installation, one test joint shall be made and tested. Test shall be done in accordance with CPChem Co. Bulletin No. 106. No joints shall be made until a successful test joint has been made.

D. When cutting pipe is required, the cutting shall be done by machine specifically designed for the cutting of HDPE pipe. The cut shall leave a smooth cut at right angles to the axis of thepipe.

E. Fittings shall be connected to HDPE pipe m accordance with manufacturer's recommendations.

F. Flanged and mechanical connections shall consist of the following:

1. A high density polyethylene flange adapter, made by the manufacturer from the same resin as the pipe, and fully pressure rated to match the pipe DR pressure rating, thermally butt-fused to the stub end of the pipe.

2. A ductile iron or steel back-up ring conforming to ANSI B16.1 fitted to the polyethylene flange adapter and shaped as necessary to suit the outside dimension of the pipe.

3. A full face neoprene gasket, conforming to ANSI B16.21.

4. Corrosion resistant bolts and nuts of Type 316 stainless steel as specified in ASTM A276 and ASTM A307. Bolts shall be tightened alternatively and evenly to the manufacturer's specified torques. After installation a bitumastic coating shall be applied to bolts and nuts.

G. Gradual changes in direction of HDPE pipelines can be accommodated by pipe deflection but every effort should be made to keep the pipe as central as possible within the trench toenable adequate compaction of side-fill.

H. If any defective pipe is discovered after it has been installed, it shall be replaced or repaired as directed by the ENGINEER at no additional cost to the OWNER. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when installed, shall conform to the lines and grades required.

I. Butt-fusion of pipes shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. Fusion shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and /or fusing equipment. Depending on site conditions, butt-fusion joining shall be performed in or outside of excavation.

3.02 TESTING

A. After installation, but prior to connection to existing distribution and transmission mains, the pipe shall be tested for compliance as specified herein. Furnish all necessary equipment and labor for the pressure test and leakage test on the pipelines.

B. Submit detailed test procedures and method for ENGINEER's review. In general, testing shall be conducted in accordance with AWWA C600.

C. Pressure pipelines shall be subjected to a hydrostatic pressure of 1.5 times the working pressure at the lowest point along the test segment or 150 psi, whichever is greater. This test pressure shall be maintained for a minimum of two (2) hours. The leakage rate shall not exceed those indicated in AWWA C600. Provide suitable restrained bulkheads as required to complete the hydrostatic testing specified.

D. Submit plan for testing to the ENGINEER for review at least ten (10) days before starting the test.

3.03 CLEANING

A. The CONTRACTOR shall use a removable watertight plug to prevent any dirt or debris from entering the pipe during construction. At the conclusion of the work, the CONTRACTOR shall thoroughly clean the entire pipe 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. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

END OF SECTION

SECTION 15110

PLUG VALVES

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01340 Shop Drawings, Product Data and Submittals.

B. Section 01730 Operating and Maintenance Data.

C. Section 02700 Pipeline Construction.

D. Section 09900 Painting.

E. Section 15100 Pipe and Pipe Fittings.

F. Section 15155 Wastewater Combination Air Valve.

1.02 QUALITY ASSURANCE

A. Experience: Supplier shall have been manufacturing plug valves for a period of at least ten (10) years.

1.03 ACCEPTABLE MANUFACTURERS

A. DeZurik, Model PEF, 100% port open.

1.04 SUBMITTALS

A. Catalog Data: Submit manufacturer's literature and illustrations.

B. Weights: Statement of net assembled weight of each size of valve furnished.

C. Shop Drawings of Valve and Operator.
   1. Dimensions.
   2. Construction Details.
   3. Materials.

D. Installation Instructions: Complete manufacturer's installation instructions.

E. Maintenance Data.
   1. Maintenance Instructions.
   2. Parts Lists.

F. Certificates: Submit manufacturer's certification that valves and accessories meet or exceed specification requirements.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Prepare valves and accessories for shipment according to AWWA C500-73, Section 31 and:

1. Seal valve ends to prevent entry of foreign matter into valve body.
2. Box, crate, completely enclose and protect valves and accessories from accumulations of foreign matter.

B. Store valves and accessories in area protected from weather, moisture, or possible damage.

C. Do not store materials directly on ground.

D. Handle items to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body. All exposed bolts, nuts, and washers for buried or submerged valves shall be cadmium or zinc plated in accordance with ASTM B 633, Type II unless specified otherwise.

B. Plug valves for use on gravity service applications shall be equal to Type PEC by DeZurik. Plug valves for use on pressure service applications shall be equal to Type PEF (100% Port) by DeZurik. All plug valves shall be supplied by the same manufacturer.

2.02 100% PORT PLUG VALVES

A. 100% Port Plug Valves shall be rectangular port design with minimum 100% open port area as defined as the geometric open port area of the plug valve that is greater than or equal to the open area of the connecting pipe. Manufacturers using Cv values to determine port opening area shall not be considered.

B. Manufacturers shall provide certified calculations that the port area meets or exceeds the 100% requirement as compared to pipe per ANSI B16.1.

C. Plugs shall be solid one piece, cast of ASTM A536 ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the shaft. Plug shall not contact the seat prior to 90% closed. Plug facing shall be Chloroprene (CR).

D. Bodies shall be of ASTM A126 Class B cast iron. Port shall be rectangular. Port area shall be 100% of Standard class pipe area. Bearings shall be sleeve type and made of sintered, oil-impregnated permanently lubricated Type 316 stainless steel per ASTM A743 Grade CF8M.

E. Seats shall be 1/8" thick welded overlay of not less than 95% pure nickel. Seat shall be at least ½" wide and raised. The raised surface shall be completely covered with nickel to insure that the resilient plug face contacts only the nickel seat.

F. Adjustable Packing shall be of the multiple V-ring type, with a packing glad follower. Shaft seals shall permit inspection, adjustment or complete replacement of packing without disturbing any part of the valve or actuator assembly except the packing glad follower.

G. Grit Excluders made of PTFE shall be provided to prevent the entry of grit and solids into the bearing area.

H. Pressure ratings shall be bi-directional and 175 psi on sizes 3" - 12" and 200 psi for 14" - 36". Every valve shall be given a certified hydrostatic and seat test. Test reports shall be submitted to the Engineer. Valves will be capable of providing drip-tight shutoff to a rating up to 175 psi in either direction.

I. Worm gear actuators shall be provided on all valves six inches or larger. Actuators shall be enclosed in a cast iron housing, with outboard seals to protect the bearings and other internal components. The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings. Actuator shall be mounted on an extended bonnet and operator, located 3.5' above finished grade. Refer to Check Valve Schedule.

J. Buried actuators shall be 90% grease flied. Input shaft and fasteners shall be stainless steel. Actuator mounting brackets shall be totally enclosed and prevent the entry of water. All gear actuators will be capable of accepting the input torque requirements as set forth in AWWA C504-70.

K. Eccentric plug valves and actuators shall meet or exceed the latest revisions of AWWA C517 and other applicable standards. Flanged ends shall be per ANSI B16.1 and mechanical joint ends per AWWA C111.

2.03 SHOP PAINTING

A. All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitor primer compatible with the finish paint specified in Section 09900 of these Specifications. The exterior of all buried valves shall have a factory applied, two coat asphaltic varnish or fusion-bonded epoxy coating system. All plug valves shall have a factory applied enamel coating, but a coat of asphaltic varnish may be added in the field. All interior ferrous metal surfaces of 4-inch and larger valves, except for finished or bearing surfaces and appurtenances shall be provided with one coat, interior epoxy coating conforming to the requirements of AWWA C550 and NSF 61.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. Install valves and accessories in accordance with manufacturer’s instructions. Valves installed in locations accessible from floor or ground will be equipped with hand wheels; and valves installed in locations higher than 6'-6" above finished floor or ground will be equipped with chain wheels and chain. The last stated provisions will apply except when valves are indicated to be operated through floor stands (or bench stands); and in such cases valves will be equipped with enclosed operators, extension stems, floor stands (or bench stands), and indicators.

C. Valves installed underground will be equipped with buried/submerged gear actuator, GB-Size of valve-N, designed for 285 PSI direct pressure, with carbon steel extension stem and 2" nut operator. Valves will be operated through AWWA valve nut mounted on vertical operating shaft extending from gear actuator. Operator extension, valve box, indicator, and cover will be provided for each valve. Extensions and valve boxes will be of correct length and height to suit elevation of ground surface. Valves will open “left”.

D. Valves installed under surface of liquids will be equipped with gasketed operator cases as specified herein above and with extension stems, floor stands, and indicators as required.

E. Valves remotely and/or automatically controlled will be equipped with power positions as specified or as indicated on the Drawings.

3.02 ADJUSTMENTS

A. Check and adjust valves and accessories for smooth operation.

3.03 FIELD PAINTING

A. All exposed non-buried or submerged valves and appurtenances specified herein shall be painted as part of the work in Section 09900 of these Specifications.

3.04 INSPECTION AND TESTING

A. Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

3.05 WARRANTY

A. All equipment furnished and supplied under this Section shall be warranted for a period of one (1) year by the Contractor and the Manufacturer. The warranty period shall be (1) year from the date of Owner Acceptance of Contract A - 2022 Hills & Dales Force Main Improvements as Specified by this Section.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:

    a. Power Systems.
    b. Control Systems.
    c. Instrumentation Systems.

6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

1.02 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.

C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.

D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to Contractor at time of Owner's acceptance.

E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.

F. Furnish and install a complete Power Generation System as shown on drawings and/or specified herein.

G. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.

H. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.

I. Install and connect electrical equipment mentioned in Division 16 Specifications or noted in drawings, whether furnished by electrical contractor or by others.

1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.

J. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.

K. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.

L. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.

M. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.

N. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.

O. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within

this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.

P. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

PART 2 - PRODUCTS

2.01 APPROVED MATERIALS AND DEVICES

A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.

B. To insure proper coordination, it is intended that all electrical equipment and materials specified in Division 16 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.

C. To insure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:

1. SECTION 16410: SAFETY SWITCHES AND FUSES
2. SECTION 16442: LIGHTING PANELBOARDS

2.02 SUBMITTALS

A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.

B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.

C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:

1. SECTION 16410: SAFETY SWITCHES AND FUSES
2. SECTION 16442: LIGHTING PANELBOARDS
3. SECTION 16511: LIGHTING MATERIALS AND METHODS

D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the

contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.

E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.

F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.

G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.

H. Samples of material shall be furnished where required by drawings or Division 16 Specification, or as requested by the Engineer on items proposed as substitutes.

I. Submit to Engineer a certificate of final inspection from local inspection department.

PART 3 - EXECUTION

3.01 SITE VISIT

A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

3.02 CLEARANCE WITH UTILITIES

A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.

B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.

C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become

responsibility of the Owner.

D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

3.03 WORKMANSHIP

A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.

B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.

C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.

D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.

E. Keep site clean of accumulation of cartons, trash and debris.

3.04 SAFETY

A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.05 CONTRACT DOCUMENTS

A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.

B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).

C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:

1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.

2. Agree to pay the electrical engineer a fee of $50.00 per drawing, up to a maximum of $400 per transfer, payable upon receipt of the files.
3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

D. Take finish dimensions at job in preference to scaled dimensions.

E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

3.06 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

3.07 EQUIPMENT STORAGE

A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-storted equipment as directed by Engineer.

3.08 EXCAVATION, CUTTING AND PATCHING

A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.

B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

3.09 PENETRATIONS

A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 16 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.

B. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

3.10 INSTALLATION OF EQUIPMENT - GENERAL

A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.

B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment,

devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.

C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.

D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.

E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.

F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

3.11 MOTORS, STARTERS AND CONTROLS

A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.

B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.

C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

3.12 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.

B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

3.13 LUG/TERMINAL RATINGS

A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.

B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

3.14 EQUIPMENT FAULT CURRENT RATINGS

A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity

ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

3.15 OUTLET LOCATION

A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to insure correct installation.

3.16 IDENTIFICATION

A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.

B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.

C. See Specification Section 16075 for additional requirements.

3.17 GROUNDING

A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

3.18 PAINTING

A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

3.19 ACCEPTANCE TESTING

A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

3.20 OPERATION AND MAINTENANCE DATA

A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

3.21 GUARANTY-WARRANTY

A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:

1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 16050

SECTION 16060

GROUNDING

PART 1 - GENERAL

1.01 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:

1. Service Equipment.
2. Transformers.
3. Non-current carrying conductive surfaces of equipment.
4. Metal Buildings.
5. Structures.
6. Other Equipment.

1.02 GENERAL REQUIREMENTS

A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to insure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall insure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.

B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be “jumpered” by an appropriate bonding conductor.

2.02 GROUNDING ELECTRODES

A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

2.03 CONNECTIONS

A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.

B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).

C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.

D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.

E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

2.04 MANUFACTURERS

A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.

B. Lugs shall be as manufactured by Square “D”, Burndy, or T and B.

C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.

D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.

PART 3 - EXECUTION

3.01 MAIN SERVICE GROUND

A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:

1. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

3.02 TRANSFORMER GROUNDS

A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

3.03 EXPOSED NON-CURRENT-CARRYING METAL PARTS

A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.

B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".

C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.

D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.

F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.

3.04 ACCEPTANCE DOCUMENTATION AND TESTING

A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.

B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.

C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 (“Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System”). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 16060

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Wire and cable identification.

B. Pullbox & Junction Box Identification

C. Electrical distribution & utilization equipment identification.

D. Emergency and Standby Power receptacle identification.

E. Instrument and control device identification.

F. Raceway identification.

PART 2 - PRODUCTS

2.01 WIRE AND CABLE IDENTIFICATION

A. Intermediate Locations:

1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.

B. Circuit/Cable Termination Locations:

1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.02 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

2.03 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

2.04 RACEWAY IDENTIFICATION

A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to

provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.

B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.

C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).

D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

3.02 WIRE AND CABLE IDENTIFICATION

A. General:

1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

B. Intermediate Locations:

1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:

    a. Wireways
    b. Pullboxes/Junction boxes larger than 4-11/16”
    c. Pullboxes/Junction boxes through 4-11/16” where wires and cables are not easily identifiable via the color coding and box labeling
    d. Vaults & Manholes
    e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
    f. Other similar intermediate locations.

2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:

    a. From where the circuit originates (including panel designation and circuit number):

        1) Ex: “FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)”

b. To where the circuit extends (using the common name of the equipment):

1) Ex: “TO: RTU-6 (ON ROOF)”

c. The purpose of the circuit:

1) Ex: “POWER”

d. The set number (If parallel power feeds are used).

1) Ex: “SET NO. 3 OF 4”

C. Circuit/Cable Termination Locations:

1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification Section 16120 for all color-coding requirements of wires and cables.

3.03 PULLBOX & JUNCTION BOX IDENTIFICATION

A. Concealed pullboxes/junction boxes:

1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: “RP-1A Cir. 1, 2 & 3”). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:

1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled “Power”, “Telecommunications”, “Fire Alarm” or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

C. Where pullboxes/junction boxes are named on contract documents (Ex:”PULLBOX #3”), an engraved nameplate shall be installed on the front surface of the box to identify the name.

3.04 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. General:

1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:

1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:

    a. Ex: First Line: “NAME: RP-A”, Second Line: “120/208V-3Ø-4W”, Third Line: “FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)”

2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):

    a. Ex: First Line: “RTU-6”, Second Line: “FED FROM: PP-A CIR. 5”

2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: “WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH”.
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: “WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER”.

D. Emergency Systems:

1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.

E. Services:

1. All Service Equipment:

    a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.

1) Ex: First Line: “AVAILABLE FAULT CURRENT: 16,154 AMPS”, Second Line: “DATE CALCULATED: JULY 8, 2013”

b. All service entrance equipment shall be clearly labeled as being service entrance rated.

2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.05 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.

1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

3.06 RACEWAY IDENTIFICATION

A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.

B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.

C. Raceway nameplates shall identify:

1. The location of the other end of the raceway (“TO MCC-1” or similar). If the other end of the raceway is at an intermediate, named pullbox (“INSTRUMENTATION PULLBOX #4” or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

3.07 OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 16075

SECTION 16110

RACEWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.01 CONDUITS

A. PVC-Coated Rigid Steel:

1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
4. Form 8 Condulets®, 3/4" through 2" diameters, shall have a tongue-in-groove “V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
7. Form 8 Condulets® shall be supplied with plastic encapsulated stainless steel cover screws.
8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).
10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.

11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.
12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:

    a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. ASTM D870)
    b. Conduit and condulet exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513.
    c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
    d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
    e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
    f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.

13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.
14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:

1. Shall be galvanized outside and inside by hot dipping.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. E.M.T.:

1. Shall be Electro-Galvanized.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Rigid Aluminum:

1. Shall be manufactured of 6063 Alloy, T-1 temper.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

E. Schedule 40 and 80 PVC:

1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

F. HDPE Innerduct

1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
2. Shall be corrugated unless noted otherwise.
3. Shall be manufactured by Carlon, Ipex or equal.

G. Flexible Metallic Conduit:

1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.

H. Liquidtight Flexible Metallic Conduit:

1. Shall be galvanized steel-core sealtite, code approved for grounding.
2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

2.02 FITTINGS, COUPLINGS & CONNECTORS

A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.

B. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.

C. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.

D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.

E. E.M.T. couplings and connectors shall be set screw, or steel compression type. All couplings and connectors shall be 720B, 730, 750B, or 760 series of Efcor or equal series of Raco. Pressure indented type connectors or cast metal will not be approved for any location. E.M.T. couplings and connectors shall be as manufactured by O-Z/Gedney, T&B, Efcor, Raco, Midwest or equal. E.M.T. fittings, couplings and connectors located within concrete (where allowed) shall be compression type and shall be adequately sealed with tape to ensure a concrete-tight seal.

F. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.

G. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.

H. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as

manufactured by Efcor, Raco, Midwest or equal.

I. All LB unilets sizes 1 ¼" or larger shall have rollers.

J. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

2.03 BUSHINGS

A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).

B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.

C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

2.04 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).

B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.

E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

2.05 WATERTIGHT ENTRANCE SEAL DEVICES

A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).

B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Minimum Diameter: 3/4-inch.

B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:

1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.
2. Exterior, Used for Instrumentation Circuits: See Below.
3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after Engineer's observation.
4. Raceways used for Instrumentation Circuits:

    a. Typical Dry or Wet Locations: Rigid Aluminum .
    b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
    c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.

5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:

    a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
    b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).

6. Terminations at instruments:

    a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.

7. Transition from underground or concrete-encased to exposed:

    a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6" above floor level, and shall be installed at uniform heights.

3.02 RACEWAY INSTALLATION

A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.

2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. Where any run of rigid aluminum conduit (including bends) exceeds 50’ in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50’ on center.
4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
7. All PVC joints shall be made as follows:

    a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
    b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
    c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.

8. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer’s installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

B. Routing/Locating:

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6” of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3” from the covering of the pipe crossed.

6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).

3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
5. All raceways entering structures shall be sealed (at the first box or outlet) with polyurethane grout compound that expands to form a flexible foam seal that prevents the entrance of gases or liquids from one area to another (Prime Resins Prime-Flex or equal).
6. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:

    a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
    b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.

7. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).

8. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18” of the termination.

END OF SECTION 16110

SECTION 16116

AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.01 DESCRIPTION

A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.01 GENERAL

A. Unless specified otherwise, all cables within the scope of this specification section shall:

1. Be rated for exposed cable tray installation.
2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
3. Be UL-rated for the proposed application.
4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
5. Utilize copper conductors.
6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.02 INSTRUMENTATION CABLING

A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:

1. Be #16AWG minimum.
2. Be rated for 300V.
3. Have aluminum foil shielding.
4. Have stranded, twisted conductors.
5. Have PVC insulation/jacket with ripcord.
6. Be manufactured by Belden, AlphaWire or General Cable.

2.03 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:

1. Be rated for 600V.
2. Be industrial grade.

3. Have stranded conductors.
4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

2.04 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:

1. Be rated for 300V.
2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Routing:

1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

    a. Cabling is plenum-rated, multi-conductor.
    b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
    c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
    d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
    e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.

2. End bushings shall be provided on both ends of all raceway terminations.
3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
2. For cabling not installed in conduit:

    a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable

loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

3. For cabling installed within conduit from endpoint to endpoint:

   a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.

C. Excess Cabling:

1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:

1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.02 SPLICES/CONNECTIONS/TERMINATIONS:

A. Control Cabling:

1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

B. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.03 LABELING

A. Refer to Specification Section 16075 for all labeling requirements.

END OF SECTION 16116

SECTION 16120

POWER CONDUCTORS AND CABLES 51V-600V

PART 1 - GENERAL

1.01 DESCRIPTION

A. Power Wires and Cables

B. Low Voltage Wires and Cables

PART 2 - PRODUCTS

2.01 POWER WIRES AND CABLES - 600 VOLT

A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.

B. General Application (see below for exceptions):

1. At or Below Grade (including within slab-on-grade):

   a. #8 or larger conductors:

      1) XHHW or RHH/RHW/USE stranded (in conduit).

   b. #10 or smaller conductors for circuits terminating at motors:

      1) THHN/THWN or XHHW stranded (in conduit).

   c. #10 or smaller conductors (excluding circuits terminating at motors):

      1) THHN/THWN or XHHW solid (in conduit).

2. Above Grade:

   a. #8 or larger conductors:

      1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).

   b. #10 or smaller conductors for circuits terminating at motors:

      1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).

   c. #10 or smaller conductors (excluding circuits terminating at motors):

      1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).

3. Power Wire and cable shall be as manufactured by Southwire, Rome, American Insulated Wire, Okonite, Phelps-Dodge, Amercable, Aetna or approved equal.

C. Class 1 Control Cabling (120VAC Control Circuits, Etc.)

1. Unless specified otherwise, Class 1 control cabling shall:

a. Be rated for exposed cable tray installation.
b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
c. Be UL-rated for the proposed application.
d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
e. Utilize copper conductors.
f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
i. Be rated for 600V.
j. Be industrial grade.
k. Have stranded conductors.
l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.

2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

2.02 WIRE CONNECTIONS:

A. All connector types:

1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):

1. On Unshielded Wire:

a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.

2. On Shielded Power Wire:

a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of

the braided shield, and connects all internal grounds to a common external ground point.

C. Other Dry locations:

1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
2. On Wire #10 and smaller: shall be made with one of the following:

   a. Ideal Wing Nuts or equal by 3M .
   b. Ideal Push-In Wire Connectors (for #12 and smaller only).

D. Other Wet/Damp locations:

1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by Ilsco, Burndy or T&B.
2. On Wire #10 and smaller: shall be made with one of the following:

   a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. All wires and cables shall be installed in conduit unless specifically noted otherwise.

B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.

C. No splices shall be pulled into conduit.

D. No conductor shall be pulled until conduit is cleaned of all foreign matter.

E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.

F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

G. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

3.02 POWER WIRE AND CABLE INSTALLATION:

A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.

B. Multi-wire lighting branches shall be used as indicated.

C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).

D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).

E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.

F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

3.03 WIRE CONNECTIONS

A. See Part 2 above for material types.

B. Aluminum Wire Connections:

1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).

C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.

D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.

E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.

F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.04 SHIELDED CABLE INSTALLATION

A. Shielded instrumentation (low voltage) cables:

1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.05 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE

INSTALLATION:

A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

1. Cabling shall be plenum-rated, multi-conductor.
2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.06 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.07 LABELING AND COLOR CODING OF WIRE AND CABLE

A. Refer to Specification Section 16075 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER

NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

3.08 TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 500-volt DC Megger Tester. Any feeder conductor with an insulation resistance less than 1 Mega ohm to ground shall be replaced by the contractor at the contractor’s expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 16120

SECTION 16130

OUTLET BOXES, JUNCTION BOXES, WIREWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Outlet and Junction Boxes

B. Pull Boxes

C. Wireways

PART 2 - PRODUCTS

2.01 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.

B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.

C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.02 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.

B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.

C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.

D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.

E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.

PART 3 - EXECUTION

3.01 APPLICATION

A. General

1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
2. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
3. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
4. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16")

1. For all below grade exterior use and elsewhere as shown:

   a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
   b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).

2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

3.02 INSTALLATION

A. General

1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 16075 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. There shall be no more knockouts opened in any sheet metal box than actually used.
3. Any unused opening in cast boxes shall be plugged.

C. Junction & Pull Boxes (larger than 4-11/16")

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment

1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 16130

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Wiring Devices

B. Plates

C. Finishes

PART 2 - PRODUCTS

2.01 WIRING DEVICES AND PLATES

A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

B. Receptacles shall have blade configuration and shall be extra-heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.

D. Each wiring device shall have a plate (see “Finishes” section below for specific requirements).

2.02 FINISHES

A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.

B. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

C. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.

D. See “Electrical Identification” specification section for coverplate labeling requirements.

PART 3 - EXECUTION

3.01 GENERAL MOUNTING

A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.

B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.

C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.

D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.

E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.

1. Receptacles and telephone outlets in offices and other finished areas: 1’-6” to the center of the box.
2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4’-0” to the center of the box.
3. Receptacles over counters: As Noted
4. Switches, general: 4’-0” to the top of the box.
5. Push-button, etc., general: 4’-0” to the top of the box.

END OF SECTION 16140

SECTION 16231

GENERATOR SET & AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 SCOPE

A. Install owner-furnished generator and automatic transfer switch set in accordance with manufacturer's recommendations.

1.02 CODES AND STANDARDS

A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of the latest editions of the following standards/codes where applicable:

1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
3. International Building Codes.
4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The owner-furnished generator is a Cummins/Onan Model C80D6C Diesel Engine Driven Generator Set, rated 80kW standby, 100kVA at 0.8PF, 120/208V, 3 phase, 4 wire, 60 Hertz at 1800 RPM, rated for outdoor application.

B. The owner-furnished ATS is a Cummins/Onan Model OTEC300 PowerCommand, 300 Amp, 120/208V, 3 phase, 3 pole, 4 wire, automatic transfer switch with NEMA 4X SS enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Equipment (and all generator accessories furnished) shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local 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, etc. between all major equipment provided for the on-site power system.

C. Generator equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic

requirements of the site.

D. Remote stop station type, labeling and location shall be submitted by contractor to engineer and local fire marshal for approval prior to rough-in. Location shall be at the exterior of the generator, on the premises. Contractor shall provide all interconnections from remote stop station to generator set as required by generator set supplier for a fully-functional system.

E. Equipment shall be initially started and operated by representatives of the manufacturer (under separate contract by owner).

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

3.02 ON-SITE ACCEPTANCE TEST:

A. The contractor shall be on-site and provide general electrical on-site assistance during the on-site testing to be provided by the generator supplier. For the contractor's reference, this testing (to be completed by the generator supplier under a separate contract), including the following:

1. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.
2. Installation acceptance tests to be conducted on-site shall include the following (performed in accordance with NFPA 110):

    a. "Cold start" test.
    b. Four (4) hour full load test. Provide resistive load banks and make temporary connections as required.
    c. One step rated load pickup test.
    d. Power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

END OF SECTION 16231

SECTION 16410

SAFETY SWITCHES AND FUSES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Safety Switches

B. Fuses

C. Branch Feeders

D. Feeders

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.

B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.

C. Fused switches shall have provisions for class R, rejection type fuses.

2.02 FUSES (600V)

A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class “R” Fusetron.

B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

2.03 MANUFACTURER

A. Safety switches shall be as manufactured by Square 'D' or Cutler Hammer.

B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

PART 3 - EXECUTION

3.01 SAFETY SWITCHES

A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.

B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by contractor as required to provide code-required clearances.

C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA 4 stainless steel

outdoors and in wet or process areas.

D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

3.02 FUSES

A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.

B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 16410

SECTION 16442

LIGHTING PANELBOARDS

PART 1 - GENERAL

1.01 GENERAL

A. The work under this section includes but is not limited to the following:

1. Lighting Panelboards
2. Circuit Breakers

PART 2 - PRODUCT

2.01 PANELBOARDS

A. Enclosure:

1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in corrosive, exterior or wet locations shall have NEMA 4 stainless steel enclosures.
3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
8. Each section of multi-section panelboards shall be of matching heights and depths.

B. Bussing/Lugs:

1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
2. All bussing and associated connectors shall be tin-plated copper.
3. All panelboards shall contain ground buss.
4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
5. Buss connectors shall be for distributed phase arrangement.
6. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.

7. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
8. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

C. Breaker arrangement and numbering:

1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
3. Breaker numbers shall be permanently attached to trim.
4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

2.02 CIRCUIT BREAKERS

A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.

B. Circuit breakers shall be of the bolt-on type.

C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).

D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.

E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

2.03 SPECIAL REQUIREMENTS

A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.

B. Lighting panels larger than 400A shall conform to the requirements for power panels.

2.04 MANUFACTURER

A. Panelboards shall be as manufactured by Square 'D' or Cutler Hammer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to insure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6’-7” A.F.F..

B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.

C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

3.02 PANEL IDENTIFICATION

A. Refer to Specification Section 16075.

END OF SECTION 16442

SECTION 16511

LIGHTING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Lighting

B. Ballasts/Drivers

C. Lamps

1.02 SUBMITTALS

A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicated that the contractor/supplier intends to meet all contract requirements. Refer to specification section 16050 for additional requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.

B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.

C. All lighting fixtures shall be so designed and shall have ballasts, drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor’s expense.

2.02 LED LUMINAIRES

A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.

B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color

temperature, distribution pattern, operational life, and CRI as shown on drawings.

C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.

D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.

E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.

F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.

G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

2.03 MANUFACTURER

A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.

B. Ballasts/drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

C. Lamps shall be as manufactured by General Electric, Sylvania, Philips or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES

A. Support:

1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.

B. Coordination:

1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to insure proper fit and coordination with other trades.
2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 16511