

VILLAGE OF WELLSVILLE, OHIO

SPECIFICATIONS FOR

PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS

September 2011

PREPARED BY:

GGJ, INC.
35585 CURTIS BLVD., UNIT C
EASTLAKE, OHIO 44095
PHONE: (440) 953-1567
FAX: (440) 953-0580

PREPARED FOR:

VILLAGE OF WELLSVILLE, OHIO
1200 MAIN ST.
WELLSVILLE, OHIO 43968
PHONE: (330) 532-2524

SPECIFICATION REVIEW:

Reviewed by: _____
Project Manager

Reviewed by: _____
Specification Engineer

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VILLAGE OF WELLSVILLE, OHIO
PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS

CITY OFFICIALS

ADMINISTRATION

Joseph Surace, Mayor

Jim Saracco, Administration

Dale Davis, Clerk

Andrew Beech, Solicitor

COUNCIL

Rosie Goss

Susie Haugh

Tony Cataldo

Joseph Soldano

John McMahon

Randy Allmon

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PROJECT DIRECTORY

OWNER:

Village of Wellsville
1200 Main St.
Wellsville, Ohio 43968
Attn: Mayor Joseph Surace

Phone: 330-532-2524

ENGINEER:

GGJ, Inc.
35585 Curtis Blvd., Unit C
Eastlake, Ohio 44095
Attn: John Sabo, PE

Phone: 440-953-1567
Fax: 440-953-0580

PROJECT CERTIFICATION

I hereby certify that the Project Drawings and the Project Manual were prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Ohio.

John Sabo, P.E.

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SECTION 00020

INVITATION TO BID

Sealed proposals will be received at the Office of the Mayor, 1200 Main Street, Wellsville, Ohio until 11:00 o'clock A.M. Local Time on Friday, September 30, 2011, or as may be amended by written Addenda, and will be opened and read immediately thereafter for the:

**VILLAGE OF WELLSVILLE, OHIO
PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS**

PROJECT DESCRIPTION: The project includes the installation of a new sanitary pump station with a Control & Generator building. Approximately 7,000 ft. of new 12" HDPE Sanitary Forcemain is also part of the scope.

COMPLETION DATE: 240 CALENDAR DAYS

Contract Documents may be examined at the following locations:

ENGINEER:
GGJ, Inc.
35585 Curtis Blvd., Unit C
Eastlake, Ohio 44095
(440) 953-1567

OWNER:
Village of Wellsville
1200 Main Street
Wellsville, Ohio 43968
(330) 532-2524

Dodge Reports
6200 Rockside Woods Blvd., Suite 310
Independence, Ohio 44131
(216) 901-1589

Plans, specifications and bidding blanks may be obtained at the above office of the ENGINEER upon payment of **ONE HUNDRED DOLLARS (\$100.00) NON-REFUNDABLE**. Contract Documents will be mailed as soon as possible after receipt of request and payment for such documents. Checks shall be made payable to GGJ, INC.

A bid security must be submitted with the bid. The bid security shall be in the form of a Certified check, a Cashiers check, or an Irrevocable Letter of Credit for an amount equal to ten percent (10%) of the bid; OR a Bond for the FULL AMOUNT of the bid. Said bid security shall be made payable to the OWNER and is to be held as a guarantee that in the event the bid is accepted and a contract is awarded to the BIDDER, the contract will be duly executed and its performance properly secured.

The successful BIDDER will be required to furnish a Contract Performance Bond in an amount not less than one hundred percent (100%) of the total price bid for the complete work, said Bond shall be that of an approved surety company authorized to transact business in the State of Ohio and shall be underwritten by a surety that is listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds".

BONAFIDE BIDDER REQUIREMENTS: Bid Proposals will **ONLY** be opened and/or received from Bonafide Plan Holders. Any Bid Proposal(s) received by a non-Bonafide Plan Holder, will be deemed invalid.

Questions by prospective bidders concerning this project should be directed to the ENGINEER'S Mr. John Sabo, P.E., Monday through Friday between 9:00 A.M. and 4:00 P.M. No questions will be taken during any other time.

Each bid proposal must be made upon the blanks furnished with the Contract Documents and must be delivered to Office of the Mayor, 1200 Main St., Wellsville, Ohio 43968, prior to the time on the date stated above.

No bidder may withdraw a bid within 60 days after the actual date of the opening thereof.

A pre-bid meeting will be held at 11:00 A.M. on Thursday, September 22, 2011 at the Village Hall located on 1200 Main Street in Wellsville, Ohio 43968. All Contractors interested in bidding should attend. A visual inspection of the project will be conducted after the meeting.

Non-Discrimination in Employment – Bidders on this work will be required to comply with the President's Executive Order No. 11246 in that employees and applicants for employment shall not discriminate against because of race, color, religion, sex or national origin. The requirements under this order are explained in the contract documents.

WAGE RATES - Each employee employed by the CONTRACTOR or any SUBCONTRACTOR and engaged in work on the project under this contract shall be paid the prevailing wage established by the Department of Industrial Relations of

the State of Ohio, as provided by the appropriate sections of the Ohio Revised Code. This shall occur regardless of any contractual relationship which may be said to exist between the CONTRACTOR or any SUBCONTRACTOR and such employee.

The OWNER reserves the right to reject any or all bids, to waive any informalities or irregularities in the bids received, and to accept any bid which it deems most favorable.

BY ORDER OF

Village of Wellsville
Mayor
Joseph Surace

Proof of Publication

September 9, 2011
September 16, 2011

END OF SECTION

DIVISION 0

BIDDING AND CONTRACT REQUIREMENTS

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INSTRUCTIONS TO BIDDERS**1. PROJECT DESCRIPTION**

- 1.1 OWNER: VILLAGE OF WELLSVILLE
1200 MAIN ST.
WELLSVILLE, OHIO 43968
- 1.2 DESCRIPTION: PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS
- 1.3 COMPLETION TIME: Completion: 240 Calendar Days
- 1.4 ENGINEER'S OPINION OF PROBABLE COST:

General Construction: \$700,000.00
- 1.5 ENGINEER: GGJ, Inc.
35585 Curtis Blvd., Unit C
Eastlake, Ohio 44095
Telephone: (440) 953-1567
Fax: (440) 953-0580
Project Contact Person: John Sabo, P.E.

2. PLANS, SPECIFICATIONS, & BIDDING DOCUMENT

- 2.1 **Viewing and Purchasing Contract Documents:** Copies of the Contract Documents may be examined at 1200 Main St., Wellsville, Ohio 43968 and at the office of the Engineer. The Contract Documents including Drawings, Specifications, bidding forms, and related contract materials may be obtained at the Eastlake office of the Engineer upon payment of **ONE HUNDRED DOLLARS (\$ 100.00) NON-REFUNDABLE.** CONTRACT DOCUMENTS will be mailed as soon as possible after receipt of request and payment for such CONTRACT DOCUMENTS. Checks shall be made payable to GGJ, INC.
- 2.2 **Bonafide Plan Holder:** is one who purchases plans and specifications for a specific project and is acknowledged by either the owner and/or his deemed representative.
- (2.3) **Pre-Bid Meeting:** There will be a Pre-Bid meeting at 11:00 AM on Thursday, September, 22, 2011 at Village Hall located at 1200 Main St., Wellsville, Ohio 43968 to view the site and to answer potential bidders' questions.
- 2.3 **Questions during Bidding:** All questions regarding the meaning or intent of the Contract Documents shall be directed to the Engineer's Contact Person noted above. Subsequent interpretations and clarifications considered necessary by the Engineer will be issued by Addenda. Questions received less than seven (7) days prior to the scheduled date for opening bids may not be answered. Only questions and clarifications made by formal written addenda will be binding. Oral and other interpretations or clarifications, when given, will be without legal effect. The Contract Work shall be performed in accordance with the Contract Documents as prepared by the Engineer.
- 2.4 **Issuance of Contract Document Sets:** Upon award of the Contract, the Owner will furnish two (2) executed copies of the Drawings, Specifications and related Contract Materials; and if requested, will furnish one (1) set of reproducible project Drawings, at no cost to the Contractor. Additional sets of Contract Documents may be purchased from the ENGINEER for the price set forth above and in the Invitation to Bid.
- 2.5 **Addendum:** Addenda may be issued by the Engineer or Owner to notify that the Contract Documents have been amended. The Bidder is required to acknowledge receipt of Addenda in the Bidding Documents or they may be subject to disqualification. Addenda will be mailed or otherwise delivered to all parties recorded by Engineer as having received the Bidding Documents.
- 2.6 **Other Project Related Information:** The following information is available for inspection at the Owner's

offices and at the Engineer's Offices:

- 2.6.1 Geotechnical Engineering Report conducted on August 8, 2011 by PSI (Professional Services Industries, Inc.) is available for viewing at the offices of both the Engineer and the Village of Wellsville. Digital copy is available on the website of GGJ, Inc. (www.ggjengineers.com)

3. SUBMISSION OF BID PROPOSALS

- 3.1 Sealed Bid Proposals will be received by the Owner at the designated place until the date and time specified in the Invitation to Bid, as may be amended, at which time they will be publicly opened and read.
- 3.2 All submitted Bid Proposals shall be sealed in individual envelopes and addressed as follows:
- Village of Wellsville
1200 Main St.
Wellsville, Ohio 43968
- 3.3 Each "sealed" envelope containing a Bid Proposal must bear on the outside, the Bidder's name, address, and the name of the project for which the Bid Proposal is submitted. If forwarded by mail, the sealed envelope containing the Bid Proposal must be enclosed in another (mailing) envelope addressed to the Owner at the above address.
- 3.4 Any Bid Proposal received after the time and date stated, will not be considered.
- 3.5 Bids must be made on the Bid Proposal forms (or photocopies thereof) furnished in the Contract Documents.
- 3.5.1 All prices bid must be entered in figures only on the Bid Schedule form provided. If the bid item embraces labor and material, the Bid Proposal shall separately state the Unit Price for Material and the Unit Price for Labor.
- 3.5.2 Enter each Bid Item's Total Unit Price as the sum of the Unit Prices entered for Material and for Labor, if the Item embraces both OR as a lump sum amount, if the item is a Lump Sum Item.
- 3.5.3 Enter each Item's Total Price as the product of its Estimated Quantity and the Item's Total Unit Price. In the event of a conflict, the Estimated Quantities and the Total Unit Price listed on the form shall govern over the Unit Prices for Material and Labor, and the Total Price listed.
- 3.6 Each Bidder must bid on all Items and Alternates contained on the Bid Schedule form. Any Bid that does not conform to this requirement may be considered informal and may be rejected.
- 3.7 Each Bidder is required to disclose in his Bid, the full names and addresses, and the place of business of all people, other than the named Bidder, that have a legal or ownership interest in the Bid Proposal. If the Bidder is a corporation, only the names of its president and secretary need to be provided. If no other person has an interest, the Bidder shall state that fact.
- 3.8 The prices recorded in the Bid Schedule must be in ink and be complete when submitted.
- 3.8.1 Any corrections to the Bid Proposal made prior to submission must be initialed by the person signing the Bid Proposal.
- 3.8.2 Submit one copy of the Bid Proposal documents.
- 3.9 Bid Proposals submitted by Corporations must be executed in the corporate name by its President, Vice-President, or other Officer accompanied by evidence of authority to sign the proposal. The corporate seal must be affixed and attested to by the Secretary.
- 3.10 Bid Proposals submitted by partnerships must be executed in the partnership name and be signed by a partner, whose title must appear along with the signature.
- 3.11 All names must be typed or printed below the signature.
- 3.12 The Bid Proposal shall contain an acknowledgment the Bidder has received all of the issued Addenda;

otherwise the Bid may be disqualified.

- 3.13 The Owner reserves the right to hold the Bid Proposals for a period of sixty (60) days after opening and to award Contracts at any time during that period.
 - 3.13.1 No Bidder may withdraw a Bid within 60 days after the actual date of the opening thereof.
 - 3.13.2 Should there be reasons why the Contract cannot be awarded within the specified period; the time may be extended by mutual agreement between the Owner and the Bidder.
 - 3.13.3 Each Bid Proposal must be accompanied by a bid guarantee instrument payable to the Owner in the form of one of the following:
 - 3.13.3.1 A Bid Bond for the full amount of the Bid, including alternatives, with a corporate Surety approved by the Owner. Use Bid Guaranty and Contract Bond (Bid Bond) form included in the bidding documents for projects located in the State of Ohio. For projects located in other states, provide Bid Bond. If bid is accepted, Bidder will be required to provide Performance Bond(s) assuring required Payments, Maintenance, and Guarantees. Should a Bid be rejected, the Bond will be promptly returned to the Bidder. Bid Bonds provided for this work shall be underwritten by a surety that is listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bond". Include the names and addresses of the Bid Bond Agent and the Surety Company.
 - 3.13.3.2 A certified check equal to 10 percent of the Bid.
 - 3.13.3.3 A cashier's check equal to 10 percent of the Bid.
 - 3.13.3.4 An irrevocable letter of credit equal to 10 percent of the Bid.
- 3.14 The successful Bidder will be required to furnish a Contract Performance Bond for the full amount bid for the complete work, including all selected alternatives. This bond shall be that of an approved Surety company authorized to transact business in the State of Ohio and shall be underwritten by a Surety that is listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds".
- 3.15 Within ten (10) days after opening the Bids, the Bids will be compared and the OWNER will return the Bid guaranties of all Bidders except for the three lowest Bidders.
- 3.16 When the agreement is executed and delivered, or the period for holding the Bids has expired and no time extension has been mutually agreed upon, the Bid guarantees of the remaining Bidders will be returned.
- 3.17 Any Bid may be withdrawn prior to the scheduled time for the opening of Bids or authorized postponement thereof.
 - 3.17.1 If a Bidder wishes to withdraw his Bid Proposal, he shall state his desire in writing to the Owner BEFORE the time fixed for the opening, and when Bidder's Proposal is reached it will be set aside and returned.
- 3.18 Materials to be incorporated in this work may be purchased by the Contractor free of Ohio State or County Sales Tax.
- 3.19 The successful Bidder must comply with the minimum wage rates for laborers and mechanics as determined by the State of Ohio prevailing wages.

4. EXAMINATION OF CONTRACT DOCUMENTS & SITE

- 4.1 In submitting a Bid, Bidder warrants that he has investigated and is acquainted with the conditions to be encountered for performing the work including the character, quality, quantities of work to be performed, the materials to be furnished, the prevailing hourly wage rates for the area in which the project is located, and the requirements of the Contract Documents. It is mutually agreed that the submission of a Bid shall be considered prima facie evidence that Bidder has made such examination and is satisfied as to all the conditions that will affect the work.

- 4.1.1 Bidders shall satisfy themselves of the accuracy of the estimated quantities in the Bid Schedule by making an examination of the site and a review of the Contract Documents, including all issued Addenda.
- 4.2 Before submitting a Bid, each Bidder must (a) examine the Bid Proposal thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the work, (c) familiarize himself with Federal, State and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the work; and (d) study and carefully correlate Bidder's observations with the Contract Documents.
 - 4.2.1 All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout.
 - 4.2.2 The Contract Documents contain the provisions required for the construction of the Project.
- 4.3 Reference is made to the Supplementary Conditions and to paragraph 2.6 above for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the work that have been relied upon by the Engineer in preparing the Drawings and Specifications. Owner will make copies of such reports available to any Bidder requesting them. These reports are not guaranteed as to accuracy or completeness; nor are they part of the Contract Documents. Before submitting his Bid, each Bidder shall, at his expense, make such additional investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 4.4 Upon request, the Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deem necessary for submission of his Bid.
- 4.5 The lands upon which the work is to be performed, rights-of-way for access to the site, and other lands designated for use by Bidder in performing the work, are identified in the Contract Documents.
- 4.6 The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Section and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the work.
- 4.7 Information obtained from an officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Bidder or relieve him from fulfilling any of the conditions of the Contract.

5. CONTRACTOR'S QUALIFICATION AND EQUIPMENT

- 5.1 Bidder shall provide evidence of sufficient previous experience on work of a similar nature to assure the Owner of his capability to perform the work.
- 5.2 Bidder shall complete the appropriate parts of the Bid Proposal relating to work experience and equipment available for use.
- 5.3 Bidder shall provide pertinent information to the Owner relative to any pending suits or outstanding liens. If no information is provided by the Bidder, the Owner shall assume that no such suits or liens exist.
- 5.4 Bidder shall provide information on all incomplete contracts including the Owner's name, Contract Amount, and Status.

6. ESTIMATED QUANTITIES

- 6.1 The unit price quantities listed in the Bid Schedule are approximate and are to be used for comparing Bids and in no way binds the Owner to using the quantities, or any part thereof, in the execution of the work.
- 6.2 Except for lump sum items, payments will be made to the Contractor for the actual quantities of work performed or materials furnished in accordance with the Contract Documents, and it is understood that the scheduled quantities of work to be done and materials to be furnished may be increased or decreased without invalidating the unit prices bid.

- 6.3 The Owner reserves the right to increase or decrease the quantities or omit altogether any items that in the judgment of the Owner may be deemed advisable after the award of the Contract.
- 6.4 The successful Bidder will be required to furnish the Owner a complete breakdown of the lump sum Items, to the satisfaction of the Engineer within five (5) days after the Notice of Award is provided, and before signing the Construction Contract.
- 6.5 Payments for lump sum Items will be based on an estimated percentage of the Item's completeness, as determined by the Engineer.

7. SUBCONTRACTORS

- 7.1 The Bidder shall state on the appropriate Contract form the names of all Subcontractors that he proposes to utilize and the work they will be assigned. All work of Bidder not assigned to a Subcontractor shall be understood by the Owner to be performed by the Bidder.
- 7.2 Each Bidder shall perform with his own organization not less than FIFTY PERCENT (50%) of the total Contract price.
- 7.3 The Owner reserves the right to approve or disapprove all Subcontractors proposed by the Bidder. If the Owner, after due investigation, rejects the use of a proposed Subcontractor, the apparent successful Bidder may either submit an acceptable substitution without increase in Bid price or decline substitution and withdraw his Bid Proposal without sacrificing his Bid security. Any listed Subcontractor that Owner does not make written objection to before awarding the Contract, shall be deemed acceptable to the Owner.
- 7.4 Requests by the Bidder to change Subcontractors after the award shall be subject to the Owner's approval and shall not change the Contract Bid prices.
- 7.5 No Bidder shall be required to employ any Subcontractor, person, or organization against which he has reasonable objection.

8. NON-COLLUSION AFFIDAVIT

- 8.1 Each Bid Proposal must be accompanied by a completed Non-Collusion Affidavit provided within the Bid Proposal.
- 8.2 Where there is reason to believe collusion or combination among Bidders exists, the Owner reserves the right to reject the Bid Proposal of those concerned.

9. INSURANCE

- 9.1 Verification of Workers' Compensation, General Liability, Automobile Liability, and Property insurances consistent with the provisions of the Contract Documents must be submitted to the Owner prior to an Award of Contract. The required Certificates of Insurance shall show that the Owner, Engineer, Engineer's Consultants, and other people identified in the Contract Documents shall be specifically named as additional insured on all policies covering work under this Contract.
- 9.2 All insurance shall be endorsed so that it cannot be canceled until thirty (30) days after Insurer's written notice to Owner of such proposed action.

10. CONTRACT

- 10.1 Before entering into the Contract, the Owner will require the Bidder to provide a Contract Performance Bond and a Payment Bond, each for 100 percent of the Contract Price, with a corporate surety approved by the Owner, to assure the faithful performance of the Contract. All bonds must be underwritten by a surety company authorized to transact business in the State where the work is located and upon which service of process can be made, conditioned on the faithful performance of the work in accordance with the Contract Documents. Such security or bond also shall indemnify the Owner against damages suffered as a result of the Bidder's failure to perform the Contract in accordance with the Contract Documents, and guaranteeing the related construction and performance of the improvements for a period not less than one (1) year from the date of final acceptance by the Owner, and guaranteeing the payment of all lawful claims of Subcontractors, equipment and material providers, and for labor performed in carrying forward or

completing the Contract.

- 10.2 All bonds shall be in the form required by the Department of Housing and Urban Development and the State of Ohio.
- 10.3 All bonds shall be underwritten by a surety that is listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds."

11. AWARD OF CONTRACT

- 11.1 The Owner reserves the right to reject any and all Bids, to waive any informalities or irregularities in the Bids received, and to accept any Bid it deems most favorable.
- 11.2 All extensions and totals of unit prices and quantities submitted as part of the Bid shall be considered informal until verified by the Owner.
- 11.3 In evaluating Bids, the Owner may consider the qualifications and experience of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternates and unit prices if requested in the Bid Forms.
- 11.4 Owner may consider the qualifications and experience of Subcontractors and other people and organizations (including those who are to furnish the principal items, material, or equipment) proposed for portions of the work. Operation costs, maintenance considerations, performance data and guarantees of materials and equipment may also be considered by the Owner.
- 11.5 Owner may conduct such investigations as it deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of the Bidders, proposed Subcontractors, and other persons and organizations to perform the work in accordance with the Contract Documents to Owner's satisfaction and within the prescribed time. Bidder shall furnish all information and data for this purpose as the Owner may request.
- 11.6 The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of the Bidder fails to satisfy the Owner that Bidder is sufficiently qualified to carry out the obligations of the Contract and to satisfactorily complete the work identified therein.
- 11.7 If a Contract is awarded, it will be awarded to the lowest and best Bidder whose evaluation by the Owner indicated to Owner that the award will be in the best interests of the project.
- 11.8 If a Contract is awarded, Owner will give the successful Bidder a Notice of Award within sixty (60) days after the day of the Bid opening.
 - 11.8.1 Copies of Notice of Award will be sent to both the Bid Bond Agent and Surety Company.
- 11.9 A conditional or qualified Bid will not be accepted.
- 11.10 Prior to awarding the Contract, the Bidder must submit certification from the Secretary of State that Bidder is authorized to do business in the State of Ohio. Also prior to award, the Bidder must submit a Power of Attorney to the Secretary of State designating it as an agent for the purpose of accepting the service of summons in any action brought under the Ohio Revised Code and the contract and bond are submitted to the Attorney General for their certified approval.

12. EXECUTION OF CONTRACT

- 12.1 Accompanying the written Notice of Award will be three (3) unsigned sets of Contract Documents not including the Drawings. Within fourteen (14) calendar days from the date of receipt of the Notice of Award, the successful Bidder shall sign and deliver to the Owner the Contract Document sets along with a performance Bond, a payment Bond, and insurance verifications.
 - 12.1.1 The Notice of Award will be accompanied by the necessary Contract and Bond forms.
- 12.2 Within fourteen (14) days of receipt of the successful Bidder's signed Contracts, the Owner will sign the Contracts and return two (2) fully executed Contracts.

- 12.3 The date of the Owner's signature shall be the effective Contract date. The Contract completion time does not start until the issuance date of the Notice to Proceed.

13. BID SECURITY

- 13.1 In the event that the successful Bidder fails, on his part, to execute the Contracts within the specified time, the Owner may consider the Bidder in default and award the Contract to the next lowest Bidder. The Bidder and/or Surety failing to enter into a contract are liable to the Owner for the lesser amount of:
- 13.1.1 The difference between his Bid and the next lowest Bid, or
- 13.1.2 A sum not to exceed ten percent (10%) of the Bid.
- 13.2 If the Owner chooses to re-bid the work, the Bidder failing to enter into a contract and/or his Surety shall pay the lesser amount of:
- 13.2.1 A sum not more than ten percent (10%) of the Bid, or
- 13.2.2 The cost incurred in the process of re-bidding, including labor, printing costs, advertising, and mailings to prospective Bidder.
- 13.3 In the event that the second lowest Bidder is awarded the Contract and fails to execute the Contract within ten (10) days, the Owner may then award to the third lowest bidder.
- 13.3.1 Same as the 13.2.1 above.
- 13.3.2 Same as the 13.2.2 above.
- 13.4 When more than one Bidder fails to execute a Contract and the Owner re-advertises for Bids, each Bidder that failed to enter into a Contract shall equally share in the re-bidding costs.

14. LIQUIDATED DAMAGES

- 14.1 Provisions for liquidated damages, if any are set forth in the Bid Proposal and the Contract.

15. DELINQUENT PERSONAL PROPERTY STATEMENT

- 15.1 Included with the Contract Documents is a delinquent Personal Property Statement to be filled out by the successful Bidder after the award of the Contract.
- 15.2 The Statement shall be sent to both the COUNTY AUDITOR and the COUNTY TREASURER. A signed copy shall remain in the Contract Documents as well.

16. SALES TAX

- 16.1 The Owner is Ohio sales tax exempt and will provide a certification of sales tax exemption. Bidder shall verify utilization of the certification with legal counsel and the State of Ohio.

END OF SECTION

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**VILLAGE OF WELLSVILLE
PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS**

BASIS OF PAYMENT

GENERAL: Payment for the work Items shall be at the total unit or lump sum price Bid for each unit of work completed and accepted in accordance with the Contract Documents.

The latest "State of Ohio, Department of Transportation, Construction and Material Specifications" manual shall govern the material and procedures used in this project, if not otherwise specified in the project Specifications or noted on the Drawings.

PRICES TO INCLUDE: For each Bid Item, the total unit price or lump sum price Bid shall be considered full compensation for the completed and accepted work, and shall include all labor, materials, tools, equipment and transportation needed to perform the work in accordance with the Contract Documents so as to provide a complete and properly functional system. The General Contractor shall be responsible for reviewing the contents and conditions of all Contract Documents as they may relate to the work under this Contract and comply with the requirement thereof.

ITEM 1 - BONDS AND INSURANCE

A. Payment:

1. The lump sum amount stated in the Bid Schedule for bonds and insurance shall include all bonds and insurance required to be in force at the commencement of the work. Successful bidder will be required to provide receipts verifying the actual costs of this item when known.
2. Subsequent expenses for bonds and insurance as may be necessary throughout the contract period for changes to the contract or for other occurrences, shall not be a part of this item.
3. Fees for bonds and insurance due to changes in the work shall be respectively a part of the cost of that work.

ITEM 2 - MOBILIZATION

A. Work included: As described in Section 00800 Supplementary Conditions SC-22 and other work incidental to this Item.

B. Payment: Lump Sum price with payments as specified in Section 00800 Supplementary Conditions SC-22.

ITEM 3 – MAINTENANCE OF TRAFFIC

A. Description: This work in this Item shall consist of work shall consists of maintaining and protecting vehicular and pedestrian traffic at the work area while the contract is in force, in accordance with the latest Ohio Department of Transportation Construction and Material Specifications, including all current supplemental specifications and standard construction drawings and all specifications and drawings in these Contract Documents and in this contract book.

B. Payment: The Lump Sum Price bid for Item Maintaining Traffic shall include the cost of removal of conflicting pavement markings and placement of interim markings, maintaining the existing roadways in a safe condition for public use, providing flaggers and their equipment, furnishing and maintaining and subsequently removing temporary traffic control items as required by the plans and specifications.

ITEM 4 – RESTORATION: TOPSOIL, SEEDING & MULCHING

A. Description: The quantity of each type of restoration: topsoil, seeding and mulching will be measured for unit price payment purposes will be the number of square yards of topsoil, seeding and mulching acceptably placed

and compacted when required per detail as specified over an area within the contract (pay) limits. Areas outside of pay limits will be the Contractor's responsibility

- B. Payment: The unit price stipulated to be paid per square yard of restoration: topsoil, seeding and mulching work performed and measured for payment purposes shall be full compensation for the actual number of square yards furnished and installed which is directly or indirectly caused by the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 5 – REMOVE AND RESET EXISTING PLAY EQUIPMENT, BENCHES, FENCE, AND REPLACE SHRUBS

- A. Description: This work in this Item shall consist of removing and resetting existing play equipment, benches, fencing, and shrubs as shown in the Drawings and/or specified in the Contract Documents.
- B. Payment: The unit price stipulated shall be a lump sum for all work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 6 – REMOVE AND RESET EXISTING BRICK WALKWAY

- A. Description: This work in this Item shall consist of removing and resetting existing brick walkway as shown in the Drawings and/or specified in the Contract Documents.
- B. Payment: The unit price stipulated shall be full compensation for each square foot of brick walkway removed and reset as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 7 – SANITARY PUMP STATION - COMPLETE

- A. Measurement: Shall be on the lump sum basis for the total amount of work to be performed under this item.
- B. Payment: The lump sum price stipulated to be paid for the pump station installation shall be full compensation for the complete installation including all work beginning with the connection of the new sanitary sewers and the furnishing and installation of the wet well vault, valve vault, pumps and all accessories, D.I. piping and fittings (originating in the wet well through the valve vault to the mechanical joint outside the valve vault), sump pit, sheeting, shoring, bypass pumping, sump pump with discharge piping, valves and fittings, discharge valves (check and plug), manhole steps, access doors, vent pipe, concrete pads, foundations, slabs, fencing, stoned drive areas, control building, etc., dehumidifier, unit heater, all electrical work pertaining to the Pump Station including all components, controls, and appurtenances necessary as shown on electrical drawings and specified in the electrical specifications and restoration of all disturbed areas and utilities, and other work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 8 – EXISTING PUMP STATION MODIFICATIONS

- A. Measurement: Shall be on an allowance basis for the total amount of work to be performed under this item.
- B. Payment: The lump sum price stipulated to be paid for the pump station modifications shall be full compensation for the modification of the existing sanitary pump station #1 to an overflow pump station. Work shall include depowering existing sanitary pumps from the existing control panel and running new power feed into building to connect to existing control panel. Conduit and wiring from the proposed building to a foot outside of the existing building will be paid under other bid item. Work under this item will include the work from 1 foot outside of building through the building to existing control panel.

ITEM 9 – ELECTRICAL

- A. Measurement: Shall be made on a lump sum basis for the actual work performed under this item.
- B. Payment: The unit price stipulated to be paid for the electrical shall be full compensation for electrical work related to pump station and control building construction. It shall also include providing and installing an emergency generator, transformers, switches, and all appurtenances related to providing a standby power to the pump station. The lump sum price shall be for all the electrical work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 10 – 24" POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE – ASTM D-3034, SDR 26 (SANITARY)

- A. Description: The work in this Item shall consist of furnishing and installing PVC Sanitary Sewer Pipe as shown on the Drawings and/or specified, including removal and disposal of existing sewers. Measurements shall be made on a lump sum basis for the actual work performed under this item.
- B. Payment: The unit price stated on the Bid Schedule shall be compensation for the lump sum price of pipe installed including all fittings and plugs measured for payment. The price shall include furnishing labor, backfill, compaction, laying, sheeting, shoring, inspection, testing of pipe and fittings, restoring all disturbed areas and utilities, removing existing sewers, coring, concrete encasement and all appurtenances to complete the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 11 – 12" PVC OVERFLOW IN EXISTING SANITARY MANHOLE

- A. Measurement: Shall be on the lump sum basis for the total amount of work to be performed under this item.
- B. Payment: The lump sum price stipulated to be paid for this item shall be full compensation for the complete installation of the PVC overflow pipe including all work, materials and appurtenances necessary as shown on drawings and specified in the specifications for a complete and ready-for-use installation.

ITEM 12 – AIR RELEASE AND CLEANOUT STATIONS

- A. Description: The unit bid price shall be made on each Air Release and Cleanout Station performed under this item.
- B. Payment: The unit price stated for each Air Release and Cleanout Station shall be full compensation for the manholes, furnished, installed, and connected in accordance with the Drawings and Specifications including excavation, backfill, labor, material, equipment, and restoration. The unit price stated in the Bid Schedule shall include precast sections, waterproofing, steps, grade adjusting, labor, construction, backfill, compaction, frame and covers, restoration of all disturbed areas and utilities, air release valve, isolation and drain valve, DIP Class 52 tee with blind flanged branch, DIP Class 52 wye with blind flanged branches, and all other appurtenances for the work shown on the Drawings and/or specified in the Construction Documents for a complete and ready-for-use installation.

ITEM 13 – 12" HDPE FORCE MAIN (DR17)

- A. Description: The work in this Item shall consist of furnishing and installing a 12" HDPE Forcemain as shown on the Drawings and/or specified. Measurements shall be made on a linear foot basis for the actual work performed under this item, measured along the horizontal projection of the longitudinal axis of the pipe. Price includes the installation of tracer wire, metallic tape, and 6 tracing wire stations.
- B. Payment: The unit price in the Bid Schedule shall be full compensation for each linear foot of forcemain installed and measured for payment. The price shall include furnishing, all fittings required including the cost of fittings, pipe fusion, excavation, backfill, compaction, laying sheeting, shoring, inspection, testing of pipe and fittings, restoring all disturbed areas and utilities, concrete encasement and all appurtenances to complete the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-to-use installation.

ITEM 14 – BORE & JACK 20" STEEL CASING (12" DIP CL 52 CARRIER PIPE)

- A. Measurement: The footage measured will be the actual number of lineal feet of Bore & Jack Construction complete in place as work performed under this item and measured from beginning to end along the longitudinal axis of each pipe run end to end of its respective steel casing.
- B. Payment: The unit price stipulated to be paid for each lineal foot of Bore & Jack sewer shall be full compensation for the actual number of lineal feet of Bore & Jack Construction including steel casing, DIP carrier pipe and boring and receiving pits installed, measured and accepted for payment purposes and shall include furnishing labor, materials, tools, appliances and equipment necessary to provide and install and test pipe, fittings and specials as specified and, in connection with same, to excavate, bed, backfill, shore, sheet, clear site, remove and dispose of existing structures, restore all disturbed utilities, structures, and site features plus

provide all appurtenances to complete the work as shown on the drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 15 – 24" DUCK BILL VALVE

- A. Description: The unit bid price shall be made on each 24" Duck Bill Valve installed under this item.
- B. Payment: The unit price stated for each 24" Duck Bill Valve shall be full compensation for each valve, furnished, installed, and connected in accordance with the Drawings and Specifications including removal and disposal of existing flap gate, excavation, backfill, labor, material, equipment, restoration, and all other appurtenances for the work shown on the Drawings and/or specified in the Construction Documents for a complete and ready-for-use installation

ITEM 16 – VERTICAL CURB, TYPE 6

- A. Description: This work shall consist of the construction of Type 6 Vertical Curb and shall conform to the plans and specifications.
- B. Payment: The unit price stipulated to be paid for each linear foot of Type 6 Curb shall be full compensation for the actual number of linear feet installed including all labor, laying, restoring all disturbed areas, and all appurtenances to complete the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 17 – GRAVEL DRIVEWAY REMOVAL & REPLACEMENT

- A. Description: This work shall consist of removal and disposal of existing driveway materials and constructing gravel driveway as shown on the plans and specifications.
- B. Payment: The unit price stipulated shall be paid per square yard installed of this item, and shall be full compensation for removal, disposal, furnishing and placing all materials including labor, equipment, and saw cutting to complete the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 18 – TYPE C PAVEMENT REPLACEMENT

- A. Description: The work in this Item shall consist of the Type C pavement replacement in the areas shown on the Drawings.
- B. Payment: The unit price stipulated to be paid for each square yard of Type C Pavement Replacement shall be full compensation for the actual number of square yards, calculated from payment limits as called for in the contract drawings, completed in compliance with the contract drawings and specifications and accepted for payment purposes and shall include furnishing all labor, materials, tools, appliances and equipment necessary thereto and, in connection with same, restore all disturbed site features and other items plus provide all appurtenances to complete the work as shown on the Drawings and specified in the Contract Documents for a complete and ready-for-use installation.

ITEM 19 – 4" CONCRETE SIDEWALK

- A. Description: This item of work shall consist of constructing concrete walks in reasonable close conformity with lines, grades and dimensions shown on the plans or established by the Engineer.
- B. Payment: The unit price stated for 4" concrete sidewalk walk shall be full compensation for the actual number of square foot, calculated from pay limits, including labor, excavation, backfill, base course, expansion joint, truncated dome pavers, forming, and excavation and removal of all excavated material, completed in compliance with the contract Drawings and Specifications.

ITEM 20 – 12" CIPP FORCE MAIN RELINE

- A. Description: The quantity to be paid shall consist of 12" FORCE MAIN relining using the CIPP Method installed in place as shown on the drawing and/or specified. Measurements shall be made on a linear foot basis for the actual work performed under this item, measured along the horizontal projection of the longitudinal axis of the pipe.

- B. Payment: The unit price in the Bid Schedule shall be full compensation for each linear foot of pipe lined and measured for payment. The price shall include furnishing all labor materials, equipment, Traffic Control, bypass temporary pumping, pre-installation televising, cleaning and prepping host pipe, cured line material, anchoring of liner, restoration, cleanup, post installation televising, testing, tools, and any other necessary appurtenances necessary to complete the work in accordance with these specifications, the manufacturer recommendations, or as shown.

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PROPOSAL TO THE VILLAGE OF WELLSVILLE, OHIO
PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS

TO: MAYOR JOSEPH SURACE
VILLAGE OF WELLSVILLE
1200 MAIN STREET
WELLSVILLE, OHIO 43968

Gentlemen:

Proposal of _____(hereinafter called "BIDDER"), organized and existing under the laws of the State of Ohio doing business as _____.
To the VILLAGE OF WELLSVILLE (hereinafter called "Owner").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of the PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submitting this BID, the BIDDER, or in the case of a joint BID, each party thereto, certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

The undersigned have full knowledge of the project site, Drawings, and the conditions of the proposal. The undersigned also, hereby agrees to furnish all the services, labor, materials and equipment necessary to complete these projects according to the Drawings and Specifications and to accept as full compensation the lump sum or unit prices stated in the Bid Schedule for the work and for use when calculating the price of a deduction or an increase in quantities.

BIDDER hereby agrees to commence WORK under this Contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within the period stipulated in the INSTRUCTIONS TO BIDDERS. BIDDER further agrees to pay as liquidated damages and that the CITY may retain from monies that are, or which may become due. The amount of such liquidated damages shall be as stipulated in the CONTRACT AGREEMENT FORM (Section 00500 herein).

- Insert "a corporation", "a partnership", or "an individual" as applicable.

The Bidder hereby acknowledges receipt of the following addenda:

<u>ADDENDUM NO.</u>	<u>DATE</u>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

We further agree that the Owner may reject any or all bids.

SUBMITTED BY:

Firm, Corporation or Individual

Address

Telephone Number

Contractor License Number

Signature:

 Date:

NOTE: Evidence of authority to sign and the corporate seal must be affixed and attested by the Secretary.

COMPLETION DATE: 240 Calendar Days commencing on the date as shown on Notice to Proceed for Final Completion.

PROPOSAL TO THE VILLAGE OF WELLSVILLE, OHIO
PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS

BID SCHEDULE

Bid Item	Item Description	Est. Qty.	Unit	Unit Cost Material	Unit Cost Labor	Total Unit Cost	Total Cost
1	BONDS AND INSURANCE	1	Lump Sum				
2	MOBILIZATION	1	Lump Sum				
3	MAINTENANCE OF TRAFFIC	1	Lump Sum				
4	RESTORATION: TOPSOIL, SEEDING & MULCHING	4000	SY				
5	REMOVE AND RESET EXISTING PLAY EQUIPMENT, BENCHES, FENCE, AND SHRUBS	1	Lump Sum				
6	REMOVE AND RESET EXISTING BRICK WALKWAY	50	SF				
7	SANITARY PUMP STATION – COMPLETE	1	Lump Sum				
8	EXISTING PUMP STATION MODIFICATIONS	1	Allowance			\$10,000.00	\$10,000.00
9	ELECTRICAL	1	Lump Sum				
10	24" POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE – ASTM D-3034, SDR 26 (SANITARY)	1	Lump Sum				
11	12" PVC OVERFLOW IN EXISTING SANITARY MANHOLE	1	Lump Sum				
12	AIR RELEASE AND CLEANOUT STATIONS	4	Each				
13	12" HDPE FORCE MAIN (DR17)	6675	LF				
14	BORE & JACK 20" STEEL CASING (12" DIP CL 52 CARRIER PIPE)	125	LF				
15	24" DUCK BILL VALVE	1	Each				
16	VERTICAL CURB, TYPE 6	675	LF				
17	GRAVEL DRIVEWAY REMOVAL & REPLACEMENT	200	SY				
18	TYPE C PAVEMENT REPLACEMENT	1400	SY				
19	4" CONCRETE SIDEWALK	30	SF				
20	12" CIPP FORCE MAIN RELINE	470	LF				
TOTAL							

TOTAL AMOUNT OF PROJECT (IN FIGURES)

TOTAL AMOUNT OF PROJECT (IN WORDS)

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SECTION 00410

BIDDER'S QUALIFICATIONS

BIDDER'S GENERAL INFORMATION

The Bidder shall furnish and notarize the following information. Additional sheets shall be attached as required. Failure to complete will cause the Bid to be non-responsive and may cause its rejection. No award will be made until all of the Bidder's General Information is provided to the Owner.

1. BIDDER/CONTRACTOR'S name and street address:

Names of Responsible Management Officer or Responsible Management Employee

2. BIDDER'S telephone number: (_____) _____

3. Name of person who inspected the site of the proposed Work for the Bidder:

Name: _____ Date of inspection: _____

4. Identify Surety Company and Agent who will provide the required Bonds on this Contract:

Name of Surety:

Address

Surety _____ Company _____ Agent: _____

Telephone Numbers: Agent: (_____) _____ Surety: (_____) _____

5. When was Bidder Company Organized?

6. How many years has Bidder been engaged in the construction business under the present firm or trade name?

7. List current contracts under construction by the Bidder, showing amount of each contract and completion date.

<u>CONTRACT/PROJECT</u>	<u>AMOUNT</u>	<u>COMPLETION DATE</u>
-------------------------	---------------	------------------------

1. _____	_____	_____
----------	-------	-------

2. _____	_____	_____
----------	-------	-------

3. _____	_____	_____
----------	-------	-------

8. Briefly describe the general character of work normally performed by the Bidder.

- _____
- _____
9. Has Bidder ever failed to complete any contract awarded to you? If so, describe, list contract, amount, date and why: _____
- _____
10. Has Bidder ever defaulted on a contract? If so, list contract, amount, date and reason: _____
- _____
11. Attach to this BID the resume of the person who will be designated as General Construction Superintendent or on-site Construction Manager for the Bidder.
12. Attach to the BID a financial statement, references, and other information sufficiently comprehensive to permit an appraisal of the Bidder's current financial condition.
13. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Local Public Agency in verification of the recitals comprising this statement of Bidder's Qualifications.

Dated at _____ this _____ day of _____, 20_____.

Bidder: _____ By _____ Title: _____

State of _____ County of _____

being duly sworn deposes and says that he is _____ of _____ and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me this _____ day of _____, 20_____.

Notary Public

My commission expires: _____ 20_____.

LIST OF SUBCONTRACTORS

The BIDDER is required to list in the spaces provided below, the SUBCONTRACTORS who will perform work under this BID in excess of 1% of the Contractor's Total Bid Price. The BIDDER shall also list the other required information for each SUBCONTRACTOR (Name, Address, Phone No., License Number, Work To Be Performed, MBE/WBE Business Owned Company, total amount of work to be performed in dollars and percent of total contract amount). Failure to comply with this requirement will render the BID as non-responsive and may cause its rejection.

The total cost of the work performed by SUBCONTRACTORS must not be more than fifty percent (50% of the total contract amount).

1. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____
2. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____
3. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____
4. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____
5. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____
6. Work to be performed _____
Subcontractor, Address, Phone Number _____

License Number _____ MBE/WBE (Yes or No) _____
Total Dollar Amount _____ Percent of Total Contract _____

(Add additional sheets, if necessary.)

EXPERIENCE RECORD

The BIDDER shall furnish the following information on a minimum of three (3) completed projects, of recent date, involving work of similar type and complexity to this Project that the BIDDER successfully completed. List below all information to enable the OWNER to judge the experience and capability of the BIDDER to perform this Project work.

1. Project Name _____
Contract Price _____
Date Completed _____
Owner: _____ Engineer: _____
Name _____ Name _____
Address _____ Address _____

Phone No. _____ Phone No. _____
Contact _____ Contact _____
2. Project Name _____
Contract Price _____
Date Completed _____
Owner: _____ Engineer: _____
Name _____ Name _____
Address _____ Address _____

Phone No. _____ Phone No. _____
Contact _____ Contact _____
3. Project Name _____
Contract Price _____
Date Completed _____
Owner: _____ Engineer: _____
Name _____ Name _____
Address _____ Address _____

Phone No. _____ Phone No. _____
Contact _____ Contact _____
4. Project Name _____
Contract Price _____
Date Completed _____
Owner: _____ Engineer: _____
Name _____ Name _____
Address _____ Address _____

Phone No. _____ Phone No. _____
Contact _____ Contact _____

(Add additional sheets, if necessary.)

RECORD OF BIDDER'S EQUIPMENT

The BIDDER shall indicate below construction equipment he has available for Work under this CONTRACT. Information should include age of equipment, description, and existing physical conditions. Also list any equipment you intend to purchase or rent for use on the proposed work. If the BIDDER has previously prepared a description of their construction equipment with the information below, it may be attached to this sheet.

<u>EQUIPMENT DESCRIPTION</u>	<u>AGE</u>	<u>CONDITION</u>
1. _____		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		
11. _____		
12. _____		
13. _____		
14. _____		
15. _____		
16. _____		
17. _____		
18. _____		
19. _____		
20. _____		
21. _____		
22. _____		
23. _____		
24. _____		
25. _____		

(Add additional sheets, if necessary.)

END OF SECTION

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SECTION 00420

BID BOND

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

_____, as PRINCIPAL, and _____
[Bidder]

_____, as surety (ies), are hereby held and firmly bound unto the
_____, as OBLIGEE in the penal sum of the dollar amount of the BID
[Owner]

submitted by the PRINCIPAL to the OBLIGEE on the _____ day of _____, 20____ to undertake
the project known as Pump Station #1 and Forcemain Improvements.

The penal sum referred to herein shall be the dollar amount of the PRINCIPAL'S BID to the OBLIGEE, incorporating any additive or deductive alternate proposals made by the PRINCIPAL on the date referred to above to the OBLIGEE that are accepted by the OBLIGEE. In no case shall the penal sum exceed _____ dollars. (If this blank is not filled in, the penal sum will be the full amount of the PRINCIPAL'S BID, including all accepted alternates.) Alternatively, if the blank is filled in, the dollar amount stated must not be less than the full amount of the BID including all accepted alternates, in dollars and cents. **(A percentage is not acceptable)** For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

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 time within which the OBLIGEE may accept the PRINCIPAL'S BID; and said Surety does hereby waive notice of any such extension.

Signed this _____ day of _____, 20_____.

Surety

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named PRINCIPAL has submitted a BID for the above referenced project;

Now, therefore, if the OBLIGEE accepts the BID of the PRINCIPAL and the PRINCIPAL fails to enter into a proper CONTRACT in accordance with the CONTRACT DOCUMENTS; and in the event the PRINCIPAL pays to the OBLIGEE the difference, not to exceed ten percent of the penalty hereof between the amount stated in the BID, and such larger amount for which the OBLIGEE may in good faith CONTRACT with the next lowest BIDDER to perform the work covered by the BID; or in the event the OBLIGEE does not award the CONTRACT to the next lowest BIDDER and resubmits the project for BIDDING, the PRINCIPAL pays to the OBLIGEE the difference not to exceed ten percent of the penalty hereof between the amount stated in the BID, or the costs, in connection with the resubmission, of printing new CONTRACT DOCUMENTS, required advertising, and printing and mailing notices to prospective BIDDERS, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect. If the OBLIGEE accepts the BID of the PRINCIPAL, and the PRINCIPAL, within ten days after the awarding of the contract, enters into a proper contract in accordance with the CONTRACT DOCUMENTS, which said CONTRACT is made a part of this BOND the same as though set forth herein;

If PRINCIPAL shall well and faithfully do and perform the things agreed to be done and performed according to the terms of said contract; and shall pay all lawful claims of SUBCONTRACTORS, MATERIAL SUPPLIERS, AND LABORERS, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any MATERIAL SUPPLIER OR LABORER having a just claim, as well as for the OBLIGEE herein; then this obligation shall be void; otherwise the same shall remain in full 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 said surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of the

CONTRACT or in or to the Drawings or Specifications therefore shall in any way affect the obligations of said surety on its BOND.

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.

SIGNED and SEALED this _____ day of _____, 20_____

Principal

by: _____

title: _____

Surety

by: _____
Attorney-in-Fact

NOTES: Attorney-in-Fact must attach certified and dated copy of this Power of Attorney.

Name and address of both Agent and Surety Company for the issued Bond must accompany bond.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and must not exceed the underwriting limitation. Surety companies and their agents or attorneys-in-fact must be authorized to transact business in the state where the PROJECT is located and shall furnish proof of such authorization in the BID.

END OF SECTION

SECTION 00430

CERTIFICATION OF NON-SEGREGATED FACILITIES

The undersigned BIDDER _____, certifies that they do not maintain or provide for their employees any segregated facilities at any of the BIDDERS establishments, and that they do not permit employees to perform their services at any location, under their control, where segregated facilities are maintained. The BIDDER certifies further that they will not maintain or provide for their employees any segregated facilities at any of the BIDDERS establishments, and that they will not permit their employees to perform their services at any location under their control where segregated facilities are maintained. The BIDDER agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are, in fact, segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The BIDDER agrees that (except where the BIDDER has obtained identical certification from proposed subcontractors for specific time periods) they will obtain identical certifications from proposed subcontractors prior to the award of subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that the BIDDER will retain such certifications in their files.

Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date _____, 20____

(Signature of Bidder's Representative)

(Printed Name of Representative)

(Title of Bidder's Representative)

END OF SECTION

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SECTION 00440

CERTIFICATION OF NON-COLLUSION AFFIDAVIT

The undersigned BIDDER, _____, certifies that the foregoing Bid Proposal Form is not made in the interest of or on behalf of any undisclosed person, partnership, company, association, organization, or corporation; that such bid proposal form is genuine and not collusive or sham; that said bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, nor that anyone shall refrain from bidding; that said bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of said bidder or of any other bidder, nor to fix any overhead, profit, or cost element of such bid price, nor of that of any other bidder, nor to secure any advantage against the Village of Wellsville awarding the contract or anyone interested in the proposed contract; that said bidder has not directly or indirectly submitted his bid price or any breakdown thereof, nor the contents thereof, nor divulged information or data relative thereto, nor paid and will not pay a fee in connection therewith to a corporation, partnership, company, association, organization, bid depository, nor to any member or agent thereof, nor to any other individual except to such person or persons as have a partnership or other financial interest with said bidder in his general business.

Date _____, 20____

Signature of Bidder's Representative

Printed Name of Representative

Title of Bidder's Representative

State of _____ :
County of _____ :S.S

I state that:

- I state that _____ understands and acknowledges that the above representations are
(Name of firm)
material and important, and will be relied on by _____ in awarding the
(Name of Public Entity)
contract(s) for which this BID is submitted. I understand, and my firm understands, that any misstatement in this affidavit
is and shall be treated as fraudulent concealment for _____ of
(Name of Public Entity)
the true facts relating to the true facts to the submission of bids for this contract.

Name and Company Position

SWORN TO AND SUBSCRIBED BEFORE ME THIS

_____ DAY OF _____, 20 ____.

Notary Public

My Commission Expires

INSTRUCTIONS FOR NON-COLLUSION AFFIDAVIT

1. This Non-Collusion Affidavit is material to any contract awarded pursuant to this bid. According to the Ohio Revised Code, governmental agencies may require Non-Collusion Affidavits to be submitted together with bids.
2. This Non-Collusion Affidavit must be executed by the member, officer or employee of the bidder who makes the final decision on prices and the amount quoted in the bids.
3. Bid rigging and other efforts to restrain competition, and the making of false sworn statements in connection with the submission of bids are unlawful and may be subject to criminal prosecution. The person who signs the Affidavit should examine it carefully before signing and assure himself or herself that each statement is true and accurate, making diligent inquiry, as necessary, of all other persons employed by or associated with the bidder with responsibilities for the preparation, approval or submission of the bid.
4. In the case of a bid submitted by a joint venture, each party to the venture must be identified in the bid documents, and an Affidavit must be submitted separately on behalf of each party.
5. The term "complimentary bid" as used in the Affidavit has the meaning commonly associated with that term in the bidding process, and includes the knowing submission of bids higher than the bid of another firm, any intentionally high or noncompetitive bid, and any other form of bid submitted for the purpose of giving a false appearance of competition.
6. Failure to file an Affidavit in compliance with these instructions will result in disqualification of the bid.

END OF SECTION

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SECTION 00450

CORPORATE RESOLUTION

I, _____, Secretary of _____,
[NAME] [COMPANY]
a _____, hereby certifies that the following is a true and
[CORPORATION, PARTNERSHIP, OR SOLE PROPRIETORSHIP]
correct copy of a resolution duly adopted by the Board of Directors of _____,
[COMPANY]
on _____, 20_____, to wit:
[DATE]

"Resolved, that _____ of this Company,
[NAME]
namely, _____ is hereby
[COMPANY]
authorized and directed to enter into any and all contracts, bid guaranty and
performance bonds with _____ for the
[MUNICIPALITY]
purpose of furnishing labor and materials as to _____ at
[PROJECT]
such price and upon such terms and conditions, including any amendments or
modifications thereto, as said _____ in his
[NAME]
sole discretion shall deem best, and that said actions shall be binding upon the
Corporation.

Resolved, further, that said _____
[NAME]
is hereby authorized and directed to execute and deliver unto said
_____ other instruments which in his
[OWNER]
discretion he shall deem necessary to carry out the foregoing resolution."

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Corporation at _____
_____, this _____ day of _____, 20_____, and I further
[ADDRESS] [MONTH]
certify that said resolution is still in full force and effect.

SECRETARY

SEAL

END OF SECTION

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CONTRACTOR EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION

During the performance of this contract, the undersigned agrees as follows:

1. The undersigned will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The undersigned will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The undersigned agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this equal opportunity (federally assisted construction) clause.
2. The undersigned will, in all solicitations or advertisements for employees placed by or on behalf of the undersigned, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
3. The undersigned will send to each labor union or representative of workers, with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representative of the undersigned's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. The undersigned will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
5. The undersigned will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the administering agency of the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
6. In the event of the undersigned's non-compliance with the equal opportunity (federally assisted construction) clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole in part, and the undersigned may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulations, or order of the Secretary of Labor, or as provided by law.
7. The undersigned will include this equal opportunity (federally assisted construction) clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The undersigned will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for non-compliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor, as a result of such direction by the administering agency the undersigned may request the United States to enter into such litigation to protect the interest of the United States.

(Signature)

(Date)

(Name and Title of Signer, Please type)

(Firm name)

Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

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SPECIFICATION FOR MBE/WBE FAIR SHARE UTILIZATION

- I. In accordance with the terms and conditions of receiving capitalization grants from U.S. EPA for both the Water Pollution Control Loan Fund (WPCLF) and the Water Supply Revolving Loan Account (WRSLA), the Ohio EPA negotiates "fair share" Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) objectives with U.S. EPA regarding each fiscal year's funding. The current negotiated goals for the Federal Fiscal Year construction-related activities are as follows:

- 3.0% of all contracts to MBEs
- 3.7% of all contracts to WBEs Definitions

II. Definitions

A. Minority Business Enterprise (MBE)

The term "Minority Business Enterprise" means a business, at least 51 percent of which is owned and controlled/operated by minority group member(s). The minority ownership must exercise actual day-to-day management of the business.

The "MBE" is a member of one or more of the following groups:

Black American	Hispanic American
Asian American	American Indian
American Eskimo	American Aleut

B. Women's Business Enterprise (WBE)

The term "WBE" means a business, at least 51 percent of which is owned and controlled/operated by a woman or women. The woman-ownership must exercise actual day-to-day management of the business.

C. Control and Operation

"Control" means exercising the power to make executive decisions, and "operation" means being actively involved in day-to-day management of the business.

III. Ownership and Control/Operation

A. Some factors to be considered in determining whether real ownership and control/operation exist are:

1. The percentage of stock owned in a corporation or the proportion of capital invested in a partnership by a woman (or women) or a minority person(s)
2. Whether ownership is meaningful (e.g., whether the minority or woman's ownership interest is such that the minority or woman owner can sell the business or liquidate at will, or whether the minority or woman ownership interest is subject to a controlling lien on that interest).
3. The provisions' for sharing income and losses.
4. Whether there is evidence that the woman or minority owner participates significantly in business policy development and decisions of importance to the business, such as the right to sign checks, etc.
5. Whether corporate history indicates that the business is, in fact, minority or woman controlled.

Note to Prime Contractors and Subcontractors:

A PRIME CONTRACTOR'S FIRM WILL NOT RECEIVE MBE/WBE CREDIT FOR WORK PERFORMED BY MBEJWBE SUBCONTRACTING FIRMS IN WHICH THE PRIME CONTRACTOR'S FIRM HAS A FINANCIAL INTEREST OR INVESTMENT.

IV. Bidder's Responsibilities

A. As a prerequisite to demonstrate MBE and WBE "fair share" goal achievement, all bidders must provide the following data:

1. Whether or not they intend to meet the fair share goals of 3.0% for MBE and 3.7.0% for WBE.
2. Name, title, address, and telephone number of a specific individual within the bidder's company who should be contacted on all MBE and WBE matters.

NOTE: Use MBE/WBE Data Sheet 1 to provide this information.

Data Sheet 1 is to be filled out by all bidders and submitted with the bid. Failure to supply this information will be considered non-responsive, relative to the MBE/WBE fair share goals.

B. For bidders assured of achieving the fair share goals:

1. Within 15 days of the date on which the owner notifies a bidder that its bid is the apparent low responsive bid, the bidder shall provide documentation to meet the following:
 - a. List of MBEs and WBEs planned for utilization.
 - b. Type of work and dollar amount of each subcontract.

NOTE: Use Data Sheet II to provide this information. Failure to supply this information will be considered non-responsive; relative to MBE/WBE fair share goals.

C. For bidders not assured of achieving the fair share goals:

1. Within 15 days of the date on which the owner notifies a bidder that its bid is the apparent low responsive bid, the bidder shall provide the following:
 - a. List of MBEs WBEs planned for utilization.
 - b. Type of work and dollar amount of each subcontract.
 - c. Specific documentation (as follows) of efforts made to achieve the fair share goals.
 - 1) Solicitation of MBEs and WBEs through a newspaper of general circulation and/or a minority oriented publication. Advertisement must appear in publication for 5 consecutive days commencing no later than 21 days before the bid date.
 - 2) Written notification to a local minority contractor association(s). This notification should indicate the type of work available for subcontracting, a definite date when responses are due, and list the person and telephone number to contact for information.
 - 3) Copies of solicitation letters sent to no less than 50 viable and functioning MBEs and WBEs. In general, solicitation letters should be postmarked no later than fifteen (15) days before the responses are due from the MBE and WBEs.

NOTE: Use Data Sheet III to provide this information. Data Sheet III is to be used by all bidders not committed to achieving the fair share goals. Failure to supply this information shall be considered non-responsive, relative to the MBE/WBE fair share goals.

V. Determination of MBE Fair Share Utilization

All documentation submitted by bidders not assured of achieving the fair share goals will be reviewed by the Procedural Compliance Unit, Division of Environmental and Financial Assistance. Based on the feasibility of subcontracting, the availability of MBEs and WBEs in-the area (generally a 100-mile radius), and the contractor's history of compliance, the Procedural Compliance Unit will determine whether the contractor has made a good faith effort to achieve the fair share goals. If the effort is not satisfactory, the contractor will be required to provide additional or sufficient minority and Women's business participation, within 15 days, to demonstrate a good faith effort to achieve the fair share goals.

VI. Sanctions

- A. The Owner may reject one or all bids for non-compliance with this policy.
- B. The Owner will invoke sanctions as it deems appropriate for non-compliance with this policy.
- C. The Owner reserves the right to waive minor deficiencies in all bids taken.

MBE/WBE DATA SHEET 1

MINORITY AND WOMEN'S BUSINESS ENTERPRISE FAIR SHARE UTILIZATION

1. Does bidder intend to meet the "fair share" goals?

_____ Yes

_____ No

2. Name, address and telephone number of person to contact on all MBE, WBE matters.

Name: _____

Address: _____

Telephone Number: _____

3. If less than the owner's stated goal, provide a narrative summary of the bidder's inability to achieve the stated goal.

MBE/WBE DATA SHEET II

MINORITY AND WOMEN'S BUSINESS ENTERPRISE FAIR SHARE UTILIZATION

1. Total dollar amount of MBE participation: _____

2. Percent of MBE participation: _____

3 Total dollar amount of WBE participation: _____

4. Percent of WBE participation: _____

5. List of MBE Subcontractors: _____

Name: _____

Address: _____

Phone: _____

Contact Person: _____

Type of Contract: _____

Amount: _____

Work to be Done: _____

Name: _____

Address: _____

Phone: _____

Contact Person: _____

Type of Contract: _____

Amount: _____

Work to be Done: _____

6. List of WBE Subcontractors: _____

Name: _____

Address: _____

Phone: _____

Contact Person: _____

Type of Contract: _____

Amount: _____

Work to be Done: _____

MBE/WBE SHEET III

MINORITY AND WOMEN'S BUSINESS ENTERPRISE FAIR SHARE UTILIZATION

1. Information concerning the subcontractor(s) who will be used

Name: _____

Address: _____

Phone: _____

Contact Person: _____

Amount of subcontract quotation: _____

Segment of work to be subcontracted: _____

2. Information to be submitted by the bidder concerning good faith efforts taken.

- a. **Announcement:** List each publication in which an announcement or notification was placed and attach a copy of each announcement from each publication.

Name of publication: _____

Address: _____

Dates of announcement: _____

Specific subcontract amount: _____

- b. **Contractor Associations:** List all Minority and Women's Business contractor associations, construction supply associations, or general business associations notified - attached a copy of each notification letter:

- c. **Minority and Women's Businesses:** List each Minority and Women's Business, construction firm or supplier, to which a letter of solicitation was sent, or with whom negotiations were held.

Company name and phone number: _____

Area of Minority and Women's Business expertise: _____

Date of follow-up call and person contacted: _____

BASIS AND METHOD OF AWARD

1. Owner reserves the right to reject any and all Bids, to waive any and all informalities and to negotiate contract terms with the successful Bidder, and the right to disregard all nonconforming, nonresponsive or conditional bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
2. In evaluating Bids, Owners shall consider the qualifications of the Bidder, whether or not the Bids comply with the prescribed requirements and alternates and unit prices if requested in the Bid forms. The Owner intends to accept alternates (if any are accepted) in the order in which they are listed in the Bid Form but Owner may accept them in any order or combination.
3. Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work as to which the identity of Subcontractors and other persons and organizations must be submitted as provided in the Supplementary Conditions. Operating costs, maintenance considerations, performance data and guarantees of materials and equipment may also be considered by Owner.
4. Owner may conduct investigations he deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, proposed Subcontractors, and other persons and organizations to do the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
5. Owner reserves the right to reject the bid of any Bidder who does not pass investigations or evaluations to Owner's satisfaction. Owner may reject any Proposal where the unit price or individual lump sum prices are unbalanced and/or unfavorable to the Owner's interest.
6. Owner will not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension". Each Contractor and supplier (over \$25,000) shall complete Form 5700-49.
7. If Contract is awarded, it will be awarded to the lowest responsive responsible Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interest of the Project.
8. If the Contract is awarded, Owner will give the Successful Bidder a "Notice of Award" within the time stated in the advertisement after the day of the Bid opening.
9. When Owner gives a "Notice of Award" to the Successful Bidder, it will be accompanied by at least three unsigned counterparts of the Agreement and three copies of all other Contract Documents. Within ten days thereafter, Contractor shall sign and deliver at least three counterparts of the Agreement to Owner with three copies of all other Contract Documents attached. Within fifteen days thereafter, Owner will deliver one copy of all fully signed counterparts to the Contractor.

END OF SECTION

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SECTION 00467

CONTINUOUS TREATMENT PROVISIONS

1. Federal regulations prohibit bypassing of any sewage during construction operations. The Contractor will be responsible for providing any required temporary pumping facilities piping, etc., necessary to complete the project without any plant by-passing and continuous treatment must be provided at the same level during construction as existed prior to construction.
2. Unless otherwise previously or subsequently specified, the Contractor shall procure and pay for all permits, licenses, and approvals necessary for the execution of his Contract.
3. The Contractor shall comply with all laws, ordinances, rules, orders, and regulations relating to the performance of the work required to complete his Contract.

END OF SECTION

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PAYMENT METHODS

Payment:

1. The Director will have current estimates in writing, one each month, of the materials in place complete and the amount of work performed in accordance with the contract during the preceding month and value thereof. The Contractor shall be paid the amount of each such estimate less a deduction of ten per centum (10%) which shall be retained until final completion of all work covered by the contract. The City shall be responsible for the progress payments to the contractors even when failure to comply with WPCLF conditions, delay or disqualification of further loan payments.
2. Partial payments may be made for materials, fixtures and equipment in advance of their actual incorporation in the work, as the Director may approve, and upon such terms and conditions as he shall prescribe. In such event, the Contractor will be held responsible for such materials, fixtures, and equipment until their actual incorporation in the work and will be required to make good, at his own cost, any shortages, injury or damage to the same from any source of cause whatsoever. Unless otherwise approved by the director, the terms of Supplemental Condition 14.2.4 shall apply to payment for stored materials.
3. Upon final acceptance of the work as certified by the Director, the City shall pay to the Contractor, the whole amount of the money then due the said Contractor under the contract, except such sum as which have already been paid and exceed such sum as may have been expended by the City under the provisions of the contract and less a deduction of ten per centum (10%) to be retained for a further period of ninety (90) days. (D) Ninety (90) days after the final acceptance provided for in section (C) preceding, the ten percent (10%) retained shall be disposed as follows:
 - A. Eighty percent (80%) of the amount so retained (being eight percent (8%) of the total amount of the contract) less any claims or deduction that shall have been established against the said amount shall be paid to the Contractor.
 - B. Twenty percent (20%) of the amount so retained (being two percent (2%) of the total amount of the contract) shall continue to be retained by the City for a period of one year from the date of final acceptance at the end of which time, if there be no claim established under the terms of this contract, the whole amount shall be due and payable to the Contractor.
 - C. The parties mutually agree to comply with the applicable provisions of the O.R.C. 153.12, .13, .14 and .63 pertaining to escrow accounts and contract retainage.

Final Payment:

1. The payment of the money provided for in subsection (D) of the preceding section shall constitute a full and complete discharge of all of the duties and obligations of the City under this contract. All prior partial estimates shall be subject to correction in the final estimates.
2. The escrow agent shall hold the escrow principal and income until receipt of notice from the owner and the contractor, or until receipt of an arbitration order specifying the amount of escrow principal to be released and the person to whom it is to be released. Upon receipt of the notice or order, the agent shall properly pay such amount of principal and the portion of the amount of the escrow income to the person indicated.
3. The escrow agent shall be compensated for its services as agreed to by the owner and the contractor from the income from the escrow account.
 - A. The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at the site or near the site.
 - B. Prior to SUBSTANTIAL COMPLETION, the OWNER, with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

- C. The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK except such as may be caused by agents or employees of the OWNER.
- D. Upon completion and acceptance of the WORK, the ENGINEER shall issue a certificate attached to the final payment request that the WORK has been accepted by him under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of WORK.
- E. The CONTRACTOR will indemnify and save the OWNER or the OWNER'S agents harmless from claims growing out of the lawful demands of SUBCONTRACTORS, LABORERS, WORKMEN, MECHANICS, MATERIALMEN, and furnishers of machinery and parts thereof, equipment, tools and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so, the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money.

END OF SECTION

MUTUAL ARBITRATION

Arbitration by Mutual Agreement. Any Claim, dispute or other matter in question between the Contractor and the Owner, except those relating to artistic effect and those which have been waived by the making or acceptance of final payment, may be decided by arbitration if all parties mutually agree in writing.

However, no demand for arbitration of any such claim, dispute, or other matter may be made until the earlier of (1) the date on which the Engineer has rendered a written decision, or (2) the tenth day after the parties have presented their evidence to the Engineer or have been given a reasonable opportunity to do so, if the Engineer has not rendered his written decision by the date. When such a written decision of the Engineer states (1) that the decision is final but subject to appeal, and (2) that any demand for arbitration of a claim, dispute or other matter covered by such decision must be made within 30 days after the date on which the party making the demand receives the written decision, failure to demand arbitration when said 30 days' period will result the Engineer's decision becoming final and binding upon the Owner and the contractor. If the Engineer renders a decision after mutually agreed arbitration proceedings are initiated, the decision may be entered as evidence, but will not supersede any arbitration proceedings unless the decision is acceptable to all parties concerned.

All such claims, disputes, and other matters in question between the Contractor and the Owner may be mutually agreed to be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then pertaining unless the parties mutually agree otherwise. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation, joinder, or in any other manner, the Engineer, his employees or consultants except by written consent containing a specific reference to the Owner contractor Agreement and signed by the Engineer, the Owner, the Contractor and any other person sought to be joined. No arbitration shall include, by consolidation, joinder or in any other manner, parties other than the Owner, the Contractor and any other persons substantially involved in a common question of fact or law, whose presence is required if complete relief is to be accorded in the arbitration. No person other than the Owner or Contractor shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Any consent to arbitration involving an additional person or persons shall not constitute consent to arbitration or any dispute not described therein. The foregoing agreement to arbitrate and any other agreement to arbitrate with an additional person or persons duly consented to by the parties to the Owner-Contractor Agreement shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

END OF SECTION

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REQUIREMENT FOR UTILIZATION OF SMALL BUSINESSES IN RURAL

AREAS (SBRA)

This procurement is subject to the EPA policy of encouraging the participation of small businesses in rural areas. It is EPA policy that recipients of EPA financial assistance awards utilize the services of small businesses in rural area (SBRA's), to the maximum extent practicable. The objective is to assure that such small business entities are afforded the maximum practicable opportunity to participate as subcontractors, suppliers and otherwise in EPA-awarded financial assistance programs. This policy applies to all contracts and subcontracts for supplies, construction, and services under EPA grants or cooperative agreements. Small purchases are also subject to this policy.

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Instructions

Under Executive Order 12549, an individual or organization debarred or excluded from participation in Federal assistance of benefit programs, may not receive any assistance award under a Federal program or a sub-agreement thereunder for \$25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or sub-agreement participant thereunder must complete the attached certification or provide an explanation why they cannot. For further details, see 40 CFR 32510, Participants' responsibilities in the attached regulation.

Where to Submit:

The prospective EPA grant, loan, or cooperative agreement recipient must return the signed certification or explanation with its application to the appropriate EPA Headquarters or Regional office, as required in the application instructions.

A prospective prime contractor must submit a completed certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

How to Obtain Forms:

EPA includes the certification form, instructions, and a copy of its implementing regulation (40 CFR Part 32) in each application kit. Applicants may reproduce these materials as needed and provide them to their prospective prime contractor, who, in turn, may reproduce and provide them to prospective subcontractors.

Additional copies/assistance may be requested from:

Compliance Branch
Grants Administration Division (PM-216F)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460
(Telephone: (202) 475-8025)

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SECTION 00480

VIOLATING FACILITIES CLAUSE

VIOLATING FACILITIES:

The Contractor shall comply with all applicable standards, orders or requirements under Section 306 of the Clean air Act, 42 USC 1857 (h), Section 508 of the Clean Water Act, 33 US C 1368, Executive Order 117389, and EPA regulations, 40 CFR Part 32, which prohibits the use of facilities under non-exempt Federal contracts, grants, or loans of facilities included on the EPA List of Violating Facilities.

END OF SECTION

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SECTION 00485

LOCAL PROTEST PROCEDURE

1. A protest based upon an alleged violation of the procurement requirements may be filed against the OWNER's procurement action by a party with an adversely affected direct financial interest. The protest shall be filed with the Owner's chief administrative Officer. The OWNER shall determine the protest and may request additional information or a hearing in order to resolve the protest.
2. A protest shall be filed as early as possible during the procurement process, but must be received by the OWNER no later than one week after the basis of the protest is known or should have been known, whichever is earlier. If the protest is mailed, the protester bears the risk of non-delivery within the required time period.
3. A protest must clearly present the procurement requirement being protested, the facts which support the protest, and any other information necessary to support the protest.

END OF SECTION

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CONTRACT AGREEMENT FORM

CONTRACT AGREEMENT FORM
FOR
VILLAGE OF WELLSVILLE

PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS

THIS AGREEMENT is dated the ____ day of _____, 20____.

BY AND BETWEEN _____, hereinafter called CONTRACTOR and the VILLAGE OF WELLSVILLE, OHIO, hereinafter called the OWNER.

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

1. SCOPE OF WORK

The CONTRACTOR shall furnish all labor, materials, supplies, equipment and other facilities and things necessary or proper or incidental to complete performances of the work under this Contract for the OWNER as required by and in strict accordance with the applicable Contract Documents entitled, PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS for Wellsville, Ohio, and shall complete everything required by the Contract and Contract Documents.

2. ENGINEER

This project has been designed by GGJ, INC., 35585 Curtis Blvd., Unit C, Eastlake, Ohio 44095, who is hereinafter called ENGINEER and who will assume all duties and responsibilities and will have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

3. CONTRACT TIME

3.1 The Work will be substantially completed within 210 calendar days after the date when the contract Time commences to run as provided in Paragraph 2.3 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.13 of the General Conditions within 30 calendar days after substantial completion.

3.1.1 Commencement of the demolition of existing facilities shall not commence without written authorization of the Engineer.

3.2 OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not complete within the time specified in Paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the work is not complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER Seven Hundred Fifty Dollars (\$750.00) for each day that expires after the time specified in Paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial Completion if CONTRACTOR shall neglect, refuse or fail to complete the remaining work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER One-Thousand Dollars (\$1,000.00) for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment.

4. CONTRACT PRICE

4.1 OWNER shall pay CONTRACTOR for performance of the Work in accordance with the Contract

Documents, in current funds, the sum of _____ \$ _____
(The amount shall be shown in both words and figures; in the case of discrepancy, the amount shown in words will govern.) in accordance with Article 14 of the General Conditions.

- 4.2 The following percentages shall be used to calculate CONTRACTOR'S Fee (overhead and profit) for changes in the value of work per Article 11.6 of the General Conditions as modified by the Supplementary Conditions.

4.2.1 Labor and Material (paragraph 11.6.1.1) 6.5 percent

4.2.2 Subcontractors (paragraph 11.6.1.2) 5 percent

5. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

- 5.1 Progress Payments - OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR'S Applications for Payment as recommended by ENGINEER, once each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the Schedule of Values provided for in Paragraph 14.1 of the General Conditions.

5.1.1 Until the Work is 50% complete, progress payments will be in an amount equal to 92% of the work completed and 90% of materials and equipment not incorporated in the Work but delivered and suitably stored, less in each case the aggregate of payments previously made.

5.1.2 When the work is 50% complete, reduction of the withholding to 4% of the dollar value of all Work satisfactorily completed to date will be made provided that the CONTRACTOR is making satisfactory progress and there is no specific cause for greater withholding.

5.1.3 Upon substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 100% of the contract price, less only 1-1/2 times such amount as is required to complete any then remaining, uncompleted, minor items, which amount shall be certified by the ENGINEER.

- 5.2 Final Payment - Upon final completion and acceptance of the Work in accordance with Paragraph 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER.

6. INTEREST

All monies not paid when due hereunder shall bear interest at the maximum rate allowed by law in Ohio for public contracts.

7. CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

7.1 CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality and with all local conditions and federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

7.2 CONTRACTOR has studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which were relied upon by ENGINEER in the preparation of the Drawings and Specifications and which have been identified in the Supplementary Conditions.

7.3 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in those referred to in Paragraph 7.2 as he deems necessary for the

performance of the Work at the Contract Price, within the Contract Time and in accordance with the other items and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purpose.

- 7.4 CONTRACTOR has correlated the results of all such observations, examination, investigations, tests, reports and data with the terms and conditions of the Contract Documents.
- 7.5 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

8. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR are attached to this Agreement, and made a part hereof and consists of the following:

- 8.1 This Agreement identified as Section 00500.
- 8.2 Contract Bonds, identified as Section 00610.
- 8.3 Workmen's Compensation Certification, identified as Section 00630.
- 8.4 Certificate of Owner's Fiscal Officer, identified as Section 00635.
- 8.5 Certificate of Owner's Legal Counsel, identified as Section 00640.
- 8.6 Notice of Commencement, identified as Section 00645.
- 8.7 Notice of Award, identified as Section 00680.
- 8.8 Notice to Proceed, identified as Section 00681.
- 8.9 Standard General Conditions of the Construction Contract, identified as Section 00700.
- 8.10 Supplementary Conditions, identified as Section 00800.
- 8.11 Evidence of insurance.
- 8.12 Specifications bearing the title Project Manual, including specifications for construction of: PUMP STATION #1 AND FORCEMAIN IMPROVEMENTS FOR WELLSVILLE, OHIO.
- 8.13 Drawings consisting of a Cover Sheet and Drawings numbered inclusive with each sheet bearing the general title as outlined in the Drawings Index of the Project Manual.
- 8.14 Addenda numbers _____ to _____ inclusive.
- 8.15 CONTRACTOR'S Bid, identified as Sections 00300, 00410, 00420, 00430, 00440, and 00450.
- 8.16 Documentation submitted by CONTRACTOR prior to Notice of Award.
- 8.17 Any Modification, including Change Orders, duly delivered after execution of Agreement.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be altered, amended or repealed by a Modification (as defined in Section 1 of the General Conditions).

9. MISCELLANEOUS

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

9.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

9.3 OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement will be effective on _____, 20____

_____(SEAL)
(Owner's Representative)

_____(SEAL)
(Contractor's Representative)

Joseph Surace
(Printed Name of Representative)

(Printed Name of Representative)

Witness _____

Address for giving notices to OWNER

Address for giving notices to CONTRACTOR

Village of Wellsville

1200 Main Street

Wellsville, Ohio 43968

END OF SECTION

SECTION 00610

BID GUARANTY AND CONTRACT BOND

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

(Name and Address of Principal)

as Principal, and

(Name and Address of Surety)

as Surety, are hereby held and firmly bound unto

Village of Wellsville, 1200 Main Street, Wellsville, Ohio 43968

(Name and Address of Obligee/Owner)

hereinafter called the Obligee, in the penal sum of the dollar amount of the bid submitted by the Principal to the

Obligee on _____

to undertake the project known as: Pump Station #1 and Forcemain Improvements

The penal sum referred to herein shall be the dollar amount of the Principal's bid to the Obligee, incorporating any additive or deductive alternate proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case shall the penal sum exceed the amount of

_____ dollars (\$_____).

(IF THE ABOVE LINES ARE LEFT BLANK, THE PENAL SUM WILL BE THE FULL AMOUNT OF THE PRINCIPAL'S BID, INCLUDING ALTERNATES. ALTERNATIVELY, IF COMPLETED, THE AMOUNT STATED MUST NOT BE LESS THAN THE FULL AMOUNT OF THE BID, INCLUDING ALTERNATES, IN DOLLARS AND CENTS. A PERCENTAGE IS NOT ACCEPTABLE.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named Principal has submitted a bid on the above referred to project;

NOW THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the Principal pays to the Obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the Obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the Principal will pay the Obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising and printing and mailing contract documents, required advertising and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be void, otherwise to remain in full force and effect. If the Obligee accepts the bid of the Principal and the Principal within ten (10) days after the awarding of the contract, enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material which said contract is made a part of this bond the same as though set forth herein, and IF THE SAID Principal shall well and faithfully perform each and every condition of such contract; and indemnify the Obligee against all damage suffered by failure to perform such contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefore; and shall pay all lawful claims of subcontractors, material suppliers, and laborers, for labor performed and materials furnished in the carrying forward performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any material supplier or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full 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 SAID Surety hereby stipulates and agrees that no modification, omissions or additions, in or to the terms of said contract or in or to the plans and specifications therefore shall in any way affect the obligations of said Surety on this bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

SIGNED AND SEALED this ____ day of _____, 20____.

	_____	Principal
_____	By: _____	Title
Witness		
	_____	Surety
_____	By: _____	
Witness		
	_____	Attorney-In-Fact
	_____	Surety Agents Address:

END OF SECTION

SECTION 00620

PAYMENT BOND

Know all men by these presents, that we, _____, as PRINCIPAL, and _____, as sureties are held and firmly bound unto the **Village of Wellsville**, its certain attorney, successors, or assigns (hereinafter called the OBLIGEE) in the sum of _____ Dollars (\$ _____) lawful money of the United State, for the payment of which sum will and truly to be made, we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally firmly by these presents:

WHEREAS, said PRINCIPAL has entered into a certain contract with said OBLIGEE, dated _____ 20 __, hereinafter called the Contract) for **Pump Station #1 and Forcemain Improvements** which contract and the specifications for said Work shall be deemed a part thereof as fully as if set out herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if said PRINCIPAL and all subcontractors to whom any portion of the work provided for in said contract is sublet and all assignees of said PRINCIPAL and of such subcontractors shall promptly make payment for all material furnished, labor supplied or performed, rental for equipment employed, and services rendered by public utilities in or in connection with the prosecution of the work, whether or not the said material, labor, equipment, or services enter into and become component parts of the work or improvement contemplated in said contract, of in any amendment or extension of or addition to said Contract, then the above obligation shall be void; otherwise to remain in full force and effect, PROVIDED, however, that this bond is subject to the following conditions and limitations:

- (a) All persons who have performed labor, rendered services or furnished materials or machinery, shall have a direct right of action against the PRINCIPAL and surety on this bond, which right of action shall be asserted in proceedings instituted in the State in which labor was performed, services rendered or materials furnished under said contract in more than one state, then in any such state). Insofar as permitted by laws of such state, such right of action shall be asserted in a proceeding instituted in the name of the OBLIGEE to the right and benefit of the person instituting such action and any or all other persons having claims hereunder, and any other person having a claim hereunder shall have the right to be made a party to such proceedings (but not later than 2 years after the complete performance of said Contract and final settlement thereof) and to have such claim adjudicated in such action and judgment rendered thereon.
- (b) The surety shall not be liable hereunder for any damages or compensation recoverable under any workmen's compensation or employer's liability statute.
- (c) In no event shall the surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than 2 years after the complete performance of said Contract and final settlement thereof.
- (d) As used herein: The term "person" refers to any individual, firm or corporation who have furnished materials or machinery or public utility services to be used on or incorporated in the work or the prosecution thereof provided for in said Contract or in any amendment or extension of or addition to said Contract, and/or to any person engaged in the prosecution of the work provided for in said Contract of in any amendment or extension of or addition to said Contract who is an agent, servant or employee of the PRINCIPAL or of any subcontractor, or of any assignee of said PRINCIPAL, or any subcontractor, or any assignee of said principal or of said subcontractor, and such labor or mechanic, but shall not include office employees not regularly stationed at the site of the work.

The said surety, for value received, hereby stipulates and agrees that no charge, extension of time, alteration or addition to the terms of the Contract, or to the work to be performed thereunder or the Specifications accompanying the same, shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time alteration or addition to the terms of the Contract or to the work or to the Specifications.

SIGNED, SEALED AND DELIVERED IN _____ ORIGINAL COUNTERPARTS THIS _____ day of _____, 20 ____.

(Individual Principals sign here)

BY: _____

TITLE: _____ (SEAL)

BY: _____

TITLE: _____ (SEAL)

Attest:

By: _____

Title: _____

Attest:

By: _____

Title: _____

BY: _____

TITLE: _____ (SEAL)

(Corporate Principal sign here)

BY: _____

TITLE: _____ (SEAL)

(Surety Sign Here)

BY: _____

TITLE: _____ (SEAL)

The rate of premium charges is \$ _____ per thousand.

The total amount of the premium charged \$ _____.

(The above must be filled in by the Corporate Surety.)

NOTE: Date of Bond must not be prior to date of NOTICE OF AWARD. If CONTRACTOR is Partnership, all partners should execute Bond.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 70 as amended) and be authorized to transact business in the State where the Project is located.

END OF SECTION

SECTION 00630

WORKERS' COMPENSATION CERTIFICATION

The undersigned CONTRACTOR, _____, being duly sworn according to law deposes and accepts the provisions of Workers Compensation for the State of Ohio, with its supplements and amendments, and provides insured liability thereunder in accordance with the terms of said Act with

(Name of Insurance Company, with Policy Number)

Date _____, 20 ____

(Signature of Contractor's Representative)

(Printed Name of Representative)

(Title of Contractor's Representative)

END OF SECTION

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SECTION 00635

CERTIFICATE OF FISCAL OFFICER

I, Dale Davis, duly appointed and acting Fiscal Officer of the
Village of Wellsville, do hereby certify that a copy of the foregoing CONTRACT has been
received by me from the Auditor of Village of Wellsville and that I hereby certify that the
amount of _____ Dollars (\$ _____) required to
meet the payment of this CONTRACT has been lawfully appropriated or authorized or directed for such purpose of
complying with the terms and conditions of the foregoing CONTRACT, and is on deposit or in the process of collection to
the credit of the appropriate fund and the same is free from any previous encumbrances.

WITNESS MY HAND this _____ day of _____, 20____, at _____.
(Day) (Month) (Year)

Fiscal Officer

Dale Davis
(Printed Name of Fiscal Officer)

END OF SECTION

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SECTION 00640

CERTIFICATE OF LEGAL COUNSEL

On this _____ day of _____, 20_____, I, **Andrew Beech**, Legal Counsel
(Month) (Year)
of **Village of Wellsville** do hereby approve the foregoing CONTRACT with
_____ as to form.
(Contractor)

(Legal Counsel)

Andrew Beech
(Printed Name of Legal Counsel)

END OF SECTION

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OWNER'S NOTICE OF COMMENCEMENT

State of Ohio,)
) ss.
County of Columbiana)

NOTICE OF COMMENCEMENT
00645-1

following representative of the Public Authority: Joseph Surace Mayor at
Name Title
1200 Main Street. Wellsville, Ohio 43968
Address

FURTHER AFFIANT SAYETH NAUGHT.

Signature

SWORN TO BEFORE ME and subscribed in my presence this _____ day of _____, 20__.

Notary Public

[SEAL]

SECTION 00650

ONE-YEAR GUARANTEE

Contractor shall guarantee all work, labor, materials, and equipment provided for a period of one year from the date that final payment is due. The following shall be completed as part of the project closeout process.

Project: Pump Station #1 and Forcemain Improvements

Owner: Village of Wellsville

Contractor: _____

Contractor Address: _____

Project Manager: _____

Phone Number: _____

Contract Start _____

Contract Completion Date: _____

One-Year Guarantee
Start Date: _____ (Date of Contract Completion Certificate)

One-Year Guarantee
Completion Date: _____

The undersigned hereby guarantees all material and labor for work performed for a period of one (1) year from the date of the final completion certificate by the Owner, Village of Wellsville, or its representative and acceptance of the property owner(s). All available manufacturers' warranties and suppliers' guarantees covering materials and equipment, under subject contract are attached. This guarantee shall include all labor, equipment, materials, or other items required to correct defects or deficiencies in the work provided. The contractor will not, however, guarantee any damage caused by improper use, extremely heavy wear, vandalism, or "Acts of God" such as high winds, extremely heavy snow storms, ice storms or flooding if the specifications or design criteria was exceeded.

The undersigned hereby certifies that all work required under this contract has been performed in accordance with terms thereof. The undersigned further certifies that all payments due for materials, supplies, equipment; and all payments due to sub-contractors, laborers or mechanics for subject work, have been made or will be made within fifteen (15) days of receipt of requested final payment.

Upon receipt of final payment, the undersigned does hereby release the property owner(s) and the Owner, Village of Wellsville from any and all claims which may arise under or by virtue of this contract.

Contractor (Company Name)

Signature and Title of Officer, Partner or Individual

Date

Witness

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SECTION 00655

DELINQUENT PERSONAL PROPERTY STATEMENT

Name of Bidder: _____

Address: _____

Having been awarded a contract by Village of Wellsville, Ohio, hereby affirms under oath, pursuant to the Ohio Revised Code Section 5719.042 (see Section 00610-2) that at the time this bid was submitted, my company (was) (was not) charged with delinquent personal property taxes on the general tax list of personal property for Columbiana County, Ohio. If such charge for delinquent personal property tax exists on the general tax list of personal property of Columbiana County, Ohio the amount of such due and unpaid delinquent taxes, including due and unpaid penalties and interest shall be set forth below.

A copy of this statement shall be transmitted by the Bidder to the county treasurer within thirty days of the date it is submitted. A copy of this statement shall also be incorporated into the contract made between the

Village of Wellsville and _____
(Name of Owner) (Name of Bidder)

and no payment with respect to any contract shall be made unless such a statement has been so incorporated as a part thereof.

Delinquent Personal Property Tax: \$ _____

Penalties: \$ _____

Interest: \$ _____

Bidder: _____

By: _____

Title: _____

Subscribed in my presence, and sworn to me this _____ day of _____, 20 ____.

Notary Public

SEAL

Ohio Revised Code Section 5791.042

5791.042 Successful bidders on contract with a taxing district to disclose any delinquent personal property taxes.

After the award by a taxing district of any contract let by competitive bid and prior to that time the contract is entered into, the person making a bid shall submit to the district's fiscal officer a statement affirmed under oath that the person with whom the contract is to be made was not charged at the time the bid was submitted with any delinquent personal property taxes on the general tax list of personal property of any county in which the taxing district has territory or that such person was charged with delinquent personal property taxes on any such tax list, in which case the statement shall also set for the amount of such due and unpaid delinquent taxes and any due and unpaid penalties and interest thereon. If the statement indicates that the taxpayer was charged with any such taxes, a copy of the statement shall be transmitted by the fiscal officer to the county treasurer within thirty days of the date it is submitted.

A copy of the statement shall also be incorporated into the contract, and no payment shall be made with respect to any contract to which this section applies unless such statement has been so incorporated as a part thereof.

HISTORY: 1982 H 379, eff. 9-21-82

CROSS REFERENCES

See Baldwin's Ohio School Law, Text 105.07

END OF SECTION

SECTION 00680

NOTICE OF AWARD

EFFECTIVE DATE _____ 20____

TO: _____
[BIDDER]

ADDRESS: _____

PROJECT: Pump Station #1 and Forcemain Improvements

CONTRACT FOR: Village of Wellsville

You are hereby notified that your Bid dated _____, 20____ for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for the above named project.

The Bid Price of your contract is \$ _____

Six (6) copies of each of the proposed Contract Documents accompany this Notice of Award. Three sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within 14 days of the Effective Date of this Notice of Award.

1. You must deliver to the Owner six (6) fully executed counterparts of the Agreement, including all the Contract Documents.
2. You must deliver with the executed Agreement, the Payment and Performance Bonds and the Insurance Certificate as specified in the Instructions to Bidders, The General Conditions (Article 5), and the Supplementary Conditions.

Failure to comply with these conditions within the time specified will entitle the Owner to consider you Bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within 10 days after you comply with the foregoing conditions, the Owner will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

OWNER: Village of Wellsville

By: _____

Title: _____

Copy to Engineer by Certified Mail

_____ Return Receipt Requested

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____,
this ____ day of _____, 20 _____. (Bidder)

By: _____

Title _____

END OF SECTION

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SECTION 00681

NOTICE TO PROCEED

EFFECTIVE DATE _____ 20 _____

To: _____

Address: _____

Project Title: Pump Station #1 and Forcemain Improvements

Owner's Project No. _____

Contract for: Village of Wellsville, Ohio

You are hereby notified that the Contract Time under the above Contract will commence to run on the Effective Date of this Notice to Proceed. By that date, you are to start performing your obligations under the Contract Documents, in accordance with the provisions in Section 3.1 of the Contract Agreement.

The Time or Date of Final Completion is _____ on _____, 20 _____, which is _____ calendar days after the Effective Date of this Notice to Proceed.

Section 3.2 of the Contract Agreement provides for an assessment of liquidated damages for each calendar day after the above-established contract completion date that the Work remains incomplete.

Before starting any Work at the site, Paragraph 2.5 of the General Conditions provides that the Contractor must study the Contract Documents and verify figures and field dimensions, and must report any observed errors or discrepancies.

Also, before starting any Work at the site, Contractor must:

1. Submit to the Engineer the Proposed Schedule called for in Section 01300 Submittals.

VILLAGE OF WELLSVILLE

By: _____

Title: Mayor

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

_____, this the _____ day of _____, 20_____
(month) (year)

Bidder _____

By _____

Title _____

Copy to Engineer (Use Certified Mail, Return Receipt Requested)

END OF SECTION

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CONTRACTOR'S PAY REQUEST

OWNER:	APPLICATION NO.: _____ WORK COMPLETED TO: _____ JOB NUMBER: _____
CONTRACTOR:	ENGINEER: GGJ., INC. 35585 Curtis Boulevard, Unit C Eastlake, Ohio 44836
PROJECT: _____	

1 ORIGINAL CONTRACT PRICE	_____
2 APPROVED CHANGE ORDERS	_____
3 CURRENT CONTRACT PRICE (Line 1 + 2)	_____
4 CONTRACT COMPLETED TO DATE	_____
5 CHANGE ORDER COMPLETED TO DATE	_____
6 STORED MATERIAL	_____
7 TOTAL COMPLETED TO DATE (Line 4 + 5 + 6)	_____
8 RETAINAGE	
a. 10% of completed work	_____
b. 10% of stored work	_____
Total Retainage (Line 8a + 8b)	_____
9 TOTAL EARNED LESS RETAINAGE (Line 7 less Line 8 total)	_____
10 LESS PREVIOUS PAYMENTS (Line 9 from prior certificate)	_____
11 CURRENT PAYMENT DUE	_____

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner		
Total approved this Month		
TOTALS		
NET CHANGES by Change Order		

CONTRACTOR:

CONTRACTOR'S CERTIFICATE: I hereby certify that the above materials and services have been furnished and performed in accordance with the conditions of the contract for the above work, and that payment has not been received and therefore is due and to be paid on said contract

BY: _____

DATE: _____

ENGINEER: **GGJ., INC.**

ENGINEER'S CERTIFICATE FOR PAYMENT: In accordance with the Contract Documents based on on-site observations and the data comprising the above application, the Engineer certifies to the Owner that to the best of the Engineer's knowledge, information and belief, the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

BY: _____

DATE: _____

OWNER:

BY: _____

DATE: _____

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APPLICATION FOR PAYMENT UNIT PRICE BREAKDOWN

Cut Off Date:
Pay Request No.:

#REF!

#REF!

#REF!

#REF!

[illegible]

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CHANGE ORDER**No.**

PROJECT: Pump Station #1 and Forcemain Improvement		GGJ NO. 09-044	
DATE OF ISSUANCE:		EFFECTIVE DATE:	

OWNER:	Village of Wellsville	OWNER's CONTRACT NO.	
CONTRACTOR		ENGINEER:	GGJ, Inc. 35585 Curtis Blvd., Unit C Eastlake, Ohio 44095

You are directed to make the following changes in the Contract Documents:

Description:

Reason for change Order:

Attachments:

CHANGE IN CONTRACT PRICE:	CHANGE IN CONTRACT TIMES:	
Original Contract Price:	Original Contract Times:	<i>(days or dates)</i>
	Substantial Completion:	
	Ready for Final Payment:	

Net changes from previous Change Orders No. ___ to No. __	Net changes from previous Change Orders No. ___ to No. ____

Contract Price prior to this Change Order:	Contract Times prior to this Change Order:	
	Substantial Completion:	
	Ready for Final Payment:	

Net Increase (Decrease) of this Change Order:	Net Increase (Decrease) of this Change Order: (days)

Contract Price with all approved Change Orders:	Contract Times with all approved Change Orders:	
	Substantial Completion: <i>Days or dates</i>	
	Ready for final payment: <i>Days or dates</i>	

RECOMMENDED:	APPROVED:	ACCEPTED:
By:	By:	By:
GGJ, Inc.	Owner (Authorized Signature)	Contractor (Authorized Signature)
Date:	Date:	Date:

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CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT Pump Station #1 and Forcemain Improvements

DATE OF ISSUANCE _____

OWNER Village of Wellsville

OWNER'S CONTRACT NO. _____

CONTRACTOR _____ ENGINEER GGJ, Inc

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

TO Village of Wellsville
OWNER

AND TO _____
CONTRACTOR

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

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

EJCDC No. 1910-8-D (1990 Edition)

Prepared by the engineers Joint Contract Documents Committee and endorsed by the Associated General Contractors of America.

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PARTIAL WAIVER OF LIEN

To All Whom It May Concern:

WHEREAS, the undersigned has been employed by (A) _____

to furnish labor and materials for (B) _____

under a contract (C) _____

for the improvement of the premises described as (D) _____

in the _____ (City-Village) of _____

County of _____, State of _____

of which _____

_____ is the Owner.

NOW, THEREFORE, this _____ day of _____, 20 _____.

for and in consideration of the sum of (E) _____

Dollars paid simultaneously herewith, the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release to the extent only of the aforesaid amount, any lien rights to, or claim of lien with respect to and on said above-described premises, and the improvements thereon, and on the monies or other considerations due or to become due from the owner, by virtue of said contract, on account of labor, services, materials, fixtures, apparatus or machinery furnished by the undersigned to or for the above-described premises, but only to the extent of the payment aforesaid.

(F) _____ (SEAL)
(Name of sole ownership, corporation or partnership)

**(Affix Corporate
Seal Here)**

_____ (SEAL)
(Signature of Authorized Representative)

_____ TITLE

INSTRUCTIONS FOR PARTIAL WAIVER:

- A) Name person or firm with whom you agreed to furnish either labor, or services, or materials, or both.
- B) Fill in nature and extent of work; strike the word labor or the word materials if not in your contract.
- C) If you have more than one contract on the same premises, describe the contract by number if available, date and extent of work.
- D) Furnish an accurate enough description of the improvements and location of the premises so that it can be distinguished from any other property.
- E) Amount shown should be the amount actually received on that date.
- F) If waiver is for a corporation, corporate name should be used, corporate seal affixed and title of officer signing waiver should be set forth; if waiver is for a partnership, the partnership name should be used, partner should sign and designate himself as partner.
- G) To be prepared and submitted with each estimate; preparation to be by Prime, Sub-Contractors, and Suppliers that are included in the estimate.

Construction Industry Affairs Committee of Chicago

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FINAL WAIVER OF LIEN

To All Whom It May Concern:

WHEREAS, the undersigned has been employed by (A) _____

to furnish labor and materials for (B) _____

under a contract (C) _____

for the improvement of the premises described as (D) _____

in the _____ (City-Village) of _____

County of _____, State of _____

of which _____

_____ is the Owner.

NOW, THEREFORE, this _____ day of _____, 20 ____.

for and in consideration of the sum of (E) _____

Dollars paid simultaneously herewith, the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release any lien rights to, or claim of lien with respect to and on said above-described premises, and the improvements thereon, and on the monies or other considerations due or to become due from the owner, on account of labor, services, materials, fixtures, apparatus or machinery heretofore or which may hereafter be furnished by the undersigned to or for the above-described premises by virtue of said contract.

(F) _____ (SEAL)
(Name of sole ownership, corporation or partnership)

**(Affix Corporate
Seal Here)**

_____ (SEAL)
(Signature of Authorized Representative)

_____ TITLE

INSTRUCTIONS FOR FINAL WAIVER:

- (A) Name person or firm with whom you agreed to furnish either labor, or services, or materials, or both.
- (B) Fill in nature and extent of work; strike the word labor or the word materials if not in your contract.
- (C) If you have more than one contract on the same premises, describe the contract by number if available, date and extent of work.
- (D) Furnish an accurate enough description of the improvements and location of the premises so that it can be distinguished from any other property.
- (E) Amount shown should be the amount actually received and equal to total amount of contract as adjusted.
- (F) If waiver is for a corporation, corporate name should be used, corporate seal affixed and title of officer signing waiver should be set forth; if waiver is for a partnership, the partnership name should be used, partner should sign and designate himself as partner.

Construction Industry Affairs Committee of Chicago

END OF SECTION

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SECTION 00700

**STANDARD
GENERAL CONDITIONS
OF THE
CONSTRUCTION CONTRACT**

Prepared by
Engineers Joint Contract Documents Committee
And
Issued and Published Jointly By

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

CONSTRUCTION SPECIFICATIONS INSTITUTE

This document has been approved and endorsed by

The Associated General

Contractors of America

These General Conditions have been prepared for use with the Owner-Contractor Agreements (No. 1910-A-1 or 1910-8-A-2) (1990 Editions). Their provisions are interrelated and a change in one may necessitate a change in the others. Comments concerning their usage are contained in the Commentary on Agreements for Engineering Services and Contract Documents (No. 1910-9) (1986 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. 1910-17) (1990 Edition). When bidding is involved, the Standard Form of Instructions to Bidders (No. 1910-12) (1990 Edition) may be used.

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS

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

1.1 *Addenda*—Written or graphic instruments issued prior to the opening of Bids, which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2 *Agreement*—The written contract between OWNER and CONTRACTOR covering the Work to be performed: other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3 *Application for Payment*—The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4 *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.5 *Bid*—The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6 *Bidding Documents*—The advertisement or invitation to Bid, instructions to bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7 *Bidding Requirements*—The advertisement of invitation to Bid, instructions to bidders and the Bid Form.

1.8 *Bonds*—Performance and Payment bonds and other instruments of security.

1.9 *Change Order*—A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

1.10 *Contract documents*—The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary

Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders and ENGINEER's written interpretations and clarifications issued pursuant to paragraphs 3.5, 3.6.1 and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 1.2.2.2 are not Contract Documents.

1.11 *Contract Price*—The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.12 *Contract Times*—The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13.

1.13 *CONTRACTOR*—The person, firm or corporation with whom OWNER has entered into the Agreement.

1.14 *Defective*—An adjective which when notifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.15 *Drawings*—The drawings which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.16 *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

1.17 *ENGINEER*—The person, firm or corporation named as such in the Agreement.

1.18 *ENGINEER's Consultant*—A person, firm or corporation having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Condition.

1.19 *Field Order*—A written order issued by ENGINEER which orders minor changes in the Work in

accordance with paragraph 9.5 but which does not involve a change in the contract Price or the Contract Times.

1.20 *General Requirements*—Sections of Division 1 of the Specifications.

1.21 *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.22 *Laws and Regulations: Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23 *Liens*—Liens, charges, security interests or encumbrances upon real property or personal property.

1.24 *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.25 *Notice of Award*—The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

1.26 *Notice to Proceed*—A written notice by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

1.27 *OWNER*—The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.28 *Partial Utilization*—Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29 *PCB's*—Polychlorinated biphenyls.

1.30 *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene and oil mixed with other non-Hazardous Wastes and crude oils.

1.31 *Project*—The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.32 *Radioactive Material*—Source, special nuclear, or by-product material as defined by the Atomic Energy Act of

1954 (42 USC Section 2011 et seq.) as amended from time to time.

1.33 *Resident Project Representative*—The Authorized representative of ENGINEER who may be assigned to the site or any part thereof.

1.34 *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.35 *Shop Drawings*—All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

1.36 *Specifications*—Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

1.37 *Subcontractor*—An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.38 *Substantial Completion*—The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.39 *Supplementary Conditions*—The part of the Contract Documents which amends or supplements these General Conditions.

1.40 *Supplier*—A manufacturer, fabricator, supplier, distributor, material man or vendor have a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.41 *Underground Facilities*—All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.42 *Unit Price Work*—Work to be paid for on the basis of unit prices.

1.43 *Work*—The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.44 *Work Change Directive*—A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the Contract times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times as Provided in Paragraph 10.2.

1.45 *Written Amendment*—A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

ARTICLE 2—PRELIMINARY MATTER

Delivery of Bonds:

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

Copies of Documents:

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

Commencement of Contract Times; Notice to Proceed:

2.3 The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Work:

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

Before Starting Construction:

2.5 Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

2.6 Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1 A preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the contract Documents.

2.6.2 A preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submit, reviewing and processing such submittal.

2.6.3 A preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.7 Before any Work at the site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with paragraphs 5.4, 5.6 and 5.7.

Preconstruction Conference:

2.8 Within twenty days after the Contract Times start to run, but before any Work at the site is started, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedules:

2.9 Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.6, CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER as provided below. The progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefore, CONTRACTOR's schedule of shop Drawing and Sample submissions will be acceptable to ENGINEER as providing a workable arrangement for reviewing and processing the required submittals. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

3.1 The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR

concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases, which have a well-known technical or construction industry or trade meaning, are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3 Reference to Standards and Specifications of Technical Societies: Reporting and Resolving Discrepancies:

3.3.1 Reference to standards, specifications, manuals or codes of any technical society, organization or association, or the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2 If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy with the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

3.3.3 Except as otherwise specifically stated in the Contract Documents or a may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or

discrepancy between the provisions of the Contract Documents and:

3.3.3.1 The provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2 The provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or regulation).

No provision of any such standard, specification manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER or any of ENGINEER's Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4 Whenever in the Contract Documents the terms "as ordered", "as directed", "as require", "as allowed", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1 A Formal Written Amendment.

3.5.2 A Change Order (pursuant to paragraph 10.4), or

3.5.3 A Work change Directive (pursuant to paragraph 10.1).

3.6 In addition, the requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.6.1 A Field Order (pursuant to paragraph 9.5).

3.6.2 ENGINEER's approval of a Shop Drawing or Sample (pursuant to paragraphs 6.26 and 6.27), or

3.6.3 ENGINEER's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.7 CONTRACTOR and any subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

ARTICLE 4—AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands:

4.1 OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a correct statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. OWNER shall identify any encumbrances of restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures of permanent changes in existing facilities will be obtained

and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 *Subsurface and Physical Conditions:*

4.2.1 *Reports and Drawings:* Reference is made to the Supplementary Conditions for identification of:

4.2.1.1 *Subsurface Conditions:* Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents: and

4.2.1.2 *Physical Conditions:* Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparing the Contract Documents.

4.2.2 *Limited Reliance by CONTRACTOR Authorized: Technical Data:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions, except for such reliance on such "technical data." CONTRACTOR may not rely upon or make any claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

4.2.2.1 The completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2 Other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3 Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3 *Notice of Differing Subsurface or Physical Conditions:* If CONTRACTOR believes that any

subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1 Is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate, or

4.2.3.2 Is of such a nature as to require a change in the Contract Document, or

4.2.3.3 Differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4 Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents: then

CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4 *ENGINEER's Review:* ENGINEER will promptly review the pertinent conditions, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5 *Possible Contract Documents Change:* If ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3, a Work Change Directive or a Change Order Will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6 *Possible Price and Times Adjustments:* An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in CONTRACTOR's cost of, or time, required for performance of the Work: Subject, however, to the following:

4.2.6.1 Such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4 inclusive:

4.2.6.2 A change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization or nor a condition

precedent to entitlement to any such adjustments:

4.2.6.3 With respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraph 9.10 and 11.9: and

4.2.6.4 CONTRACTOR shall not be entitled to any adjustment in the Contract Price or times if:

4.2.6.4.1 CONTRACTOR knew of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract times by the submission of a bid or becoming bound under a negotiated contract: or

4.2.6.4.2 The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment: or

4.2.6.4.3 CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other or anticipated project.

4.3 *Physical Conditions—Underground Facilities:*

4.3.1 *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others, unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1 OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2 The cost of all of the following will be included in the Contract Price and

CONTRACTOR shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2 *Not shown or Indicated:* If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.23), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or the amount or length of any such adjustment in Contract Price or Contract Times, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages incurred or sustained by CONTRACTOR on or in connection with any other project or anticipated project.

Reference Points:

4.4 OWNER shall provide engineering surveys to establish reference points for construction, which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or

requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocations of such reference points by professionally qualified personnel.

4.5 Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1 OWNER shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER shall not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.5.2 CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefore as provided in Articles 11 and 12.

4.5.3 If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefore as provided in Articles 11 and 12. OWNER may have such deleted portion of

the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4 To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) nothing in this subparagraph 4.5.4 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

4.5.5 The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5—BONDS AND INSURANCE

Performance, Payment and Other Bonds:

5.1 CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

5.3 Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1 All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverage's so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the supplementary Conditions.

5.3.2 CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain in accordance with paragraph 5.4. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain in accordance with paragraphs 5.6 and 5.7 hereof.

CONTRACTOR's Liability Insurance:

5.4 CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or pay anyone for whose acts any of them may be liable:

5.4.1 Claims under Worker's Compensation, disability benefits and other similar employee benefit acts:

5.4.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees:

5.4.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees:

5.4.4 Claims for damages insured by customary personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such

person by CONTRACTOR, or (ii) by any other person for any other reason:

5.4.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom and:

5.4.6 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7 With respect to insurance required by paragraphs 5.4.3 through 5.4.6 inclusive, include as additional insured's (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insured's, and include coverage for the respective officers and employees of all such additional insured's:

5.4.8 Include specific coverages and be written for not less than the limits of liability provided in the Supplemental Conditions or required by Laws or regulations, whichever is greater:

5.4.9 Include completed Operations insurance:

5.4.10 Include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.12, 6.16 and 6.31 through 6.33:

5.4.11 Contain a provision of endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplemental Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.3.2 will so provide):

5.4.12 Remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing *defective work* in accordance with paragraph 13.12 and:

5.4.13 With respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions to whom a

certificate of insurance has been issued evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

OWNERS's Liability Insurance:

5.5 In addition to the insurance required to be provided by CONTRACTOR under paragraph 54. OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claim which may arise from operations under the Contract Documents.

Property Insurance:

5.6 Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

5.6.1 Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured:

5.6.2 Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false-work and Work in transit and shall insure against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions:

5.6.3 Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects):

5.6.4 Cover materials and equipment stored at the site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER, and;

5.6.5 Be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty days written notice to each other additional

insured to whom a certificate of insurance has been issued.

5.7 OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

5.8 All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be cancelled or materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.11.

5.9 OWNER shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount, will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.10 If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraphs 5.6 or 5.7, OWNER shall, if possible, include such insurance and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment, prior to commencement of the Work at the site. OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.11 Waiver of Rights:

5.11.1 OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.6 and 5.7 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insured or additional insured in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insured or additional insured thereunder. OWNER

and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insured or additional insured under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.11.2 In addition, OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees and agents of any of them, for:

5.11.2.1 Loss due to business interruption, loss of use or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of or resulting from fire or other peril, whether or not insured by OWNER, and:

5.11.2.2 Loss or damage to the completed Project or part thereof caused by, arising out of or resulting from fire or other insured peril covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.10, after substantial completion pursuant to paragraph 14.8 or after final payment pursuant to paragraph 14.13.

Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in this paragraph 5.11.2 shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss, the insurers will have no rights of recovery against any of CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees and agents of any of them.

Receipt and Application of Insurance Proceeds

5.12 Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13, OWNER shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the moneys so received applied on account

thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13 OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

Acceptance of Bonds and Insurance: Option to Replace:

5.14 If either party (OWNER or CONTRACTOR) has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.7, OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required or such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

Partial Utilization—Property Insurance:

5.15 If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use of occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be cancelled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6—CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1 CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence of procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

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

Labor, Materials and Equipment:

6.3 CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

6.4 Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5 All materials and equipment shall be of good quality and new, except as otherwise provided in the

Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6 CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1 CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2 Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7 Substitutes and "Or-Equal" Items:

6.7.1 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1.1 "Or-Equal": If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2 *Substitute Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under subparagraph 6.7.1.1, it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents for in the provisions of any other direct contract with OWNER for work on the Project, to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3 *CONTRACTOR's Expense:* All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR's expense.

6.7.2 *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence of procedure of construction is shown or indicated in and expressly required by the Contract

Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3 *ENGINEER's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance, which will be evidenced, by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR. CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute item.

6.8-6.11 *Concerning Subcontractors, Suppliers and Others:*

6.8.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2 If the Supplementary Conditions require the identify of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or

objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject *defective Work*.

6.9.1 CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or Indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.9.2 CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

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

6.11 All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.6 or 5.7, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER,

ENGINEER's Consultants and all other additional insured for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

Patent Fees and Royalties:

6.12 CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

Permits:

6.13 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement, CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

Laws and Regulations:

6.14.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.14.2 If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR or CONTRACTOR's obligations under paragraph 3.3.2.

Taxes:

6.15 CONTRACTOR 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.

Use of Premises:

6.16 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

6.17 During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.18 CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

Record Documents:

6.19 CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counterpart of all approved shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to ENGINEER for OWNER.

Safety and Protection:

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

6.20.1 All persons on the Work site or who may be affected by the Work:

6.20.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.20.3 Other Property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety or persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings

or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

Safety Representative:

6.21 CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Programs:

6.22 CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws and Regulations.

Emergencies:

6.23 In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or ENGINEER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.24 Shop Drawings and Samples:

6.24.1 CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities,

dimensions, specified performance and design criteria, materials and similar data to show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2 CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.25 Submittal Procedures:

6.25.1 Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

6.25.1.1 All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto.

6.25.1.2 All materials and respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3 All information relative to CONTRACTOR's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the Requirements of the Work and the Contract Documents.

6.25.2 Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

6.25.3 At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing of Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to

ENGINEER for review and approval of each such variation.

6.26 ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.9. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER's review and approval will not extend to means, methods, techniques, sequences of procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or, to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.27 ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing of Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.25.1.

6.28 Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.9, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

Continuing the Work:

6.29 CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or an OWNER and CONTRACTOR may otherwise agree in writing.

6.30 CONTRACTOR's General Warranty and Guarantee:

6.30.1 CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be *defective*. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1 Abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

6.30.1.2 Normal wear and tear under normal usage.

6.30.2 CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

6.30.2.1 Observations by ENGINEER;

6.30.2.2 Recommendation of any progress or final payment by ENGINEER;

6.30.2.3 The issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4 Use of occupancy of the Work or any part thereof by OWNER;

6.30.2.5 Any acceptance by OWNER or any failure to do so;

6.30.2.6 Any review and approval of a shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7 Any inspection, test or approval by others; or

6.30.2.8 Any correction or *defective* Work by OWNER.

Indemnification:

6.31 To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other

dispute resolution costs) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32 In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor of personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the work, or anyone for whose acts any of them may be liable, the indemnifications obligation under paragraph 6.31 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.33 The indemnification obligations of CONTRACTOR under paragraph 6.31 shall not extend to the liability of ENGINEER and ENGINEER's Consultants, officers, directors, employees or agents caused by the professional negligence, errors or omissions of any of them.

Survival of Obligations:

6.34 All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

ARTICLE 7—OTHER WORK

Related Work at Site:

7.1 OWNER may perform other work related to the Project at the site by OWNER's own forces, or let other direct contracts therefore which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be

performed was not noted in the Contract Documents, then; (i) written notice thereof will be given to CONTRACTOR prior to starting any such other work, and (ii) CONTRACTOR may make a claim therefore as provide in Articles 11 and 12 if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2 CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

7.3 If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure so to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent non-apparent defects and deficiencies in such other work.

Coordination:

7.4 If OWNER contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions:

7.4.1 The person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2 The specific matters to be covered by such authority and responsibility will be itemized; and

7.4.3 The extent of such authority and responsibilities will be provided.

Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8-OWNER'S RESPONSIBILITIES

8.1 Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2 In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

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

8.4 OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents.

8.5 OWNER's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.10.

8.6 OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7 OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8 In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

8.9 The OWNER shall not supervise, direct or have control or authority over, nor be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.10 OWNER's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11 If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9—ENGINEER'S STATUS DURING CONSTRUCTION

OWNER's Representative:

9.1 ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site:

9.2 ENGINEER will make visits to the site at intervals appropriate to the various stages of construction, as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of ENGINEER's on-site visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto; or for any failure of CONTRACTOR to

comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3 If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations:

9.4 ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding in OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or Article 12.

Authorized variations In Work:

9.5 ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR who shall perform the Work involved promptly. If OWNER or CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price of the Contract Times and the parties are unable to agree as to the amount or extent thereof, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11 or 12.

Rejecting Defective work:

9.6 ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be *defective*, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will

prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7 In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

9.8 In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11 and 12.

9.9 In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

Determinations for Unit Prices:

9.10 ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding upon OWNER and CONTRACTOR, unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other and to ENGINEER written notice of intention to appeal from ENGINEER's decision and; (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in Exhibit GC-A, "Dispute Resolution Agreement" entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement as been entered into, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to ENGINEER's decision, unless otherwise agreed in writing by OWNER and CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 9.11.

Decisions on Disputes:

9.11 ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be

delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision of such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless; (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the Procedures set forth in EXHIBIT GC-A, "Dispute Resolution Agreement" entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement has been entered into, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.

9.12 When functioning as interpreter and judge under paragraphs 9.10 and 9.11, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 or 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter pursuant to Article 16.

9.13 Limitations on ENGINEER's Authority and Responsibilities:

9.13.1 Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by ENGINEER shall create, impose or give rise to any duty owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any

other person or organization, or to any surety for or employee or agent of any of them.

9.13.2 ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3 ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4 ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.13.5 The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants, Resident Project Representative and assistants.

ARTICLE 10—CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2 If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefore as provided in Article 11 or Article 12.

10.3 CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of an emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4 OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

10.4.1 Changes in the Work which are (i) ordered by OWNER pursuant to paragraph 10.1, (ii) required because of acceptance of *defective* Work under paragraph 13.13 or correcting *defective* Work under paragraph 13.14 or (iii) agreed to by the parties;

10.4.2 Changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3 Changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

10.5 If notice of any change affecting the general scope of the Work or the provisions of the contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11—CHANGE OF CONTRACT PRICE

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR's expense without change in the Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise to the claim and stating the general nature

of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after the start of such occurrence or event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3 The value of any Work covered by a Change Order or of any claim for an adjustment in the Contract Price will be determined as follows:

11.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3 inclusive);

11.3.2 Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2 on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work:

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

11.4.1 Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of the job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or

legal holidays shall be included in the above to the extent authorized by OWNER.

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

11.4.3 Payments made by CONTRACTOR to the Subcontractors for Work performed or furnished by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

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

11.4.5 Supplemental costs including the following:

11.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, off and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.

11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof—all

in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4 Sales, consumer, use of similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5 Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance of otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7 The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9 Cost of premiums for additional Bonds and insurance required because of changes in the Work.

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

11.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other

personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4—all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

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

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

11.5.4 Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

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

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

11.6 The CONTRACTOR's fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1 A mutually acceptable fixed fee; or

11.6.2 If a fixed fee is not agreed upon, a fee based on the following percentages of the various portions of the Cost of Work:

11.6.2.1 For costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR's fee shall be fifteen percent;

11.6.2.2 For costs incurred under paragraph 11.4.3, the CONTRACTOR's fee shall be five percent;

11.6.2.3 Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 11.4.1, 11.4.2, 11.4.3 and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of fifteen percent of the costs incurred by such Subcontractor under paragraphs

11.4.1 and 11.4.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

11.6.2.4 No fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.5 The amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

11.6.2.6 When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.5 inclusive.

11.7 Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowances:

11.8 It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

11.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site and all applicable taxes; and

11.8.2 CONTRACTOR's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances and no demand for additional payment on account of any of the foregoing will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.9 Unit Price Work:

11.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work,

initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with paragraph 9.10.

11.9.2 Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.9.3 OWNER or CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11 if:

11.9.3.1 The quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

11.9.3.2 There is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3 If CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12—CHANGE OF CONTRACT TIMES

12.1 The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by ENGINEER in

accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2 All time limits stated in the Contract Documents are of the essence of the Agreement.

12.3 Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefore as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.4 Where CONTRACTOR is prevented from completing any part of the work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

ARTICLE 13—TESTS AND INSPECTIONS: CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.1 *Notice of Defects:* Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2 OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of

OWNER, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

Tests and Inspections:

13.3 CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4 OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

13.4.1 For inspections, tests or approvals covered by paragraph 13.5 below;

13.4.2 That costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3 As otherwise specifically provided in the Contract Documents.

13.5 If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection, or approval. CONTRACTOR shall also be responsible for arranging and obtain and shall pay all costs in connections with any inspections, tests or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.

13.6 If any Work (or the work of others) that is to be inspected, tested or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

13.7 Uncovering Work as provided in paragraph 13.6 shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

Uncovering Work:

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

13.9 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by other. CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is *defective*, CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price and, if the parties are unable to agree as to the amount thereof, may make a claim therefore as provided in Article 11. If, however, such Work is not found to be *defective*, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12.

OWNER May Stop the Work:

13.10 If the Work is *defective*, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any surety or other party.

Correction or Removal of Defective Work:

13.11 If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all *defective* Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with Work that is not *defective*. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12 Correction Period:

13.12.1 If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be *defective*, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) correct such *defective* Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not *defective*, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the *defective* Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

13.12.2 In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

13.12.3 Where *defective* Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work:

13.13 If, instead of requiring correction or removal and replacement of *defective* Work, OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such *defective* Work (such costs to be approved by ENGINEER as to reasonableness). If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14 If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct *defective* Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER, may, after seven days' written notice to CONTRACTOR, correct and remedy and such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors and ENGINEER and ENGINEER's Consultants access to the site to enable OWNER to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefore as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's *defective* Work. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14—PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1 The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2 At least twenty days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by an Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.4 ENGINEER will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

14.5 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

14.5.1 The Work has progressed to the point indicated,

14.5.2 The quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10, and to any other qualifications stated in the recommendation), and

14.5.3 The conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

However, by recommending any such payment, ENGINEER will not thereby be deemed to have represented that: (i) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

14.6 ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

14.7 ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.5. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1 The Work is *defective*, or completed Work has been damaged requiring correction or replacement,

14.7.2 The Contract Price has been reduced by Written Amendment or Change Order,

14.7.3 OWNER has been required to correct *defective* Work or complete Work in accordance with paragraph 13.14, or

14.7.4 ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

14.7.5 Claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work.

14.7.6 Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens.

14.7.7 There are other items entitling OWNER to a set-off against the amount recommended, or

14.7.8 OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

but OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

Substantial Completion:

14.8 When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion, which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefore. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected)

reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

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

Partial Utilization:

14.10 Use by OWNER at OWNER's option of any substantially completed part of the Work which; (i) has specifically been identified in the Contract Documents, or (ii) OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1 OWNER at the time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefore. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.10.2 No occupancy of separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.15 in respect of property insurance.

Final Inspection:

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

Final Application for Payment:

14.12 After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.4.13, (ii) consent of the surety, if any, to final payment, and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu of such releases or waivers of Liens and as approved by OWNER, CONTRACTOR may furnish receipts of releases in full and an affidavit of CONTRACTOR THAT: (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) all payrolls, material and equipment bills and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

Final Payment and Acceptance:

14.13 If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the

final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.15. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. Thirty days after the presentation to OWNER of the Application and accompanying documentation, in appropriate form and substance and with ENGINEER's recommendation and notice of acceptability, the amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

14.14 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Waiver of Claims:

14.15 The making and acceptance of final payment will constitute:

14.15.1 A waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from *defective* Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.15.2 A waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15—SUSPENSION OF WORK AND TERMINATION

OWNER May Suspend Work:

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

OWNER May Terminate:

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 If CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2 If CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3 If CONTRACTOR disregards the authority of ENGINEER; or

15.2.4 If CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any,) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work such excess will be paid to CONTRACTOR. If such claims, costs losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and when so approved by ENGINEER incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

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

15.4 Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items):

15.4.1 For completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2 For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3 For all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, suppliers and others; and

15.4.4 For reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

CONTRACTOR May Stop Work or Terminate:

15.5 If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven day's written notice to OWNER and ENGINEER stop the Work until payment of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim

under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

ARTICLE 16—DISPUTE RESOLUTION

If and to the extent that OWNER and CONTRACTOR have agreed on the method and procedure for resolving disputes between them that may arise under this Agreement, such dispute resolution method and procedure, if any, shall be as set forth in Exhibit GC-A, "Dispute Resolution Agreement," to be attached hereto and made a part hereof. If no such agreement on the method and procedure for resolving such disputes has been reached, and subject to the provisions of paragraphs 9.10, 9.11 and 9.12, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17—MISCELLANEOUS

Giving Notice:

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

Computation of Times:

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

17.2.2 A calendar day of twenty-four hours measured from midnight to the next midnight will constitute a day.

Notice of Claim:

17.3 Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

Cumulative Remedies:

17.4 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER there under, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

Professional Fees and Court Costs Included:

17.5 Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

**EXHIBIT GC-A to General Conditions of
the Agreement Between OWNER and
CONTRACTOR Dated _____
For use with EJCDC No. 1910-8 (1990 ed.)**

DISPUTE RESOLUTION AGREEMENT

OWNER and CONTRACTOR hereby agree that Article 16 of the General Conditions to the Agreement between OWNER and CONTRACTOR is amended to include the following agreement of the parties:

16.1 All claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of or relating to the Contract documents or the breach thereof (except for claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.15) will be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining, subject to the limitations of this Article 16. This agreement so to arbitrate and any other agreement of consent to arbitrate entered into in accordance herewith as provided in this Article 16 will be specifically enforceable under the prevailing law of any court having jurisdiction.

16.2 No demand for arbitration of any claim, dispute or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.11 will be made until the earlier of (a) the date on which ENGINEER has rendered a written decision or (b) the thirty-first day after the parties have presented their evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such claim, dispute or other matter will be made later than thirty days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 9.11; and the failure to demand arbitration within said thirty days' period will result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned. No demand for arbitration of any written decision of ENGINEER rendered in accordance with paragraph 9.10 will be made later than ten days after the party making such demand has delivered written notice of intention to appeal as provided in paragraph 9.10.

16.3 Notice of the demand for arbitration will be filed in writing with the other party to the Agreement and with the American Arbitration Association, and a copy will be sent to ENGINEER for information. The demand for arbitration will be made within the thirty-day or ten-day period specified in paragraph 16.2 as applicable, and in all other cases within a reasonable time after the claim, dispute or other matter

question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

16.4 Except as provided in paragraph 16.5 below, no arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder or in any other manner any other person or entity (including ENGINEER, ENGINEER's Consultant and the officers, directors, agents, employees or consultants of any of them) who is not a part to this contract unless:

16.4.1 The inclusion of such other person or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration, and

16.4.2 Such other person or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings, and

16.4.3 The written consent of the other person or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

16.5 Notwithstanding paragraph 16.4 if a claim, dispute or other matter in question between OWNER and CONTRACTOR involves the Work of a Subcontractor, either OWNER or CONTRACTOR may join such Subcontractor as a party to the arbitration between OWNER and CONTRACTOR hereunder. CONTRACTOR shall include in all subcontracts required by paragraph 6.11 a specific provision whereby the Subcontractor consents to being joined in an arbitration between OWNER and CONTRACTOR involving the Work of such Subcontractor. Nothing in this paragraph 16.5 nor in the provision of such subcontract consenting to joinder shall create any claim, right or cause of action in favor of Subcontractor and against OWNER, ENGINEER or ENGINEER's Consultants that does not otherwise exist.

16.6 The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal.

16.7 OWNER and CONTRACTOR agree that they shall first submit any and all unsettled claims, counterclaims, disputes and other matters in question between them arising out of or relating to the Contract Documents or the reach thereof ("disputes"), to mediation by The American Arbitration Association under the Construction Industry Mediation Rules of the American

Arbitration Association prior to either of them initiating against the other a demand for arbitration pursuant to paragraphs 16.1 through 16.6, unless delay in initiating arbitration would irrevocable prejudice one of the parties. The respective thirty and ten day time limits within which to files a demand for arbitration as provided in paragraphs 16.2 and 16.3 above shall be suspended with respect to a dispute submitted to mediation within those same applicable time limits and shall remain suspended until ten days after the termination of the mediation. The mediator of any dispute submitted to mediation under this Agreement shall not serve as arbitrator of such dispute unless otherwise agreed.

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1420 King Street, Alexandria, VA 22314

American Consulting Engineers Council
1015 15th Street, N.W., Washington, DC 20005

American Society of Civil Engineers
345 East 47th Street, New York, NY 10017

Construction Specifications Institute
601 Madison St., Alexandria, VA 22314

SECTION 00800**SUPPLEMENTARY CONDITIONS**

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These Supplementary Conditions Amend or Supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1990 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1 DEFINITIONS

The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (No. 1910-8, 1990 Edition) have the meanings assigned to them in the General Conditions, with the following exception. The term Contract Documents shall also include the Invitation to Bid and the Instructions to Bidders.

SC-2.2 COPIES OF DOCUMENTS

The OWNER shall furnish to the CONTRACTOR the number of sets of Contract Documents as stipulated in the "Instruction to Bidders".

SC-2.3 COMMENCEMENT OF CONTRACT TIMES: NOTICE TO PROCEED

Delete the last sentence of paragraph 2.3 of the General Conditions in its entirety and insert the following in its place:

The Contract time will commence to run on one of the following dates:

2.3.1 The day stipulated in the "Notice to Proceed".

2.3.2 If no "Notice to Proceed" is given, the thirtieth (30th) day after the "Effective Date of the Agreement".

SC-2.7 EXCHANGE OF INSURANCE DATA

Delete Paragraph 2.7 of the General Conditions in its entirety and insert the following in its place:

- 2.7 As an attachment to the Agreement, the successful BIDDER shall deliver to the OWNER all certificates and other evidence of insurance that are required in the General Conditions as modified by the Supplementary Conditions. Contractor shall provide the Engineer certificates to evidence that all required insurance is obtained and maintained throughout the Contract period.

SC-5.4 CONTRACTOR'S LIABILITY INSURANCE

The limits of liability for the insurances required by paragraph 5.4 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Law or Regulations.

- A. **Worker's Compensation:** Insurance shall be provided for all employees engaged in the Work who may come within the protection of the Workers' Compensation law, and where applicable, employer's General Liability Insurance for employees not so protected and shall require all sub-contractors to provide corresponding insurance. The Contractor shall indemnify the Owner and the Engineer against all liabilities, costs and expenses due to accidents or other occurrences covered by the Workers' Compensation law.

Under Paragraphs 5.4.1 of the General Conditions, the limits shall be not less than:

- | | |
|--------------------------|---|
| 1. State of Ohio: | Statutory |
| 2. Employer's Liability: | \$100,000.00 Each Accident
\$500,000.00 Disease Policy Limit
\$100,000.00 Disease Each Employee |

- B. **Comprehensive General Liability:** Insurance shall be provided to cover all damages arising out of bodily injuries, including accidental death to one person and for all damages arising out of bodily injuries, including accidental death, to two or more persons in any one occurrence. Insurance shall protect against all property damage arising out of damages to or destruction of property. Coverage shall include collapse or damage to any structure, building or its contents, public or private utility, or pavement during construction and for two (2) years thereafter. Whenever work is to be done by blasting, coverage shall also include all damage of any kind whatsoever that may result from the blasting operation. Insurance shall insure Contractor and all sub-contractors.

Under Paragraphs 5.4.2 through 5.4.5 of the General Conditions:

- | | |
|---|--|
| 1. Bodily Injury: | |
| | \$1,000,000.00 Each Occurrence |
| | \$1,000,000.00 Annual Aggregate, Products and Completed Operations |
| 2. Property Damages: | |
| | \$1,000,000.00 Each Occurrence |
| | \$1,000,000.00 Annual Aggregate |
| 3. Property Damage liability insurance shall provide Explosion, Collapse and Underground coverages. | |
| 4. Personal Injury, with employment exclusion deleted | |
| | \$1,000,000.00 Annual Aggregate |

- C. **Comprehensive Automobile Liability:** insurance shall be provided to cover liability arising from the use and operation of motor vehicles in connection with the performance of the Contract (as customarily defined in liability insurance policies), whether they be owned, hired, or non-owned by the Contractor.

Under Paragraph 5.4.6 of the General Conditions:

1. Bodily Injury:

\$1,000,000.00	Each Person
\$1,000,000.00	Each Accident

2. Property Damages:

\$1,000,000.00	Each Occurrence
----------------	-----------------

SC-5.5 OWNER'S & ENGINEER'S PROTECTIVE LIABILITY INSURANCE

Delete Paragraph 5.5 of the General Conditions in its entirety and insert the following in its place:

5.5.1 The CONTRACTOR shall purchase and maintain additional liability insurance coverage for OWNER and ENGINEER. Contractor's general liability carrier shall issue a separate Protective Liability Policy covering OWNER, ENGINEER and Engineer's Consultants with the following minimum coverages:

1. Bodily Injury:

\$1,000,000.00	Each Occurrence
----------------	-----------------

2. Property Damages:

\$1,000,000.00	Each Occurrence
\$1,000,000.00	Annual Aggregate

5.5.2 Additional coverage pertaining to paragraphs 5.1 through 5.5 shall be provided by the contractor in the form of blanket protection consisting of \$1,000,000.00 umbrella compensation with general liability providing excess coverage over the limits set forth in said paragraphs.

SC-5.6 PROPERTY INSURANCE

Delete Paragraph 5.6 of the General Conditions in its entirety and insert the following in its place:

5.6 The CONTRACTOR shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof subject to such deductible amounts as may be required by laws and regulations. This insurance shall include the interests of OWNER, CONTRACTOR and Subcontractors in the Work, shall insure against the perils of the fire and extended coverage, shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in these Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including fees and charges of engineers, architects, attorneys and other professionals). Such fees will be subject to a deductible amount of \$1,000.00. If not covered under the "all risk" insurance or otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.6 shall contain a provision that the coverage afforded will not be canceled or materially changed until at least thirty days' prior written notice has been given to OWNER.

SC-5.7 BOILER, MACHINERY AND OTHER INSURANCE

Delete Paragraph 5.7 of the General Conditions in its entirety and insert the following in its place:

5.7 The CONTRACTOR shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include interests of OWNER, CONTRACTOR, Subcontractor, ENGINEER and Engineer's Consultants in the Work, all of whom shall be listed as insured or additional insured parties.

SC-5.8 INSURANCE CANCELLATION PROVISIONS

Delete Paragraph 5.8 of the General Conditions in its entirety and insert the following in its place:

- 5.8 All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with Paragraph 5.6 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER by certified mail and will contain waiver provisions in accordance with Paragraph 5.11.2.

SC-5.10 OTHER SPECIAL INSURANCE

Delete Paragraph 5.10 of the General Conditions in its entirety and add the following:

Railroad Protective Liability Insurance shall be provided when the Work is on railroad right-of-way to protect the railroad company against bodily injury, death, and/or property damage. Limits shall not be less than that required by the railroad company and in no case less than the following:

Bodily Injury

\$2,000,000 per occurrence

\$6,000,000 aggregate per annum

SC-6 CONCERNING SUBCONTRACTORS, SUPPLIERS AND OTHERS

Add the following language at the end of the last sentence of paragraph 6.9.1 of the General Conditions: OWNER or ENGINEER may furnish to any such Subcontractor, Supplier or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR in accordance with CONTRACTOR'S Applications for Payment.

Add the following language at the end of the last sentence of paragraph 6.11 of the General Conditions:

In advance of the Notice of Award, the apparent Successful Bidder, and any other Bidder(s) so requested, will, within seven days after the day of the Bid opening, submit to the OWNER a list of all Subcontractors and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the Work as to which such identification is so required. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, persons and organization if requested by OWNER. If OWNER or ENGINEER after due investigation has reasonable objection to any proposed Subcontractor, other person or organization, either may, before giving the Notice of Award, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. If the apparent Successful Bidder declines to make any such substitution, the contract shall not be awarded to such Bidder, but declining to make any such substitution will not constitute grounds for sacrificing the Bid Security. Any Subcontractor, other persons or organization so listed and to whom OWNER or ENGINEER does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER.

SC-6.13 PERMITS

Delete Paragraph 6.13 of the General Conditions in its entirety and insert the following in its place:

- 6.13 The OWNER will procure and pay for all permits (excluding inspection fees) which may be required by the Ohio Department of Transportation. CONTRACTOR shall obtain and pay for all other construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids. CONTRACTOR shall pay all charges of utility service companies for connections to the Work and for all charges of such companies for capital costs related thereto.

SC-6.14 LAWS AND REGULATIONS

Regulations regarding additional applicable laws and regulations required under this contract are shown in other sections of these specifications.

SC-7.4 CONSTRUCTION COORDINATOR

The GENERAL CONSTRUCTION CONTRACTOR shall be referred to and defined as the CONSTRUCTION COORDINATOR.

Duties of the CONSTRUCTION COORDINATOR include the following:

1. Safety precautions and procedures at the site.
2. See that permits are obtained.
3. Monitoring compliance with Laws and Regulations.
4. Keeping the site clean during construction.
5. Use of temporary construction facilities.
6. Scheduling purchase and delivery times.
7. Scheduling and coordinating the work of the Prime Contractors.
8. Inspect materials and equipment as received for damage.
9. Inspect installed material and equipment for mechanical, electrical, piping and instrument connections, for correct rotation and lubrication and readiness for delivery to OWNER'S operating personnel.

SC-8.2 OWNER'S RESPONSIBILITIES

Delete Paragraph 8.2 of the General Conditions in its entirety and insert the following in its place:

- 8.2 In the case of termination of the employment of ENGINEER, OWNER shall appoint an engineer whose status under the Contract Documents shall be that of the former ENGINEER.

SC-9.3 PROJECT REPRESENTATION

The duties, responsibilities and limitations of authority of the Resident Project Representative and assistants as described in paragraph 9.3 of the General Conditions are appended and hereby made a part of these Supplementary Conditions as Appendix A.

SC-11.4 & 11.6 COST OF WORK

Delete paragraphs 11.4.1, 11.4.5.9, 11.6.2.1, 11.6.2.2, 11.6 and 11.6.2.4 of the GENERAL CONDITIONS in their entirety and insert the following in its place

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

The rate of wage and labor for each employee classification is to be submitted to the ENGINEER prior to beginning work. The rate of wage and labor shall be detailed to show the base hourly rate plus the fringe benefits as herein defined for payroll costs. The defined rate of wage and

Labor cost for each employee classification shall be used for all CHANGE ORDERS not covered under paragraph 11.3.1.

The rate of wage shall be the current rate of wage as determined by the State prevailing wage office.

- 11.4.5.9 Cost of premiums for additional BONDS and INSURANCES required because of changes in work shall not be included in CHANGE ORDER costs but shall be reevaluated and if required adjusted accordingly upon issuance of the certificate of substantial completion by the ENGINEER. Premiums directly relating to property insurance coverage, in accordance with paragraph 5.9, shall be evaluated and adjusted as determined by the ENGINEER for each change order.

SC-11.6 CONTRACTOR'S FEE

Delete Paragraph 11.6 in the General Conditions in its entirety and insert the following in its place:

- 11.6 The CONTRACTOR'S fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:
- 11.6.1 A fee based on the following percentages of the various portions of the cost of the work:
- 11.6.1.1 For costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR'S fee shall be the percentage negotiated by the OWNER and CONTRACTOR and limited to a maximum of three and one-quarter percent (3-1/4%) profit and three and one-quarter percent (3-1/4%) for overhead and included in the Contract Agreement Form under overhead and profit percentage for Labor and Material.
- 11.6.1.2 For costs incurred under paragraph 11.4.3, the CONTRACTOR'S fee shall be the percentage negotiated by the OWNER and CONTRACTOR and limited to a maximum of five percent (5%) of the Subcontractor's cost of work and included in the Contract Agreement Form under overhead and profit percentage for Subcontractors.
- 11.6.1.3 No fee shall be payable on the basis of costs itemized under paragraphs 11.4.1 and 11.4.5.9.
- 11.6.1.4 The amount of credit to be allowed by CONTRACTOR to OWNER for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a decrease in the CONTRACTOR'S fee of the percentage negotiated by the OWNER and CONTRACTOR and included in the Contract Agreement Form.
- 11.6.1.5 When both additions and credits are involved in any one change; the adjustment in CONTRACTOR'S fee shall be completed on the basis of the net change in accordance with paragraphs 11.6.1.1 through 11.6.1.4 inclusive.

SC-13.4 TESTS AND INSPECTIONS

Delete the last sentence of Paragraph 13.4 of the General Conditions in its entirety and insert the following in its place:

The cost of all other inspections, tests and approvals required by the Contract Documents shall be paid by CONTRACTOR (unless otherwise specified).

SC-14.2.1 PAYMENT FOR STORED MATERIALS

- 14.2.1.1 Subsequent to the inclusion of a payment for delivered materials in a progress payment, CONTRACTOR shall submit to the ENGINEER no later than the next payment submission, a partial waiver of liens from each and every supplier for whom delivered materials were paid. If no such waiver is submitted prior to or along with the next payment, the ENGINEER may automatically deduct the amount of delivered materials paid commensurate with that particular item. There shall be no variance to this policy and unless the waiver is in hand, the money shall be deducted.
- 14.2.1.2 No payment for delivered materials shall be made for any items that are scheduled to be incorporated in the work within the next 30 days.
- 14.2.1.3 Delivered materials will not be paid in any given month for a total amount less than \$5,000.00.
- 14.2.1.4 Payment for delivered materials for such items as pipe backfill and roadway sub-base will not be

routinely considered.

- 14.2.2 In case the CONTRACTOR fails to comply with the terms of these specifications or fails to comply with the orders or directions of the ENGINEER herein provided for, the OWNER reserves the right, and the CONTRACTOR hereby assents to the same, to withhold the payment of any estimate that may otherwise be due, until the said terms, orders or directions are complied with to the satisfaction of the ENGINEER.
- 14.2.3 Payment shall be made in accordance with the provisions of the Ohio Revised Code as follows:
 - 14.2.3.1 Acceptable materials delivered to the site but not incorporated in the work will be paid for at ninety percent (90%) of the invoice value of same. Until the job is fifty percent (50%) completed, the contractor will be paid ninety percent (90%) of the estimated value of labor and material completed in estimated form. This ten percent (10%) retention of the first fifty percent (50%) of the job will be held by the Owner until 30 days after completion. After the job is fifty percent (50%) completed, material incorporated in the work and labor will be paid for at one-hundred percent (100%) of the estimated value of same as bid.
 - 14.2.3.2 When the work is completed to the satisfaction of the Owner, the Contractor shall be paid an amount which will bring the total payments to him up to ninety-five percent (95%) of the contract price.
 - 14.2.3.3 Estimates and payments shall be made about the twentieth day of each month unless, as provided by the Act, "When the rate of work and amounts involved are so large that it is deemed advisable by the Owner or Contractor, estimates and payments shall be made twice each month".
 - 14.2.3.4 The Act makes reference to payments of estimates "Unless the Contractor does not prosecute the work with diligence and with the force specified or intended in the contract".
 - 14.2.3.5 Upon approval of the Engineer, the five percent (5%) retainer may be reduced commensurate with partial acceptance of facilities completed and placed in operation.
 - 14.2.3.6 In case the Contractor fails to comply with the terms of these specifications or fails to comply with the orders or directions of the Engineer herein provided for, the Owner reserves the right, and the Contractor hereby assents to the same, to withhold the payment of any estimate that may otherwise be due, until the said terms, orders or directions are complied with and to the satisfaction of the Engineer.

SC-14.4 REVIEW OF APPLICATION FOR PROGRESS PAYMENT

Delete the last sentence of Paragraph 14.4 of the General Conditions in its entirety and insert the following in its place:

Thirty (30) days after presentation of Application for Payment with ENGINEER'S recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

SC-14.8 SUBSTANTIAL COMPLETION

- 14.8.1 The ENGINEER will conduct one (1) inspection for the Substantial Completion Certificate for each contract when requested to by the CONTRACTOR if the ENGINEER determines that certification can not be issued the CONTRACTOR will be assessed for each additional inspection.

SC-14.11 FINAL INSPECTION

- 14.11.1 The ENGINEER will conduct one (1) inspection for the final payment application review when requested to by the CONTRACTOR. If the ENGINEER determines that the contract is not complete in accordance with the approved contract documents the CONTRACTOR will be assessed for each addition inspection.

SC-15 TERMINATION

Amend the first sentence of Paragraph 15.2.9 of the General Conditions by striking out the words "seven days" and replacing with the words "ten days". As so amended Paragraph 15.2.9 remains in effect.

Amend the first sentence of Section 15.4 of the General Conditions by striking out the words "seven days" and replacing with the words "ten days". As so amended Paragraph 15.4 remains in effect.

Delete the first sentence of Section 15.5 of the General Conditions in its entirety and insert the following in its place:

If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within forty-five days after it is submitted, or OWNER fails for forty-five days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon ten days' written notice to OWNER and ENGINEER, terminate the Agreement and recover from OWNER payment for all Work executed and any expense sustained plus reasonable termination expenses.

SC-18 PRICE BREAKDOWN

Add the following paragraph under a new Article 18 entitled Price Breakdown to the General Conditions:

18.1 The CONTRACTOR shall furnish a price breakdown for the Contract itemized as required by the ENGINEER. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, sub-contract and overhead costs as well as profit for each item in the contract and shall cover supported by similar price breakdowns.

SC-21 OVERTIME PAYMENT FOR ENGINEERING AND INSPECTION

Add the following paragraph under a new Article 21 entitled Overtime Payment for Engineering and Inspection to the General Conditions:

21.1 The OWNER shall charge to CONTRACTOR and may deduct from the periodical and final payment for the work all engineering and inspection expenses incurred by OWNER as a result of any overtime work. Charges for various personnel for any such overtime during the regular specified construction period beyond the regular 8 hour day for any time worked on Saturday, Sunday or any legal holiday will be as shown in the following Schedule:

<u>Personnel Class</u>	<u>Charge/Hour</u>
Officer	\$200.00
Sr. Engineer	\$110.00
Engineer II	\$100.00
Technician	\$ 90.00
Draftsman I	\$ 80.00
Draftsman II	\$ 85.00
Construction Manager	\$ 90.00
Construction Engineer	\$ 80.00
Construction Inspector I	\$ 80.00
Construction Inspector II	\$ 90.00
2 Person Survey Crew	\$150.00
3 Person Survey Crew	\$225.00

SC-22 MOBILIZATION REQUIREMENTS

Description

This work shall consist of the performance of construction preparatory operations, including the movement of personnel and equipment to the project site, placement of project identification signs, payment of Department of Highways Inspection Fees and cost of Railroad Protective Liability Insurance as applicable, the cost of providing a field office for the resident observer, if required, and for the establishment of the CONTRACTOR'S offices, buildings and other facilities necessary to begin work on a substantial phase of the contract.

Basis of Payment

Total Original Contract Amount,
Including Mobilization

Total Limits for Partial Payments

More Than To & Including

\$ 0	\$ 100,000	10 percent of total contract amount
\$ 100,000	\$ 500,000	\$10,000 plus 3 percent of total contract over \$100,000
\$ 500,000	\$ 1,500,000	\$22,000 plus 2 percent of total contract over \$500,000
\$1,500,000	More	\$42,500 plus 1 percent of total contract over \$1,500,000

Partial payments shall be as follows:

- (1) One-third (1/3) of the amount established above as the total limit for partial payment, or one-third (1/3) of the amount BID for mobilization, whichever is less, will be released to the CONTRACTOR as the first estimate, payable not less than 15 days after the start of work at the project site.
- (2) The second one-third (1/3) of the amount established above as the total limit for partial payment, or one-third (1/3) of the amount BID for mobilization, whichever is less, shall be released with the estimate payable 30 days after the first estimate.
- (3) The final one (1/3) of the amount established above as the total limit for partial payment, or one-third (1/3) of the amount BID for mobilization, whichever is less, shall be released with the estimate payable 30 days later than the estimate in which the second one-third (1/3) has been paid.

Upon completion of all work on the project, payment of any amount BID for mobilization in excess of the total limit for partial payment will be released.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

No deduction will be made, nor will any increase be made, in the lump sum mobilization item amount regardless of decreases or increases in the final total contract amount or for any other cause.

END OF SECTION

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DUTIES, RESPONSIBILITIES, & LIMITS OF AUTHORITYDUTIES, RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY
OF RESIDENT PROJECT REPRESENTATIVE
(SC-9.3)**A. GENERAL**

Resident Project Representative is ENGINEER's Agent, will act as directed by and under the supervision of ENGINEER, and will confer with ENGINEER regarding his actions. Resident Project Representative's dealings in matters pertaining to the on-site Work shall in general be only with ENGINEER and CONTRACTOR. Written communication with OWNER will be only through or as directed by ENGINEER.

B. DUTIES AND RESPONSIBILITIES

Resident Project Representative will:

1. Schedules: Review the progress schedule, schedule of Shop Drawing submissions and schedule of values prepared by CONTRACTOR and consult with ENGINEER concerning their acceptability.
2. Liaison:
 - a. Serve as ENGINEER's liaison with CONTRACTOR, working principally through CONTRACTOR's superintendent and assist him in understanding the intent of the Contract Documents. Assist ENGINEER in serving as OWNER's liaison with CONTRACTOR when CONTRACTOR's operations affect OWNER's on-site operations.
 - b. As requested by ENGINEER, assist in obtaining from OWNER additional details or information, when required at the job site for proper execution of the Work.
4. Shop Drawings and Samples:
 - a. Receive and record date of receipt of Shop Drawings and samples, receive samples which are furnished at the site by CONTRACTOR, and notify ENGINEER of their availability for examination.
 - b. Advise ENGINEER and CONTRACTOR or its superintendent immediately of the commencement of any Work requiring a Shop Drawing or sample submission if the submission has not been approved by ENGINEER.
5. Review of Work, Rejection of Defective Work, Inspections and Tests:
 - a. Conduct on-site observations of the Work in progress to assist ENGINEER in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.
 - b. Report to ENGINEER whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspections, tests or approval required to be made or has been damaged prior to final payment; and advise ENGINEER when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
 - c. Verify that tests, equipment and systems startups and operating and maintenance instructions are conducted as required by the Contract Documents and in presence of the required personnel, and that CONTRACTOR maintains adequate records thereof; observe, record and report to ENGINEER appropriate details relative to the test procedures and startups.
 - d. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to ENGINEER.
6. Interpretation of Contract Documents: Transmit to CONTRACTOR ENGINEER's clarifications and interpretations of the Contract Documents.
7. Modifications: Consider and evaluate CONTRACTOR's suggestions for modifications in Drawings or Specifications and report them with recommendations to ENGINEER.

8. Records:

- a. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and samples submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional Drawings issued subsequent to the execution of the Contract, ENGINEER's clarifications and interpretations of the Contract Documents, progress reports, and other Project related documents.
- b. Keep a diary or log book recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list of visiting officials and representatives of manufacturers, fabricators, suppliers and distributors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to ENGINEER.
- c. Record names, addresses and telephone numbers of all CONTRACTORS, subcontractors and major suppliers of materials and equipment.

9. Reports:

- a. Furnish ENGINEER periodic reports as required of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of Shop Drawing submissions.
- b. Consult with ENGINEER in advance of scheduled major tests, inspections or start of important phases of the work.
- c. Report immediately to ENGINEER upon the occurrence of any accident.

10. Payment Requisitions: Review applications for payment with CONTRACTOR for compliance with the established procedure for their submission and forward them with recommendations to ENGINEER, noting particularly their relation to the schedule of values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.

11. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operation manuals and other data required to be assembled and furnished by CONTRACTOR are applicable to the items actually installed; and deliver this material to ENGINEER for his review and forwarding to OWNER prior to final acceptance of the Work.

12. Completion:

- a. Before ENGINEER issues a Certificate of Substantial Completion, submit to CONTRACTOR a list of observed items requiring completion or correction.
- b. Conduct final inspection in the company of ENGINEER, OWNER and CONTRACTOR and prepare a final list of items to be completed or corrected.
- c. Verify that all items on final list have been completed or corrected and make recommendations to ENGINEER concerning acceptance.

C. LIMITATIONS OF AUTHORITY

Except upon written instructions of ENGINEER, Resident Project Representative:

1. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
2. Shall not exceed limitations on ENGINEER's authority as set forth in the Contract Documents.
3. Shall not undertake any of the responsibilities of CONTRACTOR, subcontractors or CONTRACTOR's superintendent, or expedite the Work.
4. Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.
5. Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.
6. Shall not authorize OWNER to occupy the Project in whole or in part.
7. Shall not participate in specialized field or laboratory tests.

END OF SECTION

SECTION 00820

WAGE DETERMINATION SCHEDULE

THE FOLLOWING LIST IS THE CURRENT PREVAILING WAGE RATES FOR THIS PROJECT. PLEASE REFER TO GGJ WEBSITE (WWW.GGJENGINEERS.COM) TO LINK TO EACH INDIVIDUAL WAGE SCHEDULE.

HARD COPY TO BE PROVIDED UPON REQUEST

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County	Classification	Effective	Posted	Union
COLUMBIANA	Asbestos Worker	<u>9/7/2011</u>	<u>9/7/2011</u>	Asbestos Local 207 OH
COLUMBIANA	Asbestos Worker	<u>8/4/2010</u>	<u>8/4/2010</u>	Asbestos Local 84 Heat & Frost Insulators
COLUMBIANA	Boilermaker	<u>8/6/2010</u>	<u>8/6/2010</u>	Boilermaker Local 154
COLUMBIANA	Bricklayer	<u>5/4/2011</u>	<u>5/4/2011</u>	Bricklayer Local 6 Tile Setters & Finishers
COLUMBIANA	Bricklayer	<u>7/20/2011</u>	<u>7/20/2011</u>	Bricklayer Local 8 Tile Finisher
COLUMBIANA	Carpenter	<u>1/1/2007</u>	<u>11/21/2005</u>	Carpenter Local 2235 Diver
COLUMBIANA	Carpenter	<u>6/17/2010</u>	<u>6/17/2010</u>	Carpenter Local 509 NE District Interior Systems
COLUMBIANA	Carpenter	<u>10/27/2010</u>	<u>10/27/2010</u>	Carpenter Millwright Local 1871 NE District L
COLUMBIANA	Carpenter	<u>10/27/2010</u>	<u>10/27/2010</u>	Carpenter NE District Industrial Dock & Door
COLUMBIANA	Carpenter	<u>11/24/2010</u>	<u>11/24/2010</u>	Carpenter NE District Insulation F
COLUMBIANA	Carpenter	<u>4/18/2011</u>	<u>4/18/2011</u>	Carpenter Pile Driver Local 2235 Building & Hwy
COLUMBIANA	Carpenter	<u>7/28/2010</u>	<u>7/28/2010</u>	Carpenter Statewide Office Systems
COLUMBIANA	Carpenter	<u>10/27/2010</u>	<u>10/27/2010</u>	Carpenter & Floorlayer NE District F
COLUMBIANA	Bricklayer	<u>8/18/2011</u>	<u>8/18/2011</u>	Cement Mason Bricklayer Local 97 Hwy A
COLUMBIANA	Bricklayer	<u>8/18/2011</u>	<u>8/18/2011</u>	Cement Mason Bricklayer Local 97 Hwy B
COLUMBIANA	Cement Mason	<u>7/13/2011</u>	<u>7/13/2011</u>	Cement Mason Local 132 Hwy District II (A)
COLUMBIANA	Cement Mason	<u>7/13/2011</u>	<u>7/13/2011</u>	Cement Mason Local 132 Hwy District II (B)
COLUMBIANA	Cement	<u>6/11/2010</u>	<u>6/11/2010</u>	Cement Mason Local 179
COLUMBIANA	Cement	<u>6/1/2011</u>	<u>5/11/2011</u>	Cement Mason Local 179
COLUMBIANA	Lineman	<u>6/17/2010</u>	<u>6/17/2010</u>	Electrical Local 71 High Tension Pipe Type Cable
COLUMBIANA	Lineman	<u>4/21/2010</u>	<u>4/21/2010</u>	Electrical Local 71 Outside Utility Power
COLUMBIANA	Lineman	<u>1/3/2011</u>	<u>12/30/2010</u>	Electrical Local 71 Outside (Central OH Chapter)
COLUMBIANA	Elevator	<u>8/7/2008</u>	<u>8/7/2008</u>	Elevator Local 45
COLUMBIANA	Glazier	<u>6/8/2011</u>	<u>6/8/2011</u>	Glazier Local 847
COLUMBIANA	Laborer	<u>5/25/2011</u>	<u>5/25/2011</u>	Labor Hwy 3
COLUMBIANA	Laborer	<u>7/1/2010</u>	<u>12/1/2006</u>	Labor Local 809 Building
COLUMBIANA	Operating Engineer	<u>6/1/2011</u>	<u>5/25/2011</u>	Operating Engineers Local 66 Building & Hwy
COLUMBIANA	Operating Engineer	<u>6/1/2011</u>	<u>5/25/2011</u>	Operating Engineers Local 66 Building & Hwy Levels A & B Asbestos Abatement & Hazardous Waste
COLUMBIANA	Operating Engineer	<u>6/1/2011</u>	<u>5/25/2011</u>	Operating Engineers Local 66 Building & Hwy Levels C & D Asbestos Abatement & Hazardous Waste
COLUMBIANA	Painter	<u>6/15/2011</u>	<u>6/15/2011</u>	Painter Local 476
COLUMBIANA	Drywall Finisher	<u>6/15/2011</u>	<u>6/15/2011</u>	Painter Local 476
COLUMBIANA	Painter	<u>1/3/2006</u>	<u>1/3/2006</u>	Painter Local 639 (Cleveland Area) Sign
COLUMBIANA	Plasterers	<u>7/20/2011</u>	<u>7/20/2011</u>	Plasterer Local 179
COLUMBIANA	Roofer	<u>7/18/2011</u>	<u>7/18/2011</u>	Roofer Local 71
COLUMBIANA	Sheet Metal Worker	<u>6/1/2011</u>	<u>5/25/2011</u>	Sheet Metal Local 33 (Youngstown)
COLUMBIANA	Sheet Metal Worker	<u>9/24/2009</u>	<u>9/24/2009</u>	Sheet Metal Local 33 (Youngstown) Decking
COLUMBIANA	Sprinkler Fitter	<u>10/27/2010</u>	<u>10/27/2010</u>	Sprinkler Fitter Local 669
COLUMBIANA	Truck Driver	<u>6/29/2011</u>	<u>6/29/2011</u>	Truck Driver Bldg & Hwy Class 1 Locals <u>20,40,92,92b,100,175,284,438,377,505,637,908,957</u>
COLUMBIANA	Truck Driver	<u>6/29/2011</u>	<u>6/29/2011</u>	Truck Driver Bldg & Hwy Class 2 Locals <u>20,40,92,92b,100,175,284,438,377,505,637,908,957</u>
COLUMBIANA	Bricklayer	<u>7/7/2011</u>	<u>7/7/2011</u>	Bricklayer Local 10
COLUMBIANA	Bricklayer	<u>7/7/2011</u>	<u>7/7/2011</u>	Bricklayer Local 10 Industrial
COLUMBIANA	Bricklayer	<u>7/7/2011</u>	<u>7/7/2011</u>	Bricklayer Local 10 Refractory
COLUMBIANA	Bricklayer	<u>7/14/2011</u>	<u>7/14/2011</u>	Bricklayer Local 10 Tile Setter & Layer
COLUMBIANA	Bricklayer	<u>11/10/2010</u>	<u>11/10/2010</u>	Bricklayer Local 6

<u>COLUMBIANA</u>	<u>Bricklayer</u>	<u>5/4/2011</u>	<u>5/4/2011</u>	<u>Bricklayer Local 6 Tile Setters & Finishers</u>
<u>COLUMBIANA</u>	<u>Bricklayer</u>	<u>7/20/2011</u>	<u>7/20/2011</u>	<u>Bricklayer Local 8</u>
<u>COLUMBIANA</u>	<u>Bricklayer</u>	<u>7/20/2011</u>	<u>7/20/2011</u>	<u>Bricklayer Local 8 Tile Worker</u>
<u>COLUMBIANA</u>	<u>Electrical</u>	<u>4/18/2011</u>	<u>4/18/2011</u>	<u>Electrical Local 246 Inside</u>
<u>COLUMBIANA</u>	<u>Voice Data Video</u>	<u>4/18/2011</u>	<u>4/18/2011</u>	<u>Electrical Local 246 Voice Data Video</u>
<u>COLUMBIANA</u>	<u>Electrical</u>	<u>12/27/2010</u>	<u>12/15/2010</u>	<u>Electrical Local 540 Inside</u>
<u>COLUMBIANA</u>	<u>Voice Data Video</u>	<u>9/15/2010</u>	<u>9/15/2010</u>	<u>Electrical Local 540 Voice Data Video</u>
<u>COLUMBIANA</u>	<u>Electrical</u>	<u>10/20/2010</u>	<u>10/20/2010</u>	<u>Electrical Local 64 Inside</u>
<u>COLUMBIANA</u>	<u>Electrical</u>	<u>11/30/2010</u>	<u>10/20/2010</u>	<u>Electrical Local 64 Inside</u>
<u>COLUMBIANA</u>	<u>Voice Data Video</u>	<u>10/27/2010</u>	<u>10/27/2010</u>	<u>Electrical Local 64 Voice Data Video</u>
<u>COLUMBIANA</u>	<u>Voice Data Video</u>	<u>8/29/2011</u>	<u>10/27/2010</u>	<u>Electrical Local 64 Voice Data Video</u>
<u>COLUMBIANA</u>	<u>Voice Data Video</u>	<u>9/3/2012</u>	<u>10/27/2010</u>	<u>Electrical Local 64 Voice Data Video</u>
<u>COLUMBIANA</u>	<u>Ironworker</u>	<u>6/1/2011</u>	<u>5/4/2011</u>	<u>Ironworker Local 207</u>
<u>COLUMBIANA</u>	<u>Ironworker</u>	<u>5/25/2011</u>	<u>5/25/2011</u>	<u>Ironworker Local 550 Area 1</u>
<u>COLUMBIANA</u>	<u>Ironworker</u>	<u>8/3/2011</u>	<u>8/3/2011</u>	<u>Ironworker Local 550 Glass & Curtain Wall</u>
<u>COLUMBIANA</u>	<u>Plumber/Pipefitter</u>	<u>6/15/2011</u>	<u>6/15/2011</u>	<u>Plumber Pipefitter Local 396</u>
<u>COLUMBIANA</u>	<u>Plumber Pipefitter</u>	<u>6/15/2011</u>	<u>6/15/2011</u>	<u>Plumber Pipefitter Local 396 WWTP</u>
<u>COLUMBIANA</u>	<u>Plumber/Pipefitter</u>	<u>6/1/2011</u>	<u>5/18/2011</u>	<u>Plumber Pipefitter Local 495 Commercial</u>
<u>COLUMBIANA</u>	<u>Plumber/Pipefitter</u>	<u>6/1/2011</u>	<u>5/18/2011</u>	<u>Plumber Pipefitter Local 495 Industrial</u>

SECTION 00900

ADDENDA

1. All Addenda issued by the Owner/Engineer shall be inserted into this section.
2. If Addenda is issued, all prospective bidders are hereby notified that the Addenda forms a part of the Bidding and Contract documents and modifies the original bidding and contract documents issued. Acknowledge receipt of this addendum in the space provided in the bid proposal section of the specifications. Failure to do so may subject the bidder to disqualification.

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SECTION 00940

NON-DISCRIMINATION IN EMPLOYMENT

TO: _____
(Name of union or organization of workers)

The undersigned currently hold contract(s) with _____ involving funds or credit of the U.S. Government of subcontractor(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order No. 11246, Section 202, dated September 24, 1965, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, religion, sex, handicap, familial status, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER OR DEMOTION, RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT, TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF OR TERMINATION.

This notice is furnished to you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order No. 11246.

(Contractor or Subcontractor)

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SECTION 00950

RESPONSIBILITY OF THE CONTRACTORS

1. A copy of the wage determination must be posted by the contractor and maintained where it can be seen easily by all of the employees.
2. All employees working on the site must be paid at least once a week.
3. Rates of pay shall be at least the minimum shown on the wage determination for each classification.
4. Employees must be paid for overtime at 1-1/2 the regular rate for all time over 8 hours any day or over 40 hours in a week, whichever is the greater overtime.
5. Each employee must be paid the full amount earned less only those deductions approved, allowed, or required by Federal, State or Local statutes or ordinances.
6. No classification of employee shall be employed on the project unless the classification appears on the wage determination.
7. Each week as work progresses, the contractor must submit to the Authority a copy of all weekly payrolls and required attachments stipulated therein.
8. All weekly payrolls shall contain or have attached the following:
 - (a) Name of each employee. Also show address when employee is first entered on payrolls and whenever his address changes thereafter.
 - (b) Classification of employees (same as shown on wage determination or provisional approval).
 - (c) Rate of pay not less than that shown on the wage determination.
 - (d) Hours worked each day and total for each week for each employee.
 - (e) All deductions made.
 - (f) Net amount paid employee.
 - (g) The following certification:

"I certify that the payroll is correct and complete, that the wage rates contained therein are not less than the applicable rates contained in the Wage Determination decision of the Secretary of Labor, and that the classification set forth for each laborer or mechanic conforms to the work he performs."

Signature

Title

(h) The following weekly anti-kickback statement:

I _____, _____ do hereby state: I pay or
(Name of Signatory Party) (Title)
supervise the payment of the persons employed by _____
(Contractor or Subcontractor)

on the _____ that during the payroll period commencing
(Building or Work)

on the _____ day of _____, 20____, and ending on the _____ day of _____,
20____, all persons employed on said project have been paid the full weekly wages earned, that no rebates
have been or will be made either directly or indirectly from the full weekly wages earned by any person, other
than permissible deductions, as defined in Regulations, Part 3 (29 CFR Part 3) issued by the Secretary of
Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967) "(paragraph describing
deductions, if any)."

9. All prime contractors shall include the wage determination and all labor standards provision in all subcontractors as herein specified.
10. The contractor shall make employment records available for inspection by authorized representatives of the Department of Housing and Urban Development, and the Department of Labor, and will permit employees to be interviewed during working hours by these representatives. Payroll records will be maintained during the course of the work by the General Contractor, including a copy of the payroll of each subcontractor, and they shall be preserved for a period of 3 years thereafter.
11. Each monthly engineering estimate must be accompanied by the following certificate executed by each prime contractor employing mechanics and laborers at the site on the work in which the Federal Government is the participant:

Principal Contractor - _____

Project Name - _____

I, _____, as official representative of the above name and
(Name and Title)

principal contractor, do hereby certify as follows:

- () All Labor Standards Requirements have been fulfilled by the principal contractor and all subcontractors under this contract; or
- () There is an honest dispute regarding the required provisions, Explanation:

_____, _____, _____
(Signature) (Title) (Date)

END OF SECTION

DIVISION 10
SPECIALTIES

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PART ONE -GENERAL

1.01 PROJECT LOCATION & CONTACTS

- A. The Project is located at: Village of Wellsville, 1200 Main St., Wellsville, Ohio 43968. From Pump Station #1 to the WWTP.
- B. The Engineer is GGJ, Inc. 35585 Curtis Blvd., Unit C, Eastlake, OH 44095; tele 440-953-1567 fax 440-953-0580, Engineer's contact person is: Nate Wonsick, P.E.
- C. The Owner's contact person is: Mayor Joe Surace

1.02 PROJECT DESCRIPTION

- A. The Project includes all work required to complete the improvements indicated by the Contract Drawings, specified, or required for a complete, operating facility. The required work generally includes, but is not limited to, the following brief summary of the work.

SUMMARY OF THE WORK: The project includes the installation of a new sanitary pump station with a Control & Generator building. Approximately 7,000 ft. of new 12" HDPE Sanitary Forcemain is also part of the scope.

1.03 SPECIFICATIONS

- A. The Contract Specifications are intended to supplement the Drawings and to further describe the Contractor's required work. All work shall be performed by the appropriate trades. Unless included under another trade's work or specifically excluded, it shall be the responsibility of the Contractor(s) to perform all incidental work, whether or not specific mention is made of each item.
- B. It is advised that the Contractor(s) and their subcontractors familiarize themselves with the complete contents of the project Specifications.

1.04 DRAWING SCHEDULE

N/A

PART TWO - PRODUCTS

N/A

PART THREE – EXECUTION

- A. It is the sole responsibility of the Contractor to complete the project in the allotted time. Unless otherwise agreed to in writing by the Engineer, construction activities shall conform to the Construction Schedule as submitted and approved. If the Contractor deviates from the approved schedule, the Contractor shall notify the Engineer in writing as to the extent of the deviation, the reason(s) for the deviation, and what actions the Contractor intends to take to assure that the project is completed before the project completion date.

END OF SECTION

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PART ONE - GENERAL

1.01 GENERAL CONTENTS AND ASSIGNMENTS

- A. This Section contains general project administrative items and required coordination including:

- 1.02 Work Changes & Modification Procedures
- 1.03 Coordination
- 1.04 Pre-construction Meeting
- 1.05 Progress Meetings
- 1.06 Pre-installation Meetings
- 1.07 Construction Cooperation
- 1.08 Contract Closeout
- 1.09 Emergency Maintenance Supervisors
- 1.10 Application for Payment
- 1.11 Measurement & Payment
- 1.12 Project Closeout

- B. The General Contractor shall serve as a Construction Coordinator.

1.02 WORK CHANGES & MODIFICATION PROCEDURES

- A. The Engineer will advise Contractor of minor variations in the Work not involving an adjustment to Contract Price or Contract Time as authorized by EJCDC, 1990 Edition, Paragraph 9.5 by issuing supplemental instructions on AIA Form G710.
- B. The Engineer may issue a Proposal Request that includes a detailed description of a desired change and the Owner's desired method of payment with appropriate supplementary or revised Drawings and specifications. Contractor shall prepare and submit a proposal to perform the desired change within ten (10) days stating the fixed price or other basis for performing the work change as requested, any time extension requirements, the last date for Owner's acceptance, plus any other pertinent information.
- C. The Contractor may propose a change by submitting a request for change to the Engineer. The request shall describe the proposed change and its full effect on the Work and the work being performed by others. Included shall be a statement describing the reason for the change, any proposed substitutions, the fixed price or basis for determining the change in the Contract Price, and the effect on the Contract Time, if any.
- D. When work changes involve bid unit prices, the change in Contract Price shall be based on the bid unit prices and the number of measured, approved units performed by the Contractor in completing the work change. When work changes do not involve bid unit prices, the change in Contract Price shall be a negotiated fixed price or based on a negotiated basis for determining the Change in Contract Price, as requested by the Owner. If Owner and Contractor cannot agree on the change in price or time, they shall be determined in accordance with the General Conditions.
- E. Change Orders, Work Change Directives, or Written Amendments will be issued in accordance with the General Conditions.
- F. Any claims made by the Contractor shall be made within 14 days of the completion of a claim event and shall be sufficiently supported in detail by documented costs, quantities, employee time and payment records, paid invoices, the justification for any Contract time extension, and other relevant data to allow a complete evaluation of the claim.

1.03 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of the Contract Specifications to assure the efficient and orderly sequencing of all interdependent construction elements. Include provisions for accommodating items installed later, if applicable.
- B. Verify that the space and utility requirements and characteristics of operating equipment are compatible with the building space and building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing such equipment into operation.
- C. Verify and coordinate space requirements for all mechanical and electrical work that is indicated diagrammatically on Drawings, noted, or specified. Follow routing shown for pipes, ducts, and conduit, as closely as practical; place runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Except as otherwise indicated, in finished areas, conceal pipes, ducts, and wiring. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean up of Work in preparation for Substantial Completion.
- F. When Owner obtains occupancy of premises, coordinate access to site to minimize disruption of Owner's activities while correcting defective Work and Work not in accordance with Contract Documents.

1.04 PRE-CONSTRUCTION MEETING

- A. Engineer will schedule a Pre-construction meeting shortly after giving Notice of Award.
- B. Required Attendees at Pre-construction Meeting: Owner, Engineer, Affected Utilities, and Contractor's Construction Manager and Superintendent.
- C. The Contractor is responsible for review of the standard agenda items listed below and all other contract documents prior to this meeting.
- D. Standard Pre-construction Meeting Agenda Items:
 - 1. Execution of Owner-Contractor Agreement
 - 2. Submission of executed bonds and insurance certificates
 - 3. Distribution of Contract Documents
 - 4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 5. Designation of individuals representing the Contract parties and the Engineer
 - 6. Procedures, processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders, and Contract closeout procedures
 - 7. Scheduling
 - 8. Scheduling activities of testing laboratories and special consultants
 - 9. Requirements and Preparation for Monthly Progress Meetings
 - 10. Utility Relocation Coordination
 - 11. Use of premises by Owner and Contractor
 - 12. Owner's requirements and occupancy
 - 13. Construction facilities and controls provided by Owner
 - 14. Temporary utilities provided by Owner
 - 15. Survey and layout of structures
 - 16. Security and housekeeping procedures
 - 17. Testing procedures
 - 18. Procedures for maintaining record documents
 - 19. Requirements for start-up of equipment
 - 20. Inspection and acceptance of equipment placed into service during construction period
- E. Engineer will record minutes and distribute copies within 5 working days after the Pre-construction Meeting to participants, with copies to Engineer, Owner, Contractor, and those affected by the discussions or decisions made.

1.05 PROGRESS MEETINGS

- A. Schedule and attend progress meetings at monthly intervals maximum.
- B. Engineer will arrange for progress meetings, prepare agendas with copies for participants, preside at meetings, record minutes of the meeting, and distribute the minutes to all participants within 5 working days.
- C. Attendance Required: Contractor's Superintendent, major Subcontractors and suppliers, Owner, Engineer, as appropriate to agenda items.
- D. The Contractor is responsible for preparing for all Agenda items prior to the meeting.
- E. Standard Agenda Items:
 - 1. Discussion of challenges to previous meeting minutes
 - 2. Review of Work progress
 - 3. Field observations, problems, concerns, and decisions
 - 4. Identification of problems that may impede planned progress.
 - 5. Review of submittals schedule and status of submittals
 - 6. Review of off-site fabrication and delivery schedules
 - 7. Maintenance of progress schedule
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress
 - 11. Maintenance of quality and work standards
 - 12. Effect of proposed changes on progress schedule and coordination
 - 13. Review of construction photographs and as-built drawing status
 - 14. Other business relating to Work
- F. Revisions to Minutes:
 - 1. Unless the distributed minutes are challenged in writing prior to the next regularly scheduled progress meeting, they shall be considered complete, correctly stated, and accepted.
 - 2. Anyone challenging the distributed minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular minutes.
 - 3. Challenges to the prior meeting minutes shall be entertained as a priority item at the next regularly scheduled meeting.

1.06 PRE-INSTALLATION MEETINGS

- A. When required by specific specification Sections, Contractor shall coordinate, schedule and convene a pre-installation meeting at work site a minimum of 10 working days prior to commencing work of the Section.
- B. Required attendance shall be the Engineer, the Contractor's Superintendent, and any other parties directly affecting, or affected by, the Section work.
- C. Notify Engineer 10 days in advance of meeting date.
- D. Contractor shall prepare agenda and preside at meeting:
 - 1. Review conditions of installation, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Engineer shall record minutes and distribute copies within 5 work days after meeting to participants.

1.07 CONSTRUCTION COOPERATION

- A. All Contractors and sub-contractors shall cooperate with the Construction Coordinator in the allocation of site mobilization areas for field offices and sheds, for existing building access, traffic, and parking facilities.
- B. During construction, all contractors and sub-contractors shall coordinate their use of the site and facilities through the Construction Coordinator.
- C. All contractors shall comply with the Construction Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, recommendations; and resolution of ambiguities and conflicts.
- D. All contractors shall comply with instructions of the Construction Coordinator for use of temporary utilities and construction facilities.
- E. All contractors shall coordinate field engineering and layout work with the Construction Coordinator.

1.08 CONTRACT CLOSEOUT

- A. Procedures:
 - 1. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
 - 2. Provide submittals to Engineer that are required by governing or other authorities.
 - 3. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Final Cleaning:
 - 1. Perform final cleaning prior to final project assessment.
 - 2. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, [vacuum carpeted and soft surfaces.]
 - 3. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 - 4. Clean or Replace filters of operating equipment.
 - 5. Clean debris from roofs, gutters, downspouts, and drainage systems.
 - 6. Clean site; sweep paved areas, rake clean landscaped surfaces.
 - 7. Remove waste and surplus materials, rubbish, and construction facilities from the site. Waste removal shall be handled in such a way as to comply with relevant state or local solid waste regulations.
- C. Adjusting:
 - 1. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- D. Project Record Documents:
 - 1. Throughout the progress of the Work, maintain on site and record actual revisions to the Work on one set of the following record documents:
 - a. Drawings.
 - b. Specifications.

- c. Addenda.
 - d. Change Orders and other modifications to the Contract.
 - e. Reviewed Shop Drawings, Product Data, and Samples.
 - f. Manufacturer's instruction for assembly, installation, and adjusting.
2. Ensure entries are complete and accurate, enabling future reference by Owner.
 3. Store record documents separate from documents used for construction.
 4. Record information concurrent with construction progress.
 5. In the Specifications, legibly mark and record at each Product section a description of actual Products installed, including the following:
 - a. Manufacturer's name and product model and number.
 - b. Product substitutions or alternates utilized.
 - c. Changes made by Addenda and modifications.
 6. Record Drawing Requirements – As Built locations of all structures visible at or above grade shall be supplied by a registered surveyor, using data collection equipment.
 - a. AutoCAD base information will be provided by the City/Village or City/Village Engineer to the contractor.
 - b. As-Built data shall use the same horizontal and vertical control as the proposed construction documents.
 - i. Data shall include:
 1. All structures visible at grade installed by the contractor, including but not limited to manholes, curb inlets, catch basins, water valves, hydrants, blow-off assembly's, cleanouts and any other objects deemed pertinent to the the project.
 2. As-Built rim and invert elevation of all structures shall be provided.
 3. Contractor shall keep detailed records of all sewer wye's, tee's, blind connections, or any other below grade features. These records should include measurements from structures that will be visible at grade, in order to accurately show the locations of these below grade objects relative to the data collected by the surveyor.
 4. Earthwork intensive projects shall have spot grades collected in order to verify the accuracy of all earthwork and to verify all related pay items.
 - a. Interval of spot grades should be sufficient to generate As-Built contours.
 5. Roadway resurfacing or roadway replacement projects shall have spot grades collected at the approximate location of the profile grade line to verify the accuracy relative to the proposed finished grade profile.
 - a. Maximum interval of profile grade elevations is 50'.
 - c. Plan requirements:
 - i. Spot Grades where applicable
 - ii. As-Built locations of all structures visible at grade
 - iii. Rim/Inverts identified for each structure
 - iv. As-Built contours where applicable
 - d. Plans should be submitted to the City/Village Engineer for review prior to final acceptance.
 - i. Plans will be submitted in AutoCAD (.dwg) form along with the appropriate pen setting file to the City/Village Engineer.
 - ii. Submittal should also include Adobe Acrobat (.pdf) files of the As-Built drawings signed and sealed by the registered surveyor.
 - iii. Point files, breaklines and any other data used to generate the As-Built drawings will be provided at the Engineer's request.

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

E. Spare Parts and Maintenance Materials:

1. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.
2. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

1.09 EMERGENCY MAINTENANCE SUPERVISOR

- A. The Contractor shall submit to the Engineer the names, addresses, and telephone numbers of two employees responsible for performing emergency maintenance and repairs when the Contractor is not working. These employees shall be designated in writing by the Contractor as his representatives and shall have full authority to act on his behalf as specified in the General Conditions. At least one of the designated employees shall be available for contacting by telephone any time an emergency arises.

1.10 APPLICATION FOR PAYMENT

- A. Submit Applications on form AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet, including continuation sheets when required.

B. Preparation of Applications

1. Present required information in typewritten form.
2. Execute certification by signature of authorized officer.
3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed [and for stored Products].
4. List each authorized Change Order as an extension on AIA G703 - Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work.
5. Prepare Application for Final Payment as specified in Section 01700.

C. Submittal Procedures

1. Submit a minimum of four (4) copies of each Application for Payment and Schedule of Values
2. Submit an updated construction schedule with each Application for Payment.
3. Payment Period: Submit Application for Payment at the end of each month to the Engineer.
4. Submit with transmittal letter as specified for Submittals in Section 01300.
5. Submit two (2) waivers for partial payment.
6. Submit two (2) certified payroll reports for payroll period.
7. If requesting payment for stored materials, submit two (2) payments for stored material form.
8. Submit any other documentation as requested by the Engineer.

D. Substantiating Data

1. When Engineer requires substantiating information, submit data justifying dollar amounts in question.
2. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.11 MEASUREMENT & PAYMENT

- A. Measurement and Payment of Lump Sum Items will be based on Contractor's substantiated estimate of the total Item value completed as accepted by Engineer. Measurement and payment criteria applicable to the unit price Items follows.

1. Use measurement methods delineated in the basis of payment section of the bid proposal forms.
2. Take all measurements and compute quantities. Engineer will verify measurements and quantities.
3. Provide necessary equipment, workers, and survey personnel as required.

- B. The quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work in accordance with the Drawings and Specifications and verified by the Engineer determine payment.

1. If the actual Work performed in accordance with the Drawings and Specifications requires greater or fewer quantities than those indicated, provide the required quantities at the unit price bid.

- C. Quantities shall be measured using the following devices and methods.

1. Measurement Devices:

- a. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year and the Engineer.
- b. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
- c. Metering Devices: Inspected, tested and certified by the applicable state department within the past year and the Engineer.

2. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

3. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

4. Measurement by Area: Measured by square dimension using mean length and width or radius.

5. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord. Underground piping shall be measured by the horizontal projection of the longitudinal axis of the pipe.

6. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

- D. Payment Includes the Following:

1. Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.
2. Final payment for unit price Work will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit price for Work incorporated in or made necessary by the Work.

E. Defective Work shall be handled as follows:

1. Replace the Work, or portions of the Work, not conforming to specified requirements.
2. If, in the opinion of the Engineer and/or Owner, it is not practical to remove and replace the Work, the Engineer and/or Owner will direct one of the following remedies:
 - a. The defective Work may remain, but the unit price will be adjusted to a new price at the discretion of the Engineer.
 - b. The defective Work will be partially repaired to the instructions of the Engineer and/or Owner, and the unit price will be adjusted to a new price at the discretion of the Engineer.
3. When an individual specification section identifies a different method, formula, or percentage price reduction, it shall control.
4. The authority of the Engineer and/or Owner to assess defects and make appropriate payment adjustment is final.
5. Payment will not be made for:
 - a. Products wasted or disposed of in a manner that is not acceptable.
 - b. Products determined unacceptable.
 - c. Products not completely unloaded from the transporting vehicle.
 - d. Products placed beyond the lines and levels of the required Work.
 - e. Products not incorporated in the Work.
 - f. Loading, hauling, and disposing of rejected Products.

1.12 CONSTRUCTION CLOSEOUT

- A. Provide an orderly and efficient transfer of the completed Work to the Owner. Comply with requirements stated in Conditions of the Contract and in Specifications for Administrative procedures in closing out the Work.
- B. Prior to requesting inspection by the Engineer, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.
- C. When the Work is substantially complete, the Contractor shall submit to Engineer the following:
 1. A written notice that the Work, or designated portion thereof, is substantially complete.
 2. A list of items that remain to be completed or corrected.
 - a. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion.
 - b. Should Engineer determine that the Work is not substantially complete:
 - 1) Engineer will promptly notify the Contractor in writing, giving the reasons therefore.
 - 2) Contractor shall remedy the deficiencies in the Work, and send another written notice of substantial completion to the Engineer.
 - 3) Engineer will, within a reasonable time after receipt of such notice, re-inspect the Work.
 - c. When the Engineer finds that the Work is substantially complete, Engineer will:
 - 1) Prepare and deliver to the Owner a tentative Certificate of Substantial Completion on a form with a tentative list of items to be completed or corrected before final payment is made.
 - 2) After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, the Engineer will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

D. FINAL INSPECTION

1. When the Work is complete, Contractor shall submit written certification that:
 - a. The Contract Documents have been reviewed.
 - b. The Work has been inspected for compliance with Contract Documents.
 - c. Work has been completed in accordance with Contract Documents.
 - d. The Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 - e. The Work is completed and ready for final inspection.
2. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to verify that status of completion.
 - a. Should the Engineer consider that the Work incomplete or defective:
 - 1) The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
 - 2) The Contractor shall take immediate steps to remedy the stated deficiencies, and send another written certification to Engineer that the Work is complete.
 - 3) Within a reasonable time after receipt of such notice, the Engineer will re-inspect the Work.
3. When the Engineer finds that the Work is acceptable under the Contract Documents, the Engineer will request the Contractor to make closeout submittals.

E. REINSPECTION FEES

1. Should Engineer be required to perform re-inspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 - a. The Owner will compensate Engineer for such additional services.
 - b. The Owner will deduct the amount of such compensation from the final payment due the Contractor.

F. CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

1. Closeout submittals shall include, but are not necessarily limited to:
 - a. Project Record Documents
 - b. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications, and for other items when so directed by the Engineer.
 - c. Warranties and bonds.
 - d. Keys and keying schedule.
 - e. Spare parts and materials
 - f. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
 - 1) Certificates of Inspection.
 - 2) Certification of Occupancy.
 - 3) Certificates of Insurance for products and completed operations.

- 4) Evidence of payment of all subcontractors, material suppliers, and laborers having a just claim, and the release of all associated liens.
- 5) List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency services at all times including nights, weekends, and holidays.

G. FINAL ADJUSTMENT OF ACCOUNTS

1. Submit a final statement of accounting to Engineer.
2. The Statement shall reflect all adjustments to the Contract Sum:
 - a. The original Contract Sum.
 - b. Additions and deductions resulting from:
 - 1) Previous Change Orders.
 - 2) Allowances.
 - 3) Unit Prices.
 - 4) Deductions for uncorrected Work.
 - 5) Penalties and Bonuses.
 - 6) Deductions for liquidated damages.
 - 7) Deductions for re-inspection payments.
 - 8) Other adjustments.
 - c. Total Contract Sum, as adjusted.
 - d. Previous payments.
 - e. Sum remaining due.
3. The Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum that were not previously made by Change Orders.

H. FINAL APPLICATION FOR PAYMENT

1. The Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

I. INSTRUCTION

1. The Contractor shall instruct the Owner's personnel in the proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work.

PART TWO - PRODUCTS

- 2.01 Provide specified products as required.

PART THREE - EXECUTION

- 3.01 Comply with requirements

PART FOUR - SPECIAL PROVISIONS

None

END OF SECTION

SECTION 01013

OBSTRUCTIONS ENCOUNTERED

PART ONE - GENERAL

1.01 OBSTRUCTIONS ENCOUNTERED

- A. In addition to showing the improvements to be constructed under this Contract, the drawings show certain information obtained by the Owner regarding the pipes, conduits, and other structures which exist along the site of the work, both at and below the surface of the ground. The Owner expressly disclaims any responsibility for the accuracy and completeness of the information given on the drawings with regard to existing structures, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures being shown only for the convenience of the Contractor, who must verify the information to his own satisfaction. The giving of this information upon the contract drawings will not relieve the Contractor of his obligation to support and protect all pipes, conduits, and other structures which may be encountered during the construction of this Contract.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

Not Used

PART FOUR - SPECIAL PROVISIONS

None

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CONTRACT CONSIDERATIONS

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowance
- C. Schedule of values

1.02 RELATED SECTIONS

- A. Section 01011 – Summary of Project
- B. Section 00682- Applications for Payment
- C. Section 01030 - Alternates

1.03 SCHEDULE OF VALUES

- A. Submit a type printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance, and any item as requested by the Engineer.
- D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application for Payment.

PART TWO - PRODUCTS

Not Used.

PART THREE - EXECUTION

Not Used.

PART FOUR - SPECIAL PROVISIONS

None

END OF SECTION

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SECTION 01030

ALTERNATES

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. Submission procedures.
- B. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED SECTIONS

- A. Agreement: Incorporating monetary value of accepted Alternates.
- B. Instructions To Bidders, Bid Form, Supplements to Bid Forms: Requirements for Alternates.

1.03 SUBMISSION REQUIREMENTS

- A. Submit Alternates identifying the effect on adjacent or related components.
- B. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- C. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SELECTION AND AWARD OF ALTERNATES

- A. Indicate variation of Bid Price for Alternates described below and listed in the [SUPPLEMENTS TO] BID FORM document. This form requests a "difference" in Bid Price by adding to or deducting from the base Bid Price.
- B. Bids will be evaluated on the base bid price plus alternate(s) when required, that yields the lowest combined total needed for the project.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

Not Used

PART FOUR - SPECIAL PROVISIONS

None

END OF SECTION

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PART ONE - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Throughout the Contract Documents, references are made to trade and association codes and standards that define qualities and types of workmanship and materials, and establish methods for testing and reporting on pertinent characteristics.
2. Where materials or workmanship are required by the Contract Documents to meet or exceed the specifically named codes or standards, it is the Contractor's responsibility to provide materials and workmanship that meet or exceed the latest edition of the specifically named code or standard.
3. It also is the Contractor's responsibility, when required by the Contract Documents or requested by the Engineer, to deliver to the Engineer all required proof that the materials and workmanship meet or exceed the edition requirements on the date that bids are received of the specifically named code or standard. Such proof shall be in the form of a certified report of tests conducted by a testing agency approved for that purpose by the Engineer.

- B. Related work described elsewhere:** Specifically named codes or standards occurring on the Drawings and in other Sections of the Specifications.

1.02 QUALITY ASSURANCE

A. Familiarity with pertinent codes and standards:

In procuring all items used in this Work, it is the Contractor's responsibility to verify the detailed requirements of the referenced named codes and standards and to verify that the items procured for use in this Work meet or exceed the project Specification requirements. Except when a specific publication date is specified, the publication in effect on the date of Contract Document signing shall be considered the latest edition and shall apply. Contractor shall maintain a copy of the applicable referenced codes and standards on the project site. Any conflicts between the association codes and standards, and the project Specifications, shall be brought to the attention of the Engineer for resolution. Engineer's decision shall be final.

B. Rejection of non-complying items:

The Engineer reserves the right to reject items incorporated into the Work that fail to meet the specified minimum requirements. The Engineer further reserves the right, and without prejudice to other recourse the Engineer may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Engineer and the Owner.

C. Applicable standards listed in these Specifications include, but are not necessarily limited to standards promulgated by the following agencies and organizations:

1. AASHTO - American Association of State Highway and Transportation Officials, 444 North Capital Street, N.W., Washington, D.C. 20001
2. ACI - American Concrete Institute, Box 19150, Redford Station, Detroit, Michigan 48129
3. AGMA - American Gear Manufacturers Association
4. AI - Asphalt Institute, Asphalt Institute Building, College Park, MD 20740
5. AISC - American Iron and Steel Construction, Inc. 1221 Avenue of the Americas, New York, New York 10020

6. AISI - American Iron and Steel Institute, 1000 16th Street, N.W., Washington, D.C. 20036
7. AMCA - Air Movement and Control Association, 30 West University Drive, Arlington Heights, IL 60004
8. ANSI - American National Standards Institute (successor to USASI and ASA), 1430 Broadway, New York, New York 10018
9. ARI - Air-Conditioning and Refrigeration Institute, 1815 North Fort Myer Drive, Arlington, VA 22209
10. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers, 345 East 47th Street, New York, NY 10017
11. ASME - American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017
12. ASTM - American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103
13. AWWA - American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235
14. AWS - American Welding Society, 2501 N.W. 7th Street, Miami, Florida 33125
15. AWWA - American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235
16. CLFMI - Chain Link Fence Manufacturers Institute, 1101 Connecticut Avenue, Washington, D.C. 20036
17. CRSI - Concrete Reinforcing Steel Institute, 228 North LaSalle Street, Chicago, Illinois 60610
18. FM - Factory Mutual System, 1151 Boston-Providence Turnpike, Norwood, MA 02062
19. FS - Federal Specifications, General Services Administration, Specifications and Consumer Information Distribution Section (WFSIS), Washington Navy Yard, Building 197, Washington, D.C. 20407
20. GA - Gypsum Association, 1603 Orrington Avenue, Evanston, IL 60201
21. IEEE - Institute of Electrical and Electronic Engineers
22. ISA - Instrument Society of America
23. MIL - Military Specifications, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120
24. MLSFA - Metal Lath/Steel Framing Association, 221 North LaSalle Street, Chicago, IL 60601
25. NAAMM - National Association of Architectural Metal Manufacturers, 221 North LaSalle Street, Chicago, IL 60601
26. NEC - National Electrical Code, 470 Atlantic Avenue, Boston, Massachusetts 02210
27. NEMA - National Electrical Manufacturers Association, 2101 L Street, N.W., Washington, D.C. 20037
28. NFPA - National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
29. NFPA - National Forest Products Association, 1619 Massachusetts Avenue, N.W., Washington, D.C. 20036
30. NTMA - National Terrazzo and Mosaic Association, 3166 Des Plaines Avenue, Des Plaines, IL 60018
31. ODOT - Ohio Department of Transportation, 1980 W. Broad Street, Columbus, OH 43223
32. OSHA - Occupational Safety and Health Act
33. PCA - Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 20076

34. PCI - Prestressed Concrete Institute, 20 North Wacker Drive, Chicago, IL 60606
35. PENNDOT – Pennsylvania Department of Transportation, Keystone Building, 400 North Street, Harrisburg, PA 17120
36. PS - Product Standard, U.S. Department of Commerce, Washington, D.C. 20203
37. SDI - Steel Deck Institute, Box 3812, St. Louis, MO 63122
38. SDI - Steel Door Institute, 712 Lakewood Center North, Cleveland, OH 44107
39. SJI - Steel Joist Institute, 1703 Parham Road, Suite 204, Richmond, VA 23229
40. SSPC - Steel Structures Painting Council
41. TCA - Title Council of America, Inc., Box 326, Princeton, NJ 08540
42. UL - Underwriters' Laboratories, Inc., 333 Pfingston Road, Northbrook, IL 60062
43. Uni-B - Uni-Bell Plastic Pipe Association, 2655 Villa Creek Drive, Suite 164, Dallas, Texas 75234
44. WVDOH – West Virginia Department of Highways, Contract Administration Division, West Virginia Division of Highways, 1900 Kanawha Boulevard, East, Building 5, Room 737, Charleston, WV 25305-0430

PART TWO - PRODUCTS

N/A

PART THREE - EXECUTION

N/A

PART FOUR - SPECIAL PROVISIONS

None

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SECTION 01300

SUBMITTALS

PART ONE - GENERAL

1.01 SECTION 01300 INCLUDES:

- A. 1.02 Related Sections
- B. 1.03 Submittal Procedures (For the Record, Shop Drawings for Review & Approval, General Information, and For Operation and Maintenance Requirements)
- C. 1.04 Proposed Products list
- D. 1.05 Substitutions
- E. 1.06 Samples
- F. 1.07 Manufacturer's installation instructions
- G. 1.08 Manufacturers' certificates
- H. 1.09 Operation & Maintenance Manuals
- I. 1.10 Construction Schedule
- J. 1.11 Schedule of Values
- K. 1.12 Workers' Compensation Certificates
- L. 1.13 Product and Work Item Warranties and Bonds

1.02 RELATED SECTIONS

- A. When specific or more comprehensive submittals are required than are described herein, they are specified in stand alone Sections or within other technical Sections.

1.03 SUBMITTAL PROCEDURES

- A. The Contractor shall transmit all submittals (except for laboratory testing results) to the Engineer using AIA Form G810 or approved equal. Submittals from subcontractors, suppliers, or others will not be accepted. Laboratory testing results shall be sent directly from the Laboratory to the Engineer, as specified in Section 01410 Testing Laboratory Services.
- B. Sequentially number the transmittal form. Mark revised submittals with the original number plus a sequential alphabetical extension.
- C. The Contractor shall stamp and clearly identify Submittal Date, Project Title and Location; Contractor's Name and Address, Specification Section, Purpose of the Submittal (Record Purposes, Review & Approval, General Information, and Operation & Maintenance requirements); the person who performed the submittal review, and other identification that may be appropriate.
 - 1. Submittals for Record Purposes include laboratory test results, licenses, permits, and installation and calibration certificates. Laboratory test results shall be signed by an authorized agent of the independent laboratory performing the tests and will be used for comparing to the specification requirements. The Contractor shall obtain all licenses and permits required by Local, State, and Federal laws. Where requested, the Contractor shall submit installation and calibration certificates from manufacturers indicating the manufacturer's satisfaction with the installation, the calibration, and the operation of the manufacturer's equipment.
 - 2. Submittals for Review & Approval include Construction Schedules, Construction Drawings, Shop Drawings, Manufacturer's literature and certifications, Supplier's literature and certifications, Design data, Samples, Schedule of values, and other related or requested data.

Shop Drawings: Submittals for Review

- a. Submit scaled, accurate drawings for review. After found to be in general conformance with the Drawings and Specifications, Engineer will distribute in accordance with PART THREE - EXECUTION

- b. Submit the number of opaque reproductions desired by the Contractor, plus three (3) copies, which will be retained by Engineer for distribution. If Contractor requires more than four copies for its use, Contractor shall reimburse Engineer for the time required to markup the extra copies requested.
- c. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- d. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- e. All Shop Drawings submitted for review shall be stamped with the review block shown below:

<input type="checkbox"/>	REVIEWED AND FOUND TO BE IN GENERAL CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS.
<input type="checkbox"/>	REVIEWED AND FOUND, AS NOTED, TO BE IN GENERAL CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS.
<input type="checkbox"/>	SUBMITTAL DOES NOT CONFORM TO THE DRAWINGS AND SPECIFICATIONS AND THE CONTRACTOR WILL ASSUME ALL LIABILITY FOR ITS FUNCTIONAL PERFORMANCE.
<input type="checkbox"/>	REVISE AND RE-SUBMIT
<input type="checkbox"/>	REJECTED
REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AND THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY CORRECTIONS OR COMMENTS MADE DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT DRAWINGS AND SPECIFICATIONS. REVIEW OF A SPECIFIC ITEM DOES NOT INCLUDE THE REVIEW OF AN ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. CONTRACTOR IS RESPONSIBLE FOR: DIMENSIONS, WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE; INFORMATION PERTAINING TO FABRICATION PROCESSES; THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION; THE COORDINATION OF THE WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING ALL WORK IN A SAFE AND SATISFACTORY MANNER.	
GGJ, INC. CONSULTING ENGINEERS	
DATE _____ BY _____	

- 3. General Information is typically additional information requested to meet the general needs of the project.
- 4. Operation & Maintenance information is required for all equipment. See OPERATION & MAINTENANCE MANUALS below.
- D. Prior to making submittals to the Engineer, the Contractor shall verify important field measurements and product dimensions. Carefully review for correctness, suitability, and fit.
- E. Apply Contractor's stamp and sign, thereby certifying that Contractor has carefully reviewed the material submitted, verified the products & product dimensions, checked field measurements and product dimensions, reviewed adjacent construction Work, coordinated related information, and that the product or material for which it is seeking Engineer's approval is in accordance with the requirements of Contract Documents.
- F. The Contractor shall make its submittals in an order that expedites the Project. Deliver to Engineer - Attention [Project Name] Construction Manager at 35585 Curtis Blvd., Unit C, Eastlake, Ohio 44095. Coordinate submission of related items.

- G. For each submittal for review, allow 20 working days excluding delivery time to and from the contractor. If certain submittals require expediting, the Contractor may request that the submittal be expedited. The Engineer will place the requested expedited submittal ahead of the other project submittals and make a reasonable effort to assist in completing the review as soon as possible. The Engineer, however, shall not be responsible for any delays to the un-expedited project submittals caused by its reviewing of the expedited submittals first.
 - H. Identify all variations from the Contract Documents. Note any product or system limitations that may be detrimental to the successful performance of the completed Work.
 - I. Provide space for Contractor's and Engineer's review stamps.
 - J. When a submittal is being resubmitted, identify all changes made since the previous submission, and identify submittal with original section number followed by an alphabetical letter extension e.g. A, B, C . . . to identify the re-submittal level.
 - K. Distribute copies of reviewed submittals as appropriate. Engineer will distribute reviewed submittals to Owner and Project Field Representative. Instruct parties to promptly report any inability to comply with provisions.
 - L. Maintain an accurate submittal log for the duration of the Work, including mailing and received dates, the status of each submittal, and the resulting outcome of each submittal. Make the submittal log available to the Engineer for review upon request. Notify Engineer in writing if any of Contractor's submittals have not been responded to in a timely manner.
- 1.04 PROPOSED PRODUCTS LIST
- A. Within 15 days from the effective date of the Owner-Contractor Contract, submit a list of all manufacturers' major equipment and products proposed for use, identifying the name of the manufacturer, trade name and model number of each product or piece of equipment.
 - B. For products specified only by referenced standards, give manufacturer, trade name, model or catalog designation and referenced standards.
- 1.05 SUBSTITUTIONS
- A. Unless otherwise specified, substitutions will be considered only when substantiated by the Contractor's submittal of a complete request for substitution within forty-five (45) calendar days after the Contractor has received Owner's Notice to Proceed. The request for substitution shall include any proposed deduct or increase in price offered for Owner accepting the substitution.
 - B. The Contractor shall accompany any request for substitution with such drawings, specifications, samples, manufacturer's literature, performance data, and other information necessary to describe and completely evaluate the proposed substitution. The burden of proof shall be on the Contractor.
 - C. If any substitution will affect a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be identified and included in the request for substitution.
 - D. Approval of any request for substitution shall not relieve the Contractor from the responsibility for any deficiency that may exist in the substitution or for any departures or deviations from the requirements of the Contract Documents. Except as otherwise expressly specified by the Contractor in the request for substitution and expressly approved in writing by the Engineer, the Contractor shall be deemed to warrant by the request that the proposed substitution will satisfy all standards and requirements satisfied by the originally specified products or procedure and that the approval of the request for substitution shall not be deemed to modify the Contract Documents with respect thereto.
 - E. Major Equipment Evaluation:
 - 1. Any request for substitution of equipment identified elsewhere in the Drawings or Specifications as being subject to "Major Equipment Evaluation" shall identify five (5) installations similar to that proposed. The following information regarding each installation shall be provided.

- a. Name and location of facility.
 - b. Brief description (size, number, performance, etc.).
 - c. Names, addresses and telephone numbers of owner, operator, design engineer and general contractor responsible for equipment installation.
 - d. The following dates: Order placed, delivery, start-up and full operation.
2. Provide the manufacturer's standard published Operation and Maintenance Manual. Identify any modifications to the procedures identified that are specific to the equipment to be supplied. For the specific equipment proposed, provide the frequency of scheduled maintenance procedures and the total expected time required for routine maintenance.
 3. A performance evaluation will be conducted by the Engineer and will include interviews with people other than those identified by the Contractor, manufacturer, or supplier. At a minimum, the following questions will be asked:
 - a. Were there any delays or problems with delivery of equipment attributable to the manufacturer?
 - b. Describe any equipment breakdowns.
 - c. Describe manufacturer's service responsiveness during warranty.
 - d. Describe manufacturer's service responsiveness following warranty.
 - e. Describe any costs (whether covered by manufacturer or not) associated with equipment failures following installation.
 - f. Is/was operation and maintenance, as recommended by manufacturer/supplier, adequate?
 - g. Describe the equipment process performance. How long to achieve satisfactory performance? How do actual and manufacturer performance compare? How long has required/satisfactory performance been continuously achieved?

1.06 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors or in custom colors selected by Owner/Engineer, textures, and patterns for Engineer's review.
- C. Include identification on each sample, with full Project information.
- D. Submit the number of samples specified in individual specification sections, one of which will be retained by Engineer.
- E. Reviewed samples that may be used in the Work are indicated in individual specification sections.

1.07 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. Manufacturer installation instructions shall be submitted for owner information, prior to installation.
- B. When appropriate, submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing to Engineer.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.08 MANUFACTURER CERTIFICATES

- A. When appropriate or specified in individual specification sections, submit manufacturer certifications to Engineer.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results of material or Product, but must be acceptable to Engineer.

1.09 OPERATION & MAINTENANCE MANUALS

- A. Contractor shall compile and furnish three (3) finalized copies of the reviewed Manual covering all equipment as follows:
 - 1. Submittals shall include but not be limited to descriptive literature, bulletins and spec sheets that describe the equipment, system, or item; the operation of the equipment, system, or item; a detailed list of equipment components and appurtenances including manufacturer & model number where appropriate; notice of any items required for operation that are not included; utility requirements; general arrangement drawings; materials of construction, assembly data, dimensional data; performance curves, certifications and guarantees; parts lists with ordering numbers and suppliers, assembly drawings, recommended spare parts to keep on site; lubrication and routine maintenance requirements; schematic wiring and piping diagrams; calibration procedures and specifications; related data on instrumentation and control equipment; drive data; operation & maintenance data; equipment supplier's name & address; and other pertinent data as is applicable.
 - a. When the data submitted includes more than one model or item, the Contractor shall clearly mark the items and model that is being submitted for review.
 - b. Manuals shall be tailored for the contract work and be prepared by the Contractor. The manuals shall have a heavy plastic or fiberboard cover and contain all data associated with the equipment or system, as installed, including a copy of the material found by the Engineer to be in general accordance with the Drawings and Specifications. Manuals shall be printed on or be folded to 8-1/2 x 11 in. size whenever practical. Drawings shall be reduced, when practical, or provided in full size and placed in an envelope or pocket bound into the manual. The Contractor shall include clearly marked divider tabs to separate specification section equipment and to improve the ease of use. Provide a detailed Table of Contents, and use a manual title label identifying the contents of the manual. Label shall include "O & M Manual for [Project Name]", the General Contractor's Name, and the Year project was placed into service. Manuals shall be submitted in completed form and be approved by the Engineer not less than 30 days prior to the date of final acceptance.

1.10 CONSTRUCTION SCHEDULE

- A. Immediately after signing the Contract, each prime Contractor shall prepare a graphic construction schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on or before the project completion date. Copies of the construction schedule, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer in writing, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required to complete the work on or before the project completion date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.
- C. Each prime Contractor on the project shall give its progress schedule to the General Contractor for incorporation in a combined project schedule.
- D. The General Contractor shall prepare a combined Project Progress Schedule and shall update it monthly for presentation at project progress meetings. A copy of the combined Project Progress Schedule shall be submitted with the respective periodic estimate.
- E. All project schedules shall be on 11" x 17" or smaller size paper to facilitate ease of reproduction.

1.11 SCHEDULE OF VALUES

- A. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.
A Schedule of values is required to be compatible with the "continuation sheet" accompanying applications for payment.
- B. Type dated schedule on 8 1/2 in. X 11 in. white paper; Contractor's standard forms and computer printouts will be considered for approval by Engineer upon Contractor's request. Identify schedule with Project title, Name & Address of Contractor, and date of submission.
- C. Schedule shall list separately the installed labor and material value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
 - 1. Identify each line item with the number and title of the respective major section of the specifications.
 - 2. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 - 3. For items where progress payments will be requested for stored materials, breakdown the value into the cost of the materials, delivered and unloaded; and the total installed value.
 - 4. For completed construction, subdivide as needed to identify costs for audit, inventory, insurance and replacement cost purposes.
- D. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer, substantiating the sums described.
- E. Use required means to assure arithmetical accuracy of the sums described.

1.12 INSURANCE CERTIFICATES

- A. Submit a copy of the Contractor's current Workers' Compensation Certificate and all renewal Certificates until the date that Final payment is due. Coverage shall not lapse for any reason.

1.13 PRODUCT AND WORK ITEM WARRANTIES AND BONDS

- A. Form of Submittals
 - 1. Bind in commercial quality 8-1/2 x 11 inch three D side ring binders with durable plastic covers.
 - 2. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor [and equipment supplier]; and name of responsible company principal.
 - 3. Table of Contents: Neatly type Table of Contents of the binder manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
 - 4. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- B. Preparation of Submittals
 - 1. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
 - 2. Verify that documents are in proper form, contain full information, and are notarized.
 - 3. Co-execute submittals when required.
 - 4. Retain warranties and bonds until time specified for submittal.

C. Time of Submittals

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART TWO - PRODUCTS

N/A

PART THREE - EXECUTION

3.01 DISTRIBUTION

- A. Distribution of reviewed and approved submittals will be made by the Engineer in accordance with PART FOUR of the individual specifications if addressed there, otherwise distribution will be as follows:
 1. Information for Record - One copy to Owner, Engineer, and Resident Project Representative.
 2. Review and Approval - After finding to be in general accordance with the Drawings and Specifications, the Engineer will issue a Construction Bulletin and distribute copies to the Contractor (the number submitted for its needs); one copy each for Owner, Engineer, and Resident Project Representative.

3.02 PERFORMANCE OF WORK

- A. Complete all work associated with submittals or required above.

PART FOUR - SPECIAL PROVISIONS

None

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SECTION 01350

PRODUCT REQUIREMENTS & HANDLING

PART ONE - GENERAL

1.01 DESCRIPTION

- A. This Section includes supplemental requirements covering all Work, materials, and equipment. If there is disagreement between Section 01350 and PART FOUR of another Section, the other Section's PART FOUR shall take precedence; otherwise Section 01350 shall govern.

PART TWO - PRODUCTS

2.01 SHOP PAINTING

- A. All ungalvanized non-stainless steel ferrous surfaces shall be painted.
- B. Shop painting of ferrous surfaces shall be as follows:
 - 1. Surfaces shall be thoroughly cleaned of dirt, grease, oil, rust, scale, or other foreign substances. All metal surfaces shall be abrasive blasted in accordance with SSPC-SP10, Near-White Blast Cleaning.
 - 2. Surfaces shall receive a shop coat of a primer compatible with the finish coating to be used by the Contractor.

2.02 GALVANIZING

- A. Where galvanized metal is indicated or specified, galvanizing shall conform to ASTM A-123 (Hot Dip Galvanized). Threaded parts and hardware shall be galvanized in conformance with ASTM A-153.

2.03 STAINLESS STEEL& ALUMINUM

- A. Stainless steel and aluminum shall not be painted. Bolts, nuts, and washers used on aluminum fabrications shall be stainless steel.

2.04 ANCHOR BOLTS

- A. All stationary Equipment shall be securely anchored as recommended by the equipment manufacturer, shown on the Drawings, or required.

2.05 SAFETY GUARDS

- A. Installed equipment shall be equipped with all guards, shields, and devices to meet OSHA requirements.
- B. Chain and belt guards shall be totally enclosed of 12 gauge steel construction.
- C. Guards shall include expanded metal inspection panels. Removable access panels shall be provided to perform routine maintenance.

2.06 SOUND LEVELS

- A. Installed equipment shall not exceed 88 dB (A) weighted maximum sound level at 3 ft from the equipment. This value shall not be exceeded throughout the entire speed and load range of the equipment.

2.07 MANUFACTURER'S NAMEPLATE DATA

- A. Equipment shall be identified by permanently attached nameplate of corrosion-resistant metal. Plates shall contain the following information:
 - 1. Manufacturer's name
 - 2. Serial and model numbers

3. Rated capacity
4. Temperature, pressure, or other limitations

PART THREE - EXECUTION

3.01 DELIVERY, HANDLING, AND STORAGE

- A. Unless otherwise specified in the individual Sections, the Contractor shall deliver, handle, store and maintain materials and equipment in accordance with the requirements of the manufacturer.
- B. Materials, equipment, and articles to be incorporated into the Work shall be stored to facilitate inspection and inventory and to ensure the preservation of their quality and fitness for the Work. Stocked materials shall be subject to test and shall meet the requirements of the Specifications at the time incorporated into the Work.
- C. Where construction is in roads or streets, the portion of the right-of-way not required for public travel may be used for temporary storage purposes unless otherwise prohibited. Materials shall not be stored in areas where such storage creates a hazard. Any other additional space required for construction or storage of materials and equipment shall be obtained by the Contractor at the Contractor's expense.
- D. The Contractor shall confine all equipment, the storage of materials and equipment, and the operations of the workers to areas permitted by law, ordinances, permits, and the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.
- E. Switchgear, motor control centers, panelboards, instrument control panels, fixtures, process equipment, and like equipment shall be received and stored in a dry, clean, dust-free, heated area. If no such area is available at the time such equipment is received, such space shall be provided by the Contractor at no expense to the Owner. If equipment is stored in an area conducive to the formation of condensation, heaters shall be provided to prevent condensation. Work of other trades shall be substantially complete in the area before the equipment is installed in its final position or suitable protection shall be provided to prevent damage by falling material, dust, dirt, and moisture.

3.02 INSTALLATION

- A. Equipment shall be installed in accordance with the manufacturer's instructions and Contract Documents. Required anchors, grout, and leveling shims shall be provided by the Contractor.

3.03 INITIAL LUBRICATION

- A. Initial lubrication required for equipment start-up, field test operation, and normal operation prior to substantial completion shall be furnished and applied in accordance with the manufacturer's recommendations.
- B. Where lubricating points are not easily accessible on equipment, provide extensions as required for easy access with a standard grease gun.

3.04 PACKING

- A. Each piece of equipment with a shaft containing a packing gland shall be checked for condition by backing the packing gland off and examining for proper grade, amount, and type of packing as recommended by the manufacturer.

3.05 MAINTENANCE

- A. The Contractor shall perform and log all preventive maintenance tasks as recommended by the manufacturer while the equipment is in storage and after installation until the equipment has been accepted by the Owner.

3.06 TROUBLESHOOTING

- A. Should a problem occur before acceptance, the Contractor shall determine the cause and recommend corrective actions to the Engineer. The Contractor shall correct equipment and installation deficiencies.

PART FOUR - SPECIAL PROVISIONS

TESTING LABORATORY SERVICES

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Laboratory responsibilities.
- D. Laboratory reports.
- E. Limits on testing laboratory authority.
- F. Contractor responsibilities.
- G. Schedule of inspections and tests.

1.02 RELATED SECTIONS

- A. Information Available to Bidders: Soil investigation data.
- B. General Conditions: Inspections, testing, and approvals required by public authorities.
- C. Section 01300 - Submittals: Manufacturer's certificates.
- D. Section 01700 - Contract Closeout: Project record documents.
- E. Individual Specification Sections: Inspections and tests required, and standards for testing.

1.03 REFERENCES

- A. ASTM C802 - Practice for Conducting an Inter-laboratory Test Program to Determine the Precision of Test Methods for Construction.
- B. ASTM C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
- C. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- D. ASTM C1093 - Practice for Accreditation of Testing Agencies for Unit Masonry.
- E. ASTM D290 - Recommended Practice for Bituminous Mixing Plant Inspection.
- F. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- G. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- H. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- I. ASTM E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.
- J. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- K. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.04 SELECTION AND PAYMENT

- A. Include within the Contract Price an amount sufficient to cover all testing and inspecting required under this Section and other pertinent Sections of these Specifications, and to cover all testing and inspecting required by governmental agencies having jurisdiction and other tests and inspections as are directed by the Engineer.
- B. When initial tests requested by the Engineer indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the Contractor.
- C. Employment of testing laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of ASTM C301, ASTM C425, ASTM D2412, ASTM C802, ASTM D2444, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D290, ASTM D3740, ASTM D4561, ASTM E329, ASTM E543, ASTM E548, ASTM E699, and ACI 613, ASTM C42, ASTM C39, and all applicable reference standards in these specifications.
- B. Laboratory: Authorized to operate in State in which Project is located.
- C. Laboratory Staff: Maintain a full time registered Engineer or certified specialist on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.06 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer or specialist and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.07 LABORATORY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified inspecting, sampling, and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional inspection and tests required by Engineer.
- G. Attend pre-construction meetings and progress meetings.

1.08 LABORATORY REPORTS

- A. After each inspection and test, promptly submit two copies of laboratory report to Engineer, and to Contractor.
- B. Include:
 - 1. Date issued
 - 2. Project title and number
 - 3. Name of inspector

4. Date and time of sampling or inspection
5. Identification of product and specifications section
6. Location in the Project
7. Type of inspection or test
8. Date of test
9. Results of tests
10. Conformance with Contract Documents.

C. When requested by Engineer, provide interpretation of test results.

1.09 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities:
 1. To provide access to Work to be tested
 2. To obtain and handle samples at the site or at source of Products to be tested
 3. To facilitate tests and inspections
 4. To provide storage and curing of test samples.
- D. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring inspecting and testing services.

1.11 SCHEDULE OF INSPECTIONS AND TESTS

A. SOIL INSPECTION AND TESTING

1. Make required inspections and tests including, but not necessarily limited to:
 - a. Visually inspect on-site and imported fill and backfill, making such tests and retests as are necessary to determine compliance with the Contract requirements and suitability for the proposed purpose.
 - b. Make field density tests on samples from in-place material.
 - c. As pertinent, inspect the progress of excavating, filling and grading; make density tests at fills and backfills; and verify compliance with provisions of the Contract Documents and governmental agencies having jurisdiction.
2. Make and distribute necessary reports and certificates.

B. CONCRETE INSPECTING AND TESTING

1. Portland cement:

- a. Secure from the cement manufacturer Certificates of Compliance delivered directly to the concrete producer for further delivery directly to the testing laboratory.
- b. Require the Certificates of Compliance to positively identify the cement as to production lot, bin or silo number, dating and routing of shipment, and compliance with the specified standards.
- c. If so required by the Engineer, promptly provide such other specific physical and chemical data as requested.

2. Aggregate:

- a. Provide one test unless character of material changes, material is substituted, or additional test is requested by the Engineer.
- b. Sample from conveyor belts or batching gates at the ready-mix plant:
 - 1) Sieve analysis to determine compliance with specified standards and grading.
 - 2) Specify gravity test for compliance with specified standards.

3. Laboratory design mix:

- a. After approval of aggregate, and whenever character or source of material is changed, provide mix design in accordance with ACI 613.
- b. Provide designs for all mixes prepared by a licensed civil engineer.

4. Molded concrete cylinders:

- a. Provide three test cylinders for each 150 cubic yard, or fraction thereof, of each class of concrete of each day's placement.
- b. Test one cylinder at seven (7) days, one at twenty-eight (28) days, and one when so directed.
- c. Report the mix, slump, gauge, location of concrete in the structure and test results.
- d. Take specimens and make tests in accordance with the applicable ASTM standard specifications.

5. Core tests:

- a. Provide only when specifically so directed by the Engineer because of low cylinder test results.
- b. Cut from locations directed by the Engineer, securing in accordance with ASTM C42, and prepare and test in accordance with ASTM C39.

6. Placement inspections:

- a. On concrete over 2000 psi, provide continuous or other inspection as required by governmental agencies having jurisdiction.
- b. Throughout progress of concrete placement, make slump tests to verify conformance with specified slump.
- c. Using all required personnel and equipment throughout progress of concrete placement, verify that finished concrete surfaces will have the level or slope that is required by the Contract Documents.

C. CONCRETE REINFORCEMENT INSPECTING AND TESTING

1. Prior to use, test all reinforcement steel bars for compliance with the specified standards.

- a. Material identified by mill test reports, and certified by the testing laboratory, does not require additional testing. Require the supplier to furnish mill test reports to the testing laboratory for certification.
 - b. Tag identified steel at the supplier's shop. When steel arrives at the job site without such tags, test it as unidentified steel.
2. Unidentified steel:
- a. Have testing laboratory select samples consisting of two (2) pieces of each size, each 18" long.
 - b. Have the testing laboratory make one tensile test and one bend test for each 2-1/2 tons or fraction thereof of each size of unidentified steel.
3. Provide continuous inspection for all welding of reinforcement steel.

D. STRUCTURAL STEEL INSPECTING AND TESTING

1. Prior to use, test all structural steel for compliance with the specified standards.
- a. Material identified by mill test reports and certified by the testing laboratory does not require additional testing. Require the supplier to furnish mill test reports to the laboratory for certification.
 - b. Tag identified steel at the supplier's shop. When steel arrives at the job site without such tags, test it as unidentified steel.
2. Unidentified steel:
- a. Have testing laboratory make one tensile test and one bend test for each five (5) tons or fraction thereof of each shape and size of unidentified structural steel.
3. Shop Welding:
- a. Provide qualified testing laboratory inspector.
 - b. On single pass welds, inspect after completion of welding and prior to painting.
 - c. On multiple pass welds, and on butt welds with cover pass on the back side, provide continuous inspection.
4. Field welding:
- a. Provide continuous inspection by a qualified testing laboratory inspector.

E. SEWER PIPE AND JOINT MATERIAL TESTING

1. Vitrified Clay Pipe
- a. Tests for clay pipe shall be made on four (4) specimens of each size and type of pipe as selected by the Engineer which pipe shall be furnished by the manufacturer. Tests shall be made by an independent testing laboratory approved by the Engineer and shall be at the Contractor's expense. Tests shall be made in accordance with current standards of ASTM C301 and ASTM C425.
 - b. All clay sewer pipe shall be subject to inspection on the job by the Engineer. The purpose of the inspection shall be to cull and reject pipe that, independent of the physical tests, fails to conform to the requirements of these specifications.
2. PVC Pipe
- a. Test for PVC gravity sewer pipe shall be made by an independent testing laboratory, approved by the Engineer and shall be at the Contractor's expense.
 - b. Drop Impact Test: Pipe (6" long section) shall be subjected to impact from a free falling tup (20 lb. Tup

A.) in accordance with ASTM Method of Test D2444. No shattering or splitting shall be evident when the following energy is impacted.

<u>Nominal Size</u>	<u>Ft. - lbs.</u>
4	150
6	210
8	210
10	220

- c. Pipe Stiffness: Minimum pipe stiffness (F/Y) at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM Methods of Test D2412, "External Loading Properties of Plastic Pipe by Parallel Plate Loading."
- d. Joint Tightness: Two (2) sections of pipe shall be assembled in accordance with the manufacturer's recommendation. Joints shall be tested in accordance with ASTM D3212, "Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals."
- e. Flattening: There shall be no evidence of splitting, cracking or breaking when the pipe is tested as follows: Flatten specimen of pipe six (6) inches long between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five (2-5) minutes.

3. C900 Pipe

- a. Testing: See Section 02634 PVC PIPE (AWWA C900)

4. Ductile Iron Pipe

- a. Testing: See Section 02625 DUCTILE IRON PIPE & FITTINGS

F. WAIVER OF INSPECTION AND/OR TESTS

- 1. Specified inspections and/or tests may be waived only by the specific approval of the Engineer, and such waivers will be expected to result in credit to the Owner equal to normal cost of such inspection and/or test.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

Not Used

PART FOUR - SPECIAL PROVISIONS

None

END OF SECTION

TEMPORARY WORK FACILITIES AND PROJECT CONTROLS**PART ONE - GENERAL****1.01 DESCRIPTION**

- A. Section 01500 specifies requirements related to preliminary work and temporary items, facilities, and control of the project Work including:
- 1.02 Conformity with Drawings & Specifications (incl. Field Engineering)
 - 1.03 Cutting & Patching Existing Structures and Buried Improvements
 - 1.04 Maintenance of Existing Operations
 - 1.05 Cooperation of Contractor(s)
 - 1.06 Road Maintenance and Restoration
 - 1.07 Temporary Parking, Access Roads, and Paving of Trenches
 - 1.08 Maintaining Traffic & Utilities in Right-Of-Ways
 - 1.09 Barricades, Signs, Lights, & Site Safety
 - 1.10 Environmental Protection
 - 1.11 Night, Sunday and Holiday Work
 - 1.12 Specific Contractor Responsibilities
 - General Contractor
 - Electrical Contractor
 - Prime Contractors
 - 1.13 Unauthorized Work
 - 1.14 Use of Site
 - 1.15 Use of Explosives
 - 1.16 Construction Photographs
 - 1.17 Construction Audio-Color Video Taping
 - 1.18 Quality Assurance
 - 3.01 Maintenance and Removal
 - 3.02 Water Control
 - 3.03 Erosion and Sediment Control
 - 3.04 Notification of Utility Owners
 - 3.05 Failure to Perform Section Provisions
- B. Other related Sections that may or may not be part of this project work include, Section 01410 Testing Laboratory Services, Section 01590 Field Offices, and others.

1.02 CONFORMITY WITH DRAWINGS & SPECIFICATIONS

- A. All Work shall conform to the lines, grades, cross sections, dimensions, and directions shown on the Drawings and specified unless altered by the Engineer. Alterations and deviations, as may be required or desired, shall be approved in writing by the Engineer.
- B. Field engineering shall be performed by Professional Engineers registered in the State of the project location. Surveying shall be performed by Professional Surveyors registered in the State of the Project location. Engineers and Surveyors, acceptable to the Engineer, shall submit Insurance Certificates giving evidence that they have current Errors and Omissions insurance coverage. The Contractor's Engineers and Surveyors shall,
- 1. Verify and protect all survey control and reference points before starting field construction work. Establish two or more permanent benchmarks on site that are referenced to established control points. Record benchmark location descriptions, with horizontal and vertical data, on Project Record Documents. If a survey control or reference point is disturbed, notify the Owner's Engineer prior to re-establishing. Any discrepancies shall be promptly reported to the Owner's Engineer for resolution.
 - 2. Establish and periodically verify elevations, lines, grades, and levels. Locate and lay out all improvements by surveying or other appropriate instruments. Verify that all proposed improvements are constructed on Owner's property and that dimensions, locations, angles, and elevations of the constructed work are in accordance with the Drawings. On unit price items, determine and certify quantities for payment requests.

- C. Contractor shall maintain a set of Contract Documents solely for use as the Project Record Documents. The Project Record Documents shall note all deviations from the original bid documents and reflect actual constructed conditions. Contractor shall have said documents available at each progress meeting to verify that deviations are being recorded as they are encountered.

1.03 CUTTING & PATCHING STRUCTURES AND BURIED IMPROVEMENTS

- A. Where existing surface structures and buried improvements are shown on the Drawings, their location, depth, configuration, and dimensions are believed to be reasonably representative based on the data used in preparing the Drawings, but such representations are not guaranteed. Such improvements are shown for general informational purposes and shall not be construed to represent that in all cases, the improvements will be as shown on the Drawings.
- B. Where cutting and patching to structures or other buried improvements are noted or required, examine and assess existing conditions prior to commencing the Work, including elements subject to damage or movement during cutting and patching. Beginning to cut or patch shall be Contractor's acceptance of existing conditions.

1. PREPARATION

- a. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other improvements from damage.
- b. Provide protection from elements for areas that may be exposed by uncovering work.
- c. Maintain excavations safe and free of water.

2. CUTTING

- a. Execute excavation and backfill as required in accordance with Section 02220 and perform cutting and patching Work.
- b. Uncover work to install improperly sequenced work.
- c. Remove and replace defective or non-conforming work.
- d. Remove samples of installed work for testing when requested.
- e. Provide openings in the Work for the penetration of mechanical and electrical work, or for other purposes.
- f. Employ original installer or qualified equal to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- g. Cut rigid materials using masonry saw, core drill, or other appropriate cutter. Pneumatic tools are not allowed without prior approval.

3. PATCHING

- a. Execute patching to complement adjacent Work.
- b. Fit products together so they properly integrate with other Work.
- c. Execute work by methods that avoid damage to other Work, and that will provide appropriate surfaces to receive patching and finishing.
- d. Employ original installer or qualified equal to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- e. Restore work with new products in accordance with requirements of Contract Documents.
- f. Fit work air and water tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- g. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

1.04 MAINTENANCE OF EXISTING OPERATIONS

- A. The function of all critical existing piping systems, collection systems, treatment facilities, and pumping facilities shall be maintained throughout the construction of the Work. When construction requires interruption of any critical operation or function, the contractor(s) shall first seek written approval from the Owner through the Engineer. Unless approval is secured in writing to the contrary, the contractor(s) shall do whatever is required to maintain continuous operation of the existing systems and facility functions. This may require, but is not limited to bypass pumping, overland piping, temporary treatment units, auxiliary power, and supporting appurtenances. All interruptions shall be kept to a minimum.

1.05 COOPERATION OF CONTRACTOR(S)

- A. The contractor(s) shall plan and perform their work to minimize interference with the operation of the Owner, other contractors, utilities, or public facilities on or near the Work.
- B. The Owner reserves the right to perform other work by contract or otherwise, and to permit other public entities, utilities, or others to perform work on or near the Work site during the construction period. If a conflict arises that cannot be resolved by the conflicting parties, the Owner will determine when and how the Work will proceed. Claims for delay or inconvenience due to such other parties working on the site will not be considered.

1.06 ROAD MAINTENANCE & RESTORATION

- A. Temporary road paving shall be provided and maintained on all pavements disturbed by the Work. Where the Work site is a pumping, treatment, similar, or related facility, and suitable access roads for operating personnel and deliveries shall be provided and maintained, as required.
- B. Permanent pavement and final restoration shall be performed as the project approaches completion but no later than the last paving season prior to the Contract completion date.

1.07 TEMPORARY PARKING, ACCESS ROADS, AND PAVING OF TRENCHES

- A. The Contractor shall provide and maintain adequate temporary parking spaces at locations approved by the Engineer on or near the Work site. The parking spaces shall be used for the contractors' personnel and their visitors. Upon completion of the Work, remove and restore the disturbed area, as required.
- B. Construct temporary all-weather access roads, including bridges and culverts as necessary, to serve the construction area. Width and load bearing capacity of the roads shall be sufficient to provide low maintenance and safe unimpeded traffic flow during construction.
- C. Temporary paving, consisting of a gravel base and a 2-inch wearing course, shall be applied to all trench excavations in paved areas immediately after the excavation trench has been backfilled and compacted. Temporary paving shall be installed and maintained to the level of the surrounding roadway.

1.08 MAINTAINING TRAFFIC & UTILITIES IN RIGHT-OF-WAYS

- A. Where the Work is located on or in public streets, roads, or highways, the Contractor shall perform the work to minimize danger and inconvenience to the public. Roadways and pedestrian paths, affected by the construction work, shall be maintained and kept clean and safe. This includes providing free access to hospitals, schools, and other such facilities, and providing temporary driveways, bridges, stream crossings, and walkways as necessary.
- B. Emergency vehicle access shall be provided to the Work site and to adjacent property at all times. If the work requires closure to vehicle access, the Contractor shall notify and obtain the approval of the Engineer, fire, police, and emergency medical providers of such closure. Closure time shall be kept to a minimum.
- C. Provide free access to all fire hydrants, water valves, gas valves, traffic control panels, and other important utility improvements located on the site and along the line of the work.

- D. Maintain gutters, waterways, and sewer systems affected by the work.

1.09 BARRICADES, SIGNS, LIGHTS & SITE SAFETY

- A. The Contractor shall employ guards for the work, when and as necessary to provide site safety. The Contractor shall erect and maintain such strong and suitable barriers, signs, and warning lights as will effectively prevent accidents and injury to people and property. Adequate lighting shall be maintained between the hours of one-half (1/2) hour before sunset and one-half (1/2) hour after sunrise.
- B. No excavation shall be left open for any significant period awaiting further work by the Contractor's forces or by others. Excavations shall be temporarily backfilled and resurfaced if applicable with a temporary pavement passable to traffic.
- C. In addition to other safety requirements, a fence at least four (4) feet high shall surround any excavation left open at the end of the day.
- D. The Contractor shall be responsible for complying with all local, State, and Federal regulations pursuant to maintaining traffic, safety notification, construction methods and obtaining all necessary construction permits.
- E. Construction safety measures shall comply with Department of Labor Occupational Safety and Health Regulations for Construction.

1.10 ENVIRONMENTAL PROTECTION

- A. When the Work includes an existing sanitary sewerage collection system or a treatment facility, the General Contractor shall be responsible for maintaining all sanitary and process flow streams, and plant functions. Provisions shall be made for the temporary piping, pumping, storage and/or disposal of flow streams during periods when the operation of the sewers or treatment facilities are hindered or disrupted by the Work.
- B. Provide on-site sanitary facilities for project workers.
- C. All prime contractors shall perform their work in such a manner as to eliminate all unnecessary noise, dust, and odors.
- D. Maintain all equipment in compliance with all standards as required by the Occupational Safety and Health Act.
- E. Take whatever action is necessary and provide all labor, tools, equipment, and machinery to adequately handle all wastewater, surface, and flood flows that may be encountered during the performance of the work. At no time shall any contractor cause the discharge of untreated wastewater to the environment.
- F. It shall be the responsibility of each contractor to prevent or limit unnecessary loud noise and the pollution of air and water resulting from the construction operations.
- G. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems, and to prevent dust attributable to the construction operations from entering the atmosphere.
- H. Construction sequencing shall be planned to minimize the size and time of exposure of disturbed areas. Scheduling of clearing, grading and stabilization shall reflect the construction capabilities of the Contractor as well as climate factors.
- I. Trenches shall be backfilled at the end of each working day. Backfilling shall be conducted in a manner appropriate to avoid accelerated erosion until temporary and/or permanent stabilization is affected.
- J. Dust from unpaved streets or parking areas and dust remaining after sweeping paved streets shall be controlled with calcium chloride dust palliative or as otherwise directed by the Engineer.
- K. Existing vegetation shall be protected as much as possible during construction.
- L. During construction, all contractors are prohibited from unnecessarily disturbing or uprooting trees and vegetation. Special care shall be taken so as not to disturb trees and vegetation along stream banks and in the

vicinity of streams; dumping soil or debris into streams or on stream banks; changing the course of streams without encroachment permits; leaving coffer dams in streams; leaving temporary stream crossings for equipment; operating equipment in streams; or discharging silt laden water into streams.

- M. All stockpiled topsoil and fill materials shall be protected from soil erosion by the use of a filter fabric or straw bale barrier constructed around the perimeter of the stockpiled material. The stockpiled material shall not be placed within fifty feet of any stream or channel bank.
- N. Stockpiling excavated material shall not be allowed on roadways or right-of-ways unless written permission is received by the Contractor, and transmitted to the Owner, from the legislative agency or property owner responsible for the maintenance of the area where the material is to be stockpiled.
- O. All top soil, excavated from areas where cuts and fills are to be made, shall be stockpiled on a level area enclosed in an erosion barrier and stabilized for use after the final sub grade is completed.
- P. All disturbed unpaved areas that are to be exposed for more than thirty days shall be provided with a seed and mulch cover. The seed shall be a blend of 40% Kentucky bluegrass, 40% Creeping Red Fescue, and 20% Perennial Rye applied at a rate of 5 pounds per 1000 S.F. The seeding shall include a uniform application of 12-12-12 fertilizer applied at a rate of 20 pounds per 1000 square feet and covered by 1/4 inch of soil and straw mulch applied at a rate of three tons per acre or approved equal.
- Q. Mulch shall be used on all areas where temporary or final stabilization cannot be performed due to unfavorable weather conditions. Mulching materials shall be straw, wood, or wood cellulose fibers, or erosion control fabric in conformance with the requirements of the project specifications.
- R. All temporary and final plantings shall be maintained for thirty calendar days after all planting is complete and approved by the Engineer. Maintenance shall include necessary watering, weeding, cultivating, spraying and pruning to keep plant materials in a healthy growing condition, and to keep planted areas neat and attractive during the maintenance period. At the end of the maintenance period, all plant materials shall be in healthy growing condition.
- S. Final stabilization of all disturbed areas shall be performed in compliance with the project Specifications.
- T. Water containing suspended material from any part of the Contractor's operations shall be clarified before discharging to storm sewers, channels, or streams.
- U. The Contractor shall construct and maintain filters, sedimentation traps, or stilling basins with overflows to clarify waters containing suspended materials from fill areas, excavations, deep wells, well points, and disposal sites before discharging to drains or streams.
- V. The Contractor shall carry out cleanup, grading, seeding, planting and restoration of the work area as early as practical as the construction proceeds.
- W. After the construction is completed, the temporary paving and seeding shall be replaced with final paving and seeding as specified.
- X. If rodents are found to be present, provide appropriate rodent control.

1.11 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except in the case of emergency. Except for emergency work, the written authorization of the Engineer shall be required. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility, and may be subject to rejection upon later inspection.

1.12 SPECIFIC CONTRACTOR RESPONSIBILITIES

- A. The General Contractor shall provide all temporary water, heating, lighting, and power required to construct the Work that is not specifically specified to be provided by others, until such time as the Owner takes beneficial use of the work.

1. Pay all utility charges related to providing temporary electrical power and lighting that is required to construct the Work until the Work is placed into the beneficial service of the Owner.
 2. Provide fuel for building/structure temporary heating, if any.
 3. Provide temporary building or structure heat, heating equipment, and security lighting to protect the work until it is complete and ready for Owner's occupancy. Such equipment shall meet all requirements of the N.E.C., O.B.B.C. and the local codes for temporary construction services.
 - a. Any prime contractor that has special, out of the ordinary heating, lighting, or power requirements for the work of its trades, shall provide those special needs including any related equipment.
 4. Provide Resident Engineer's Office (see Section 01590, if included in this project)
 5. Project Sign (see Section 01580, if included in this project)
 6. Provide adequate water for drinking and for construction needs including supply lines as necessary to such locations that will expedite construction.
 7. Provide and maintain barricades, signs, signal lights, fences, guards, flaggers and all other security and safety equipment required to protect the public, the Work, and the Owner's Work-related facilities and operations. Restrict entry to the Work site to authorized people and vehicles. Maintain, and make available to Engineer and Owner upon request, a log of workers and visitors.
 8. Provide environmental protection
 9. Provide temporary paving
 10. Provide temporary construction required to maintain the operation of the existing facilities or existing facility function.
 11. Provide temporary plugs, blind flanges, bulkheads, piping, connections, pumping, valves, sheeting, shoring, bracing, sanitary facilities, treatment process function, and similar work or items that may be needed while constructing the Work.
 12. Provide a temporary Contractor's office located on the Work site until completion of the Contract. An authorized agent shall be present at all times while the work is in progress.
 13. Provide all articles necessary for giving "First Aid to the Injured" on the job site. Maintain and display an adequate plan for the immediate removal and emergency treatment of anyone injured or who becomes critically ill on the work site.
 14. Arrange for the installation of temporary electrical service for construction purposes as well as make provisions to adequately protect all transformers and any associated temporary power equipment throughout the course of construction.
 15. Protect the Work against weather damage and the operations of other trades. The General Contractor shall be responsible for the proper use of all temporary wiring systems until they are removed.
- B. The Electrical Contractor shall provide all temporary electrical service and power distribution, except as specifically excluded, for the Work as called for herein or required.
1. Provide, maintain, and remove when no longer needed, all temporary power service required to maintain all critical treatment processes and operations during the construction of the Work.
 2. Provide and maintain temporary power installations as required by all of the prime contractors for construction purposes (including extending temporary service from the utility supply to the various project construction areas). Required installations and maintenance includes general lighting, power, and telephone requirements; connections for temporary heat; and power installations and telephone hookups to the Engineer's field office and to all prime contractors' trailers and work sheds.

3. Power for any electric arc welding shall be excluded from the requirements for temporary power service. Power for any electric arc welding equipment shall be furnished complete by the contractor whose trades require the welding.
 4. Provide power in accordance with the General Contractor's construction schedule.
 5. Pay all utility charges for step down transformers, metering or other materials.
 6. Provide at least one full-time electrician to satisfy temporary electrical service needs. The electrician shall be on site when any trade is working that requires temporary power. The electrician may be engaged in other phases of the Work while on site. When electrical services are required to serve the needs of other prime contractors outside of normal working hours, payment for the temporary power electrician shall be negotiated between the Electrical Contractor and the prime contractor(s) requiring the extended-time service.
 7. Conform all electrical work for construction purposes to Federal and State (Ohio Safety Code IC-3) requirements as well as the requirements of the National Electrical Code. The cost to obtain and pay for required applications, permits and inspection pertaining to this work shall be included in the Electrical Contractor's bid.
 8. Install temporary work in such a manner as not to interfere with the permanent construction. If interferences do occur, it shall be the responsibility of the Electrical Contractor to make such changes as may be required to overcome the interferences.
 9. Furnish and install not less than 200 watt lamps for general lighting, and all fuses as may be required for a complete job. Replacement of lamps, fuses, including that caused by theft, will be the responsibility of the Electrical Contractor throughout the life of the project.
- C. Any prime contractor that has special heating, lighting, or power requirements for the work of its trades, shall provide the special needs including any related equipment. Power for electric arc welding equipment shall be furnished complete by the trades requiring the welding. Each prime contractor shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided by the Electrical Contractor.
1. Each prime contractor shall properly dispose of all debris removed or resulting from its work.
- 1.13 UNAUTHORIZED WORK
- A. Work done beyond the lines shown on the Drawings, specified, or ordered; work done without required inspection; or any Extra work performed without written authorization will be considered unauthorized work and will not be paid for under the provisions of the Contract. Work so performed may be ordered removed at Contractor's expense.
- 1.14 USE OF SITE
- A. Owner will make a reasonable effort to accommodate the needs of the Contractor for his operation so long as his operation does not materially interfere with the safety or required operation of the site facilities.
 - B. Where the work is to be constructed upon or within a temporary or permanent easement, the easement(s) shown on the Drawings will be secured by the Owner without cost to the Contractor. When the work is constructed in or within 10 feet of an easement, the Contractor shall adequately stake the easement limits and shall not enter upon or occupy any private property that it does not have a written agreement to do so.
 - C. All improvements and surfaces disturbed by the Contractor's work shall be properly maintained during construction and be returned to their original or better condition upon completion of the project.
- 1.15 USE OF EXPLOSIVES
- A. When the use of explosives is authorized by the Engineer, the storage, handling, protection methods, and firing of the explosives shall be performed only by people highly experienced in such work. The Contractor agrees and warrants that when explosives are used, all State laws, local ordinances, and applicable safety

requirements will be strictly met. Contractor shall be responsible for all damage resulting from the use of the explosives.

1.16 CONSTRUCTION PHOTOGRAPHS

- A. Unless excluded in PART FOUR, provide photographs by an experienced photographer, acceptable to Engineer, of the site and construction throughout the progress of Work.
- B. Take photographs at least 15 days prior to each application for payment and as necessary to provide the clear, chronological record of construction steps performed in constructing the proposed facilities. Specifically, photographs shall document,
 - 1. Site clearing
 - 2. Excavations and buried pipe installations
 - 3. Foundations and below-ground structures
 - 4. Structural framing
 - 5. Enclosure of building
 - 6. Equipment
 - 7. All other work
 - 8. Final Completion
- C. Take the following photographs to evidence existing conditions when applicable,
 - 1. Interior views: From points that show all locations of proposed work.
 - 2. Exterior views:
 - a. To view each structure and/or all locations of utility and underground services, and to show all work adequately. The average distance between photograph shots along the route of a utility or underground service shall be 50 feet unless otherwise approved by the Engineer.
 - b. Include in photographic coverage all driveways, sidewalks, curbs, ditches, streets, landscaping, trees, shrubs, culverts, catch basins, retaining walls, visible utilities and building exteriors within the zones of influence.
- D. Take photographs of soil erosion and sedimentation controls on a routine basis.
- E. Prints requirements:
 - 1. Full color; three prints of each view; Smooth Paper Surface; High Contrast; Minimum size 4 inch x 6 inch
 - 2. Identify each print on back. Identify name of Project, contract number, phase, orientation of view, name and address of photographer, and photographer's numbered identification of exposure.
 - 3. Identify the date and time of print on front, lower right corner.
 - 4. Photographs shall be inserted into clear vinyl carrier sheets (8-3/8" x 11-3/16") chronologically in numerical order and bound in "D" ring type binders. Each binder shall contain an index identifying each photograph and coordinating it with its specific location.
- F. Digital Files:
 - 1. Deliver Digital Files on disk to Engineer with project record documents. Catalog and index digital files in chronological sequence; provide typed table of contents.

G. Technique:

1. Provide factual presentation.
2. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

H. Views:

1. Provide photographs from locations as necessary to provide diversified overall views of all the performed work from positions that are to remain accessible throughout the progress of the work
2. Consult with Engineer for instructions on specific views required.

I. Deliver prints with each Application for Payment with transmittal letter specified under Section 01300.

1.17 CONSTRUCTION AUDIO- COLOR DIGITAL RECORDING

A. Unless excluded in PART FOUR, provide audio-color digital video recording on DVD of the project construction site.

1. Provide Pre-Construction, during construction and completion of construction videos of the construction site and existing facilities (interior and exterior) to be affected by the Work.

B. Quality Assurance

1. Secure the services of a professional videographer who is skilled and experienced in construction audio-color video recording and whose work samples are acceptable to the Engineer.
2. Do not replace the videographer without the Engineer's written approval.

C. Submittals

1. Comply with pertinent provisions of Section 01300.
2. Except as otherwise directed and separately paid for, submit three copies of each audio-video DVD.

D. Preliminary Video Record

1. Prior to beginning construction, the General Contractor shall video the construction area to provide a true and accurate video record of the project site. The video shall be a high resolution DVD that will provide for a clear and concise picture playback and for "still" frame reviews.

E. System Description

1. Prior to the start of any construction activities, audio-video recording is required along water and sewer line routes, roadways, and at structures that will or may be affected by the work.
2. The recording equipment must be able to produce quality color pictures for the purpose of providing permanent documentation of existing condition of construction areas.
3. The video portion of the recording shall reproduce a bright, sharp, clear picture with accurate color, free from distortion, drop out, tearing or other forms of picture imperfection.
4. The audio portion of the recording shall be clear, at a proper volume, and free from distortion.

F. Product Data, Samples and Certificates

1. Submit product data on camera and type of DVD to be used, including name, make and model number.
2. Submit sample of work on a prior project, demonstrated for Engineer, to assure quality requirements.

3. Submit written certificate that all requirements of the audio-video color recording were accomplished in accordance with this Section.

G. Equipment

1. Audio-Video Color DVD: Standard Full size 800mb DVD.
2. Camera: Video output from camera capable of producing a minimum of 300 lines of horizontal resolution at center with minimum light lag; produce optimum color imagery with a minimum of 7 foot-candles of illumination; provide a video signal-to-noise ratio of at least 49 Db; produce quality color picture of images at varying distances and angles as required for this project.
3. Alpha-Numeric Displays: Video recording must contain continuous display of simultaneously generated transparent digital information including date and time of recording, engineering stationing, name of street/easement/building, direction of travel, and viewing side.

H. Digital Recording

1. Investigate visually all areas prior to recording, making notation of features not readily visible on DVD. This would include, but not be limited to, culverts, catch basins, manholes, and any obstruction that may be partially buried.
2. Record all measurements including size, type, and condition of features observed during inspection.
3. All recording must be done during times of good visibility. No outside recording will be allowed during periods of visible precipitation or when ground is covered with snow, leaves or debris without written approval of Engineer.
4. Furnish all power for auxiliary lighting required to fill in shadow areas caused by trees, utility poles, road signs, and other such objects, as well as other conditions requiring artificial illumination in order to produce the proper detail and perspective on the recordings.
5. Do not exceed forty-eight (48) feet per minute (15 meter per minute) average rate of speed in the direction of travel during recording. Control direction of travel during recording. Control panning rates and zoom-in, zoom-out rates in a manner that produces clarity of subject during playback.
6. When conventional wheeled vehicle is used for recording, provide eight (8) foot (2.4 m) minimum camera lens to ground distance to insure proper perspective. In areas not accessible to conventional wheeled vehicles, provide coverage by walking or special conveyance but with the same requirement for recorded quality and content as specified herein.
7. Properly identify all DVD's and associated cases by number, location and project name under direction of the Engineer.
8. Begin each recording with the current date, project name, and municipality, general location and viewing side and direction of progress.
9. Conduct all recording in the presence of the Engineer unless waived by the Engineer. The Engineer or a person approved by the Engineer will conduct the audio portion.
10. Include recorded coverage of, but not limited to, all existing driveways, sidewalks, curbs, ditches (drainage pattern is of particular concern), streets (including full width paving condition), landscaping, trees, shrubbery, culverts, catch basins, headwalls, retaining walls, fences, visible utilities, and all building exteriors located within the zone of influence of construction. Of particular concern are existing faults, fractures, defects, or other imperfections. The term street is understood to mean street, highway, avenue, boulevard, road, alley, lane, driveway, parking lot, etc., and all adjacent areas within the possible zone of influence.
11. Houses and buildings to be identified both visibly and audibly by house or building number, when possible, in such a manner that the progress of the recording and the proposed route of construction may be located by reference to houses and buildings.

12. Record by audio-video all easements for the full width of permanent and temporary easements and all other adjacent areas within the zone of influence. Easements are understood to mean all areas not in streets that require recorded coverage by walking or other special conveyance as opposed to normal wheeled conveyance in street areas. Also include in this coverage, areas that are intended to be used for construction access, storage or waste areas, and other Contractor activities.

I. Delivery of DVD's

1. Deliver DVD's to Engineer prior to construction work within area of influence.
 - a. DVD's must be submitted prior to the Contractor's request for the initial progress payment.
2. Supply with DVD's a record of the contents of each DVD on a run sheet identifying each segment in the tape by location; street or easement viewing side, traveling direction, engineering station; referenced to counter numbers. Include a report reviewing findings of visual inspection.
3. Furnish brief report and inventory of all DVD's completed, referenced by location and tape number.
4. All DVD's and written records must be delivered to the Engineer. This information becomes the property of the Owner.
5. The video expense shall be part of the Contractor's obligation.

J. Video Records of Sewers

1. All sewers installed under this contract shall be video recorded in accordance with the following at no additional cost to the Owner:
 - a. After cleaning, manhole sections shall be visually inspected by means of closed-circuit video. The inspection shall be done one manhole section at a time and the flow in the section being inspected will be suitably controlled.
 - b. The video camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, video monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Engineer.
 - c. The camera shall be moved through the line either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the video camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, video cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the video camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If again, the camera fails to pass through the entire manhole section, the inspection shall be considered complete and no additional inspection work will be required.
 - d. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be used to set up between the two manholes of the section being inspected to insure good communication between members of the crew.
 - e. Measurement for location of defects and lateral connections shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device. Accuracy shall be satisfactory to the Engineer.
2. Documentation shall be as follows:
 - a. Video Inspection Logs: Printed location records shall be kept by the Contractor that clearly shows the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots,

storm sewer connection, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner.

- b. Photographs: Instant developing, 35 mm, or other standard-size photographs of the video picture of problems shall be taken by the Contractor upon request of the Owner's Representative, as long as such photographing does not interfere with the Contractor's operations.
- c. DVD Recording: The purpose of DVD recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. DVD recording playback shall be at the same speed that it was recorded.

1.18 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
 - 1. Comply with manufacturers' instructions, including each step in sequence.
 - 2. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
 - 3. Comply with specified allowances and standards as minimum quality for the Work except where more stringent codes or specified requirements indicate higher standards or more precise workmanship.
 - 4. Perform work with people qualified to produce quality workmanship.
 - 5. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- B. Monitor Tolerances:
 - 1. Monitor tolerance control of installed products to produce acceptable quality Work. Do not permit tolerances to accumulate.
 - 2. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
 - 3. Adjust products to appropriate dimensions; position before securing in place.
- C. Prepare Mock-Ups:
 - 1. Tests will be performed under provisions identified in product specification sections.
 - 2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
 - 3. Accepted mock-ups are representative of the quality required for the Work.
 - 4. Where mock-up has been accepted by the Engineer and was specified to be removed; remove mock-up and clear area when directed to do so.
- D. Manufacturers' Field Services and Reports:
 - 1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
 - 2. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer shall be subject to the approval of Engineer.

3. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
4. Submit a report in duplicate within 30 days of observation to Engineer for information.

E. Workers and Equipment:

1. The Contractor shall employ only competent and efficient workers for each type of work performed. Anyone employed on the Work that is deemed incompetent, disorderly, or who commits trespass upon public or private property adjacent to the work, shall be dismissed when the Engineer so orders. No one, so dismissed, shall be re-employed unless express permission is given by the Engineer. The methods, equipment, and appliances used and the labor employed on the work shall produce an Owner-acceptable quality finished product and shall be sufficient to complete the Contract within the specified time limit.
2. In hiring employees to perform work under this Contract, or any subcontract hereunder, no Contractor, Subcontractor, nor any person acting on their behalf shall discriminate against anyone performing work under this Contract, because of race, sex, creed, color or national origin.

PART TWO - PRODUCTS

- 2.01 Provide specified products as required.

PART THREE - EXECUTION

3.01 MAINTENANCE AND REMOVAL

- A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.
- B. Remove the temporary facilities and controls as rapidly as progress of the Work will safely permit, or as directed by the Engineer.

3.02 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from ponding or running water. Provide water barriers as required to protect site from soil erosion.

3.03 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, to prevent or control water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Site clearing and grubbing shall not commence until such time that the contractor is prepared to start construction. Remove only those trees, shrubs, and grasses that must be removed for construction; protect the remainder to preserve aesthetic, habitat, and erosion control values. Install sedimentation controls immediately following access and site clearing and maintain them in effective operating condition during construction until final seeding and site restoration occurs.
- G. Construct diversion channels when required to collect runoff and prevent silt and other eroded materials from entering local drainage courses. Diversion channels will flow to temporary sediment basins, and are to be stabilized through seeding, riprap, or lining with plastic.

- H. Silt fences shall be trenched six to twelve inches deep, the fabric laid in the trench and the soil properly backfilled into the trench to prevent undercutting.
- I. Straw bales shall be trenched a minimum of four inches deep and placed on their ends with the binding material off the ground. Drive two stakes through the bales and into the ground 1-1/2' to 2' deep to secure the bale. Fill the spaces between the bales with loose straw, and properly backfill the trench with soil.
- J. Where a trench excavation occurs parallel to a waterway, a vegetated barrier shall be maintained between the stream and the construction area. All trench soils shall be stockpiled on the side of the trench away from the waterway, and a line of silt barriers established along the edge of construction on the contour between the trench and the waterway.
- K. Any disturbed area that will not be actively under construction for a period of 30 days or more shall be stabilized immediately by seeding and mulching or by anchored straw mulch.
- L. Storm sewer inlets shall be surrounded with silt barriers to prevent silting.
- M. Slopes exceeding 15 percent or that tend to be unstable shall be provided special treatment such as water diversion berms, sod, jute blankets, or excelsior blankets.
- N. If work is suspended for any reason, the contractor shall maintain the soil erosion and sedimentation controls in good operating condition during the suspension of the work. When seasonal conditions permit and the suspension of work is expected to exceed 30 days, the Contractor shall seed, fertilize, and mulch all disturbed areas left exposed when the work is suspended.

3.04 NOTIFICATION OF UTILITY OWNERS

- A. Not less than five (5) days in advance of commencing excavation, notify in writing all utility companies, such as gas, water, electric power, transmission, cable, and telephone, which have installations that could be disturbed by the Work; and make proper provisions for locating, removing, relocating, or otherwise protecting said installations. Make additional utility company contacts and provisions to locate and protect utility company installations, as necessary, as the Work progresses.
- B. Unless shown on the Drawings or otherwise specified to be removed, protect or relocate all active utility installations or improvements encountered by the Work. Service interruptions should be avoided whenever possible but when unavoidable, interruptions should be kept to a minimum. In such cases, promptly notify all those affected
- C. If a utility installation or improvement is damaged, promptly notify those affected, repair or replace to utility standards. Restore service as soon as possible at no additional cost to Owner
- D. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure appropriate instructions.
- E. Do not proceed with the permanent relocation of utilities until written instructions are received from the Engineer.

3.05 FAILURE TO PERFORM SECTION PROVISIONS

- A. If the Contractor fails to comply with the provisions of this Section, the Owner may, but is not obligated to, cause the unperformed provisions to be completed and deduct the related cost of such work from any monies due the Contractor. If Owner causes unperformed work to be completed, it shall in no way release the Contractor from his liability for the safety of the public and the work.

PART FOUR - PROJECT SPECIFIC REQUIREMENTS

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

- A. This Section includes the requirements for project identification and miscellaneous informational signs.
- B. The Contractor shall provide and erect a project sign readable from both sides plus miscellaneous informational signs as may be needed (to direct deliveries, locate Contractor's and Engineer's offices, etc.) at locations required or designated by the Engineer.

PART TWO - PRODUCTS

2.01 PROJECT IDENTIFICATION SIGN

- A. The sign shall be new and be made from minimum 3/8-in. thick exterior grade plywood with high density overlay approximately 8 ft wide by 4 ft high.
- B. The sign shall be framed with 2 in. x 6 in. wood with mitered corners. The edge of the sign shall fit 3/4 in. into grooves cut off-centerline in the 6-in. dimension of the frame. The frame shall be bolted to posts with galvanized bolts.
- C. The sign shall have 4 in. x 4 in. x 8 ft. wood posts that are imbedded 3 feet into the ground.
- D. The sign shall be painted by an experienced professional sign painter using exterior quality paint that is adequate to withstand weathering, fading, chipping and peeling for the duration of the construction. Unless specified to the contrary in PART FOUR, the sign shall have a white background and royal blue lettering and border. Lettering shall be Series C of Standard Alphabet for Highway Signs, Public Roads Administration, and Federal Works Agency.
- E. The sign shall be approved by the Engineer and include, in general, the Project title and name of Owner as indicated on Contract Documents, names and titles of authorities, names and titles of Engineer and Consultants, and the Names and field phone numbers of the Prime Contractors. The sign shall resemble and provide the information shown in PART FOUR, if included.

2.02 PROJECT INFORMATION SIGNS

- A. Painted informational signs shall be of the same materials, colors, and lettering as the Project Identification Sign, or standard commercial products with letter sizing adequate to provide legibility at 150 feet distance.
- B. Provide signs on each field office and storage shed, and to direct visitors and traffic into and within the site. Relocate as Work progress requires.
- C. Provide municipal/state traffic agency directional traffic signs to and within site.

PART THREE - EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after the date that Contractor is given the Notice to Proceed.
- B. Erect project sign at the designated location or a location with high public visibility adjacent to main entrance to site as approved by Engineer.
- C. Erect supports and framing on secure foundation.
- D. Install sign surface plumb and level. Anchor securely.
- E. Paint all exposed surfaces of sign, supports, and framing.

- F. Install all informational signs as required.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations and restore the disturbed area at completion of Project.

PART FOUR - SPECIAL PROVISIONS

None

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide material and labor required to perform start-up of each respective item of equipment and system prior to beginning of testing, adjusting, and balance procedures.
 - 1. Provide information and assistance required, cooperate with tests. Adjust and balance as required.
- B. Comply strictly with specified procedures in starting up mechanical systems.
- C. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and the other Sections the Specifications.

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 that run rough or noisy when operated.
 - 4. Lubricate as necessary, and in accord with manufacturer's recommendations.
- B. Drives:
 - 1. Adjust tension in V-belt drives, and adjust varipitch 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 nameplate 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 that continues to leak.
 5. Remove and repair bonnets that leak.
 6. Coat packing gland threads and valve stems with a surface preparation of "Moly-Cote" or "Fel-Pro", after cleaning.
- F. Verify that control valve seats are free from foreign material, and properly positioned for intended service.
- G. Tighten flanges after system has been placed in operation.
1. Replace flange gaskets that show any sign of leakage after tightening.
- H. Inspect screwed joints for leakage.
1. Promptly remake each joint that appears to be faulty; do not wait for rust to form.
 2. Clean threads on both parts, apply compound and remake joints.
- I. After system has been placed in operation, clean strainers, dirt pockets, orifices, valve seats and headers in fluid system, to assure being free of foreign materials.
- J. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.
- K. Check each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.
- L. Inspect each pressure gauge and thermometer for calibration.
1. Replace items that are defaced, broken, or that read incorrectly.
- M. Repair damaged insulation.
- N. Vent gases trapped in any part of systems.
1. Verify that liquids are drained from all parts of gas or air systems.
- O. Check piping for leaks at every joint, and at every screwed, flanged, or welded connection, using "Leak-Tek" or other approved compound.

1.03 ADJUSTMENTS

- A. Provide such periodic continuing adjustment services as necessary to insure proper functioning of mechanical systems after occupancy of the Project, and for a period of one (1) year after Date of Substantial Completion.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

Not Used

PART FOUR - SPECIAL PROVISIONS

None

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and the other Sections in the Specifications.
 - 2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Conduct daily inspections, and more often if necessary, to verify that requirements for cleanliness are being met.
- B. In addition to the standards described in this Section, comply with pertinent requirements of the Engineer and the governmental agencies having jurisdiction.

PART TWO - PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

- A. Provide required personnel, equipment, and materials needed to maintain the specified standards of cleanliness.

2.02 COMPATIBILITY

- A. Use only the cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART THREE - EXECUTION

3.01 PROGRESS CLEANING

- A. General:
 - 1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
 - 2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
 - 3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
 - 4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the environment.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of material stored on the site. Restack, tidy, or otherwise service arrangements to meet the above requirements.
3. Maintain the site in a neat and orderly condition at all times.

C. Structures:

1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
 - a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed.
 - a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Engineer, may be injurious to the finish floor material.

3.02 FINAL CLEANING

- A. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
- B. Prior to Completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described above.

C. Site:

1. Exterior:
 - a. Inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
 - b. Remove all traces of splashed materials from adjacent surfaces.
 - c. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
 - d. In the event of stubborn stains not removable with water, the Engineer may require light abrasive blasting or other cleaning at no additional cost to the Owner.
2. Interior:
 - a. Inspect interior surface and remove all traces of soil, waste materials, smudges, and other foreign matter.
 - b. Remove all traces of splashed material from adjacent surfaces.

- c. Remove paint droppings, spots, stains, and dirt from finished surfaces.
- 3. Glass: Clean inside and outside.
- E. Schedule final cleaning as approved by the Engineer to enable the Owner to accept a completely clean Work.

PART FOUR - SPECIAL PROVISIONS

None

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DIVISION 2
SITE WORK

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PART ONE GENERAL

1.01 DESCRIPTION

- A. Work Included: Grubbing, scalping and otherwise clearing of the construction site in accordance with the drawings and as specified herein or ordered.
- B. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions and Sections of Division 1.
 - 2. All applicable Divisions of the Technical Specifications.
- C. Definitions:
 - 1. Clearing is defined as the removal of trees, stumps, bushes, timber, rubbish and any other vegetation, walkway or retaining walls, or debris as necessary to accommodate new construction or recontouring of site. Clearing also involves the removal of fences walls, guard posts, guardrail, signs and other obstructions interfering with the proposed work.
 - 2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, organic materials and debris.

1.02 QUALITY ASSURANCE

- A. State and local code requirements shall control the disposal of trees, stumps, vegetation and debris. The Contractor shall comply with the requirements of the following:
 - 1. Ohio Department of Transportation
 - 2. Ohio Department of Natural Resources

1.03 SUBMITTALS

- A. Material and debris resulting from the clearing and grubbing operations shall be disposed of off the project site by the Contractor, unless a disposal site is designated on the Drawings. The Contractor shall obtain and submit to the Engineer written permission from the Owner of the property upon which the material and debris are to be placed.

1.04 JOB CONDITIONS

- A. The Contractor may clear all obstructions within the PERMANENT RIGHT-OF-WAY and the CONSTRUCTION EASEMENT OF 15 FEET AS NECESSARY for the completion of the contract and as approved by the Engineer.
- B. The Contractor shall not remove any yard walkway, building access stairs, stone or concrete support wall in excess of the trench width without the approval of the Engineer.
- C. Streets, roads, adjacent property and other facilities to remain shall be protected against damage throughout the work.
- D. Existing trees, shrubs and other objects located outside the trench width shall not be disturbed unless authorized by the Engineer.

PART TWO - PRODUCTS

2.01 MATERIALS

A. Security Fencing:

1. Undamaged picket snow fence, 4' high, formed of wooden slits, tightly woven wire or galvanized chain link fence 4' high.

B. Silt Fence:

1. Install silt fence in accordance with information provided in the Rainwater and Land Development Manual, current edition, Ohio Department of Natural Resources.

C. Tree Wound Dressing:

1. Antiseptic, waterproof asphaltum base paint.

PART THREE - EXECUTION

3.01 PREPARATION

- A. Mark areas to be cleared and grubbed with stakes, flags or plastic colored ribbon for the approval by the Engineer. The Engineer reserves the right to order additional trees or shrubs removed at no additional cost to the Owner, if, in his opinion, they cannot be maintained or have been damaged by the Contractors operation.
- B. Protect benchmarks, utilities, existing trees, shrubs or other landscape features designated for preservation with temporary fencing or barricades satisfactory to the Engineer. No material shall be stored within twenty (20) feet or construction operation carried on within four (4) feet of any tree to be saved or within the protection fencing.

3.02 UTILITY RELOCATIONS

- A. Inform all companies, individuals and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed, in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the Contractor's operations.
- B. The Contractor shall be responsible for the maintenance of all utility service connections.

3.03 CLEARING AND GRUBBING

- A. Only those trees and shrubs shall be removed that are in actual interference with excavation or grading work and such removal shall be subject to approval by the Engineer. The Engineer reserves the right to order additional trees or shrubs removed and/or replaced at no additional cost to the owner if, in his opinion, they cannot be maintained or have been damaged by the Contractor's operations.
- B. All trees, stumps, vegetation and debris not designated to remain shall be cleared and/or grubbed, except for special treatment as follows:
 1. In locations to be seeded, stumps, roots and other protruding obstructions shall be removed to a minimum of six (6) inches below the final ground surface.
 2. The top of the back slope and/or toe of embankment unless otherwise indicated on the plans.
- C. At all times, the Contractor shall remain within the property lines and/or easement areas.
- D. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with Sections 02130 and 02222.

3.04 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled or graded and stockpile at a location approved by the Engineer for use in finish grading.
- B. The topsoil is the property of the Owner and shall not be used as backfill or removed from the site.

3.05 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps, and other debris resulting from clearing and grubbing operations shall become the property of the Contractor and shall be legally disposed of.
- B. Do not deposit or bury on the site debris resulting from the clearing and grubbing work.
- C. Debris may be burned on-site if local ordinances allow open-air burning, if required permits are obtained, and if burning operations are conducted in compliance with local ordinances and regulations.

3.06 RESTORATION

- A. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved agricultural practices and materials.
- B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the project Owner.
- C. Remove protective fences, enclosures and guards upon the completion of the project.
- D. Restore walkways, lawns, guard posts, guardrail, signs and other interferences to the condition equal to that existing before construction operations.
- E. Restoration of all surfaces shall be in accordance with all applicable Sections of the Specifications.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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SECTION 02120

FOUNDATION CUSHION

PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all the materials for and shall properly place, at all locations where called for by the drawings or when deemed necessary by the Engineer, a cushion of well compacted crushed limestone or slag and screenings in order to obtain firm foundations for the several structures to be built under this contract.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. The slag and screenings shall be obtained from freshly panned slag graded in three (3) sizes up to two and one-half (2-1/2") inches and shall be free from all foreign material. Crushed limestone shall be similarly graded and shall be thoroughly washed.

PART THREE - EXECUTION

3.01 PLACING

- A. The crushed limestone or slag and screenings shall be placed in layers not over six (6) inches in depth and thoroughly compacted into the material below. The larger size shall be placed first, and this shall be followed by the intermediate size and, lastly, by the screenings. The amount of material of each size to be placed will depend upon the nature of the ground to be compacted. The placing of this material shall be continued until the required depth is placed, and the top of the cushion shall be finished to the lines and grades given the Engineer.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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TRENCH EXCAVATING, BEDDING & BACKFILL

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work Included: All trench excavations and fills to the lines and grades given for conduits, pipe lines, etc. as required for the proper completion of the work of this contract as shown on the Contract Drawings.
- B. The trench excavation work item in this contract shall include the removal, handling, re-handling, filling, and disposal of any and all materials (whether they be wet or dry) found unsuitable by the Engineer encountered within the limits of the work and the transportation and placing thereof, and shall include all pumping, bailing, draining, sheeting and shoring, backfill, refill and protection, and sand backfill, together with rolling and tamping where such is required by these specifications and is not specifically included in another item of work in this contract.
- C. Existing ground elevations of the work site(s) are shown by figures and/or by contours on the contract drawings. The contours and elevations of the present ground are believed to be reasonably correct, but do not purport to be absolutely so, and are presented only as an approximation. The Contractor shall satisfy himself, however, by his own actual examination of the site of the work, as to both the existing elevations and the amount of work required under this Section. If the Contractor is not willing to accept the ground surface elevations indicated upon the drawings for payment, he shall notify the Engineer prior to the starting of any excavation work.
- D. Profiles, as shown on the drawings, are generally centerline of pavement and the Contractor, in his site examination, shall determine the variance in elevations over the pipelines.
- E. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions and Section of Division 1.
 - 2. All applicable Divisions of the Technical Specifications.

1.02 QUALITY ASSURANCE

- A. State and local code requirements shall control the construction specified herein.
- B. Compaction testing shall be performed by a soil testing laboratory engaged and paid for by the Contractor. Testing shall be in accordance with ASTM Standards:
 - 1. C33 Specification for Concrete Aggregates.
 - 2. D698 Tests for Moisture - Design of Relations of Soils.
 - 3. D1556 Test for Density of Soil-in-Place by the Sand Cone Method.
 - 4. D2922 Test for Density of Soil and Soil Aggregates in Place by Nuclear Methods.

1.03 SUBMITTALS

- A. Certification attesting that the composition analysis of pipe protection and material stone backfill materials meets specification requirements.

1.04 JOB CONDITIONS

- A. Control of Traffic

1. The Contractor shall provide all traffic control measures in accordance and with the approval of the State and local authorities.

B. Utility Services

1. The Contractor shall be responsible for maintaining all building utility service connections during the excavation and backfill process.
2. Immediately report to the utility company and the Engineer any break, leak or other damage to the lines or protective coatings made or discovered.
3. Allow free access to utility company personnel at all times for purposed of maintenance, repair and inspection.

1.05 DEFINITIONS

- A. The term "Excavation" in these specifications shall be construed to mean the proper removal of all materials encountered in making the cut to receive the pipeline and appurtenance, and including earth, shale and rock in accordance with the following:

1. Excavation not in Rock

- a. Excavation not in rock shall be defined as all excavation that does not satisfy the definition of "Rock Excavation" which follows.

2. Rock Excavation

- a. Rock excavation shall be defined as the excavation of solid rock or boulders greater than one-fourth (1/4) cubic yard in volume, or solid ledge rock and masonry which, in the opinion of the Engineer, requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power operated hand tool. Any material which can be excavated using a hand pick and shovel, power operated excavator, power operated backhoe or power operated shovel shall not be defined as rock.

PART TWO - PRODUCTS

2.01 PIPE BEDDING MATERIAL

- A. Gravel, crushed limestone, or crushed slag can be utilized as bedding material for all underground piping except in areas where metallic pipe is proposed for use. In such instances, crushed slag shall not be used as a bedding material for metallic pipe. The material shall be free from dirt and shall be of an aggregate size conforming to Number 56, 6, 67 or 68 specified in AASHTO M43 and as shown in ODOT Specifications Table 703-1.

2.02 BACKFILL MATERIAL

A. Paved Roadway, Driveway and Similar Structures

The sub-base material for construction, which crosses beneath, paved and unpaved state highways, state highway shoulders, local roadways, driveways and sidewalks, shall be backfilled with granular backfill as specified by Section 02225.

B. Unpaved Areas

1. The sub-base material for construction which occurs in areas other than those described in Subsection 2.02.A shall be:
 - a. From the top of pipe bedding to twenty-four (24) inches over the top of pipe material excavated from the trench if free of stones larger than two (2) inches in size and free of wet, frozen or organic materials.
 - b. From twenty-four (24) inches above the pipe to sub-grade elevation material excavated from the trench if

free of stones larger than eight (8) inches in size and free of wet, frozen or organic material.

c. Imported material approved by the Engineer.

C. Granular Backfill:

Granular backfill material shall conform to the requirements of ODOT 304.

D. Controlled Density Fill Material:

Controlled density fill material shall be a cement base fill material that can be deposited in a fluid state. It shall be composed of Portland cement and approved filler material. The mixture shall meet the following requirements:

Cement:	100	lb/cy
Fly Ash:	250	lb/cy
Sand (S.S.D.):	2,850	lb/cy
Water:	500	lb/cy
Compressive Strength:	Min: 100	psi
	Max: 500	psi

2.03 TOPSOIL

A. Where shown on the Drawings, specified, or required, provide topsoil consisting of loose, friable, loamy fertile soil, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, peat, muck, roots, heavy or stiff clay, stones larger than two (2) inches in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Each load of topsoil shall be subject to approval by the Engineer.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which the work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISH LINES AND ELEVATIONS

A. Grade and shape the ground surface in accordance with the finish lines and elevations shown on the Drawings, specified or required by the Engineer. Comply with other applicable provisions of the Specifications.

3.03 PROCEDURES

A. Utilities

a. Not less than five (5) days in advance of commencing excavation, notify in writing all utility companies, such as gas, water, electric power, transmission, cable, and telephone, which have installations that could be disturbed by the Work; and make proper provisions for locating, removing, relocating, or otherwise protecting said installations. Make additional utility company contacts and provisions to locate and protect utility company installations, as necessary, as the Work progresses.

b. Unless shown on the Drawings or otherwise specified to be removed, protect or relocate all active utility installations or improvements encountered by the Work. Service interruptions should be avoided whenever possible but when unavoidable, interruptions should be kept to a minimum. In such cases, promptly notify all those affected

c. If a utility installation or improvement is damaged, promptly notify those affected, repair or replace to utility

standards. Restore service as soon as possible at no additional cost to Owner

- d. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure appropriate instructions.
- e. Do not proceed with the permanent relocation of utilities until written instructions are received from the Engineer.

3.04 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to insure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes
- B. Maintain access to all streets and private drives.
- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform to construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with state and local codes, permits and regulations.

3.05 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.
- C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

3.06 BLASTING

- A. Blasting will not be permitted except at points at least fifty (50) feet distant from any existing structure, and, then, only under such regulations as may be established by the Owner.
- B. Explosives, where used, shall be moved, stored, and handled in a manner to comply with local Ordinances and State Codes, and other pertinent regulations, as specified under these specifications.
- C. The Contractor must use all possible precautions against accidents or damage on account of explosives or use and storage of explosives, and he must assume all risk and responsibility therefore, saving harmless the Owner from any and all claims occasioned thereby. An experienced man shall be employed to carry on the blasting work.
- D. Blasting shall be conducted so as not to endanger persons and property and shall always be covered with mats or otherwise satisfactorily confined.

3.07 SUPPORT OF EXCAVATION

- A. The Contractor shall be responsible for supporting and maintaining all excavations required hereunder utilizing a trench box and even to the extent of sheeting, shoring the sides and ends of excavations with timber or other satisfactory supports. If the sheeting, braces, shores, and stringers or walling timbers or other supports are not properly placed or are insufficient, the Contractor shall provide additional or stronger supports. The requirements of sheeting or shoring, or of the addition of supports, shall not relieve the Contractor of his responsibility for their sufficiency. All trench protection and sheeting and shoring must conform to the regulations of the Federal Occupational Safety and Health Act (OSHA) and will be subject to their respective inspections. All orders of the OSHA representatives must be complied with by the Contractor.
- B. All timbering shall be removed where and when required and, upon its removal, all voids carefully and compactly

filled. If any timber is ordered in writing to be left in place, it shall be cut-off as directed and will be paid for with a Change Order. No payment will be made for wasted ends or for timber left in place without specific written authorization by the Engineer.

3.08 REMOVAL OF WATER

- A. The Contractor shall pump out or otherwise remove and dispose of, as fast as it may collect any water, sewage, or any other liquids which may be found or may accumulate in the excavation, regardless of whether it be water or liquid wastes from his own contract or from existing conduits and works.
- B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled and concrete work has been completed. Preclude trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- D. There shall be, upon the work at all times during the construction, proper and approved pumps and machinery of sufficient capacity to meet the maximum requirements for the removal of water or other liquids and their disposal.
- E. Water discharged from the excavation shall be controlled in accordance with all State and Local regulations.

3.09 METHOD OF TRENCH EXCAVATION

- A. All excavation shall be in open cut, unless otherwise permitted by the Engineer. Loosening of material by blasting will not be permitted without written authorization by the Owner specifying both the extent and location of the blasting to be done.
- B. Excavation shall be made to undisturbed finish sub-grade six (6) inches below the bottom of the pipe, unless otherwise shown on the Drawings.
- C. Where unsuitable bearing material is encountered, the trench shall be excavated to an additional depth below the excavation for the bottom of the pipe barrel of six (6) inches for pipe of twenty four (24) inches diameter and smaller and of nine (9) inches for pipe greater than twenty four (24) inches in diameter. This additional excavation is to be refilled with suitable material in a satisfactory manner to provide the proper foundation for the conduit bed.
- D. Trenches must be excavated with vertical sides from the bottom of the trench to one (1) foot above the top of the pipe, from which point sides may slope to ground surface, except that, in streets or roadways, trenches must be excavated with vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to provide free working space on each side of the piping according to the size of the pipe and the character of the ground. In every case there shall be sufficient space between the pipe and the sides of the trench to make it possible to thoroughly compact the backfill around the pipe and to secure tight joints, but in no case less than one (1) foot on either side of pipe. In no case, however, shall the width of the trench at the top of the pipe exceed the dimensions as shown on the Contract Drawings. In no case will it be permitted to excavate pipe trenches with sides sloping to the bottom.
- E. Bottom of trenches must give a full, firm but slightly yielding support to the lower section of the pipe and so that the pipe barrel is firmly supported in the cradle throughout its entire length, in such manner as to prevent any subsequent settlement of the pipe. Boulders or loose rocks which might bear against the pipe will not be permitted in the trench bottom or sides below two (2) feet above the pipe. Bell holes must be excavated to assure full length bearing of the pipe barrel.
- F. Trenches must be kept free from water until the material in the joints has sufficiently set.
- G. At no time shall the Contractor advance trenching operations more than 200' feet ahead of completed pipeline except as approved by the Engineer.
- H. Where the Contractor, by error or intent, excavates beyond the minimum required depth, the trench shall be brought to the required pipeline grade with bedding material.

3.10 BEDDING

- A. Bedding material below the pipe and that under and around the pipe to spring line shall be well tamped. That above spring line shall be placed in six (6) inch layers and be well tamped to a minimum height of twelve (12) inches above the top of the pipe.
- B. Where foundation conditions are such that the above types of bedding cannot be provided, as in quicksand, etc., special provisions shall be made as called for by the Drawings or as directed by the Engineer by providing concrete cradle or lumber foundations.

3.11 UNAUTHORIZED EXCAVATIONS

- A. All excavations carried outside of the lines and grades given or specified, together with the disposal of such material, and all excavations and other work resulting from slides, cave-ins, swellings or upheavals shall be at the Contractor's own cost and expense. All spaces resulting from unauthorized excavations or from slides or cave-ins shall be refilled at the Contractor's expense with concrete or other suitable material.

3.12 ADDITIONAL EXCAVATION

- A. It is expected that satisfactory foundations will be found at the elevations shown on the drawings, but in case the materials encountered are not suitable, or in case it is found desirable or necessary to go to additional depth, the excavation shall be carried to an additional depth as ordered and refilled as directed by the Engineer.
 - 1. Payment for this work shall be by Change Order.

3.13 THRUST RESTRAINT

- A. Provide pressure and vacuum pipe with concrete thrust blocking at all bends, tees, valves, and changes in direction, in accordance with the Contract Drawings and as shown on the standard details.

3.14 BACKFILLING

- A. As the various pipelines, conduits, etc. or parts of same are completed and inspected, the Contractor shall refill the space under, around and over with material as specified herein. Unless otherwise directed, all forms, bracing and lumber shall be removed during backfilling and the cavities and voids resulting from the removal shall be thoroughly backfilled.
- B. The bedding material shall be as specified and placed in accordance with the standard details. The limits of bedding shall be as indicated on the Standard Details for the respective pipes. The Contractor must use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe when compacting the backfill. When the backfill has progressed to the limits shown on the Standard Details for the respective pipe, the work of backfilling shall be stopped, and the backfill in place shall be tamped or puddled as directed. Care shall be taken to prevent floating of the pipe.
- C. No cinders, rubbish, rocks, boulders, shale or other objectionable material shall be used as backfill against the pipe or in any part of the trench when, in the opinion of the Engineer, it will be injurious to the work. No backfilling shall be done with frozen materials or upon frozen materials.
- D. Over sewers and other arched structures built in place and after the structure is completed and before the supports or centers are struck, the trenches shall be carefully filled by depositing without shock and by tamping suitable earth or other selected material at the sides and to a height not less than two (2) feet above the top of the pipe. This backfill shall be graded evenly across the trench. This backfilling must be done as the work progresses, and before any filling is deposited directly from a machine, bucket, cars, wagon, or other vehicles. The backfilling shall then be brought up evenly, and all eccentric loading shall be avoided. In no case shall material dumped from a bucket, truck or bulldozer be allowed to fall directly upon any conduit, pipe or other structure, and, in all cases, the bucket must be lowered so that the shock of the falling material will not injure the structure.
- E. The backfill shall be placed and compacted, using power driven mechanical tampers in layers of six (6) inch

compacted thickness unless otherwise approved by the Engineer. Final paving shall be as specified in Section 02500 and as shown on the Contract Drawings and Standard Details.

3.15 DISPOSAL OF MATERIALS

- A. A selected portion of the excavated materials will be used for backfilling or filling about the pipe as ordered. Excavated material in excess of that needed for backfilling and filling and unsuitable material shall be disposed of by the Contractor at his own expense, and the cost of such disposal shall be deemed as having been included in the unit or lump sum prices bid.
- B. Prior to disposal, the Contractor shall obtain and submit to the Engineer written permission from the owner of the property upon which the material and debris are to be placed.

3.16 COMPACTION REQUIREMENTS

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698.
- B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Engineer:
 - 1. Structures, Pavements, Walkways, Curbs and Steps:
 - a. Compact the sub-grade and each layer of fill material or backfill material at 95% of maximum density.
 - 2. Lawn and Unpaved Areas:
 - a. Compact each layer of fill material or backfill material at 90% of maximum density.
- C. Moisture Control:
 - 1. Where sub-grade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of sub-grade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
 - 2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
 - 3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the test laboratory.
- D. Uncompacted Backfill:
 - 1. Where uncompacted backfill is indicated on the Contract Drawings, backfill the trench from one (1) foot above the pipe to the top of the trench with material excavated from the trench, crowned over the trench to a sufficient height to allow for settlement to grade after consolidation.
- E. Unsuitable Backfill Material:
 - 1. Where the Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material stone backfill or suitable foreign backfill material.
- F. Compaction Tests
 - 1. A set of initial compaction tests on the various layers of trench backfill shall be performed immediately after compaction begins to prove that the method being used attains the required compaction results. If the required results are not attained, make needed adjustments in the method being used and repeat the

process until the specified requirements are met.

2. Once the method of compaction has been proven, Contractor shall not change the method without the approval of the Engineer.
3. Trench backfill compaction tests shall be performed to verify the specified consolidation. Unless otherwise directed, perform one test for every 2000 sq. ft. of layer area of backfill material used.
4. At paved areas, perform at least one field density test for every 2000 sq. ft. of paved area, but not less than three tests.
5. On other compacted sub-grade fill layers, perform at least one field density test for every 2000 sq. ft. of area, but not less than three tests.
6. If the above testing results are below that specified, provide additional compaction and testing as necessary to attain the specified compaction.

3.17 UTILITY MARKING TAPE

- A. Install detectable utility marking tape above all plastic pipelines, eighteen (18) inches below final grade as specified by Section 02663.

3.18 ROUGH GRADING

- A. Rough grade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, lawns and paved areas.
- B. Grade areas to be paved to depths required for placing sub-base and paving materials.
- C. Rough grade areas to be seeded three (3) inches below indicated finish contours.

3.19 RESTORATION OF UNPAVED SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02470, Seeding, Sodding and Mulching.

3.20 MAINTENANCE

- A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

- B. Protection of people and property:

- a. Barricade open holes, depressions, and other hazards occurring as part of the Work, and post warning lights on property adjacent to or having public access.
- b. Operate warning lights during hours from dusk to dawn each day and as conditions require.
- c. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, or other hazards created by the operations under this Section.
- d. Contractor shall be responsible for damage resulting from the construction activity.

- e. Use whatever means are necessary to prevent dust, dirt, and debris from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- f. Maintain access to adjacent areas at all times.

PART FOUR – SPECIAL PROVISIONS

4.01 N/A (or state per each individual job)

END OF SECTION

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EXCAVATION FOR STRUCTURES, EMBANKMENT AND BACKFILL

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Excavate, backfill, compact, and grade the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the soils engineer.

1.03 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.04 SUBMITTALS

- A. Certification attesting that the composition analysis of special material stone backfill materials meet specification requirement.

PART TWO - PRODUCTS

2.01 BACKFILL MATERIALS

- A. Non-structural fill and backfill:
 - 1. Provide granular backfill materials, free from organic matter and deleterious substances, with a top size of three (3) inches and a maximum of 25% passing the #100 sieve.
- B. Structural:
 - 1. Granular material used for structural backfill shall be run-of-bank sand and gravel free of organic and deleterious substances meeting the following gradations:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
3"	100
3/8"	50-100
#4	40-85
#10	30-75
#40	15-45
#200	5-15

Liquid limit
25% maximum

Plasticity index
7 maximum

2. Porous fill under slabs: Provide twelve (12) inches unless otherwise shown on the Drawings. Porous fill shall be crushed coarse aggregate in the form of stone, gravel, or slag meeting the requirements of Ohio Department of Transportation. Size and grading requirements of coarse aggregate shall meet the requirements for AASHTO #57 coarse aggregate.

2.02 WEED KILLER

- A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

2.03 TOPSOIL

- A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than two (2) inches in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.
- B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.04 OTHER MATERIALS

- A. Provide other materials, not specifically described but required, for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART THREE - EXECUTION

3.01 GENERAL EXCAVATION

- A. The Drawings show the horizontal and the lower limits of structures. The methods and equipment used by the Contractor when approaching the bottom limits of excavation to a smooth surface shall be selected to prevent disturbing the soil below the bottom limits of excavation. All soil loosened during excavation shall be removed from the footing bottom. For protection of footing bottoms during excavation refer to section on Mud Mats.
- B. Unless authorized in writing by the Engineer, excavation which is carried below the bottom limits of structures shall be classified as unauthorized excavation.
- C. Unauthorized excavation shall be filled with Class B concrete to the bottom limits of structures. Under circumstances where structural integrity is not a factor, the Engineer may authorize the filling of unauthorized excavation with special backfill material compacted to 100% density, as specified under Compaction Requirements. Such preparation shall be at the cost of the Contractor.

3.02 PROCEDURES

- A. Utilities
 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section,

immediately notify the Engineer and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
2. Keep excavations and site construction area free from water.

- D. Use necessary means to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

- E. Maintain access to adjacent areas at all times.

3.03 REMOVING AND STOCKPILING TOPSOIL

- A. The Contractor shall remove and stockpile for re-use, topsoil from the area of excavation. The work shall be done in accordance with applicable portions of ODOT Specification. Stockpile shall be located as shown on the Drawings or as agreed to by the Engineer.

3.04 EXCAVATION OF UNSUITABLE MATERIALS

- A. Unsuitable materials, such as peat, organic contaminated soil, existing below the Contract bottom limits for excavation shall be removed as directed by the Engineer. Such excavation shall be conducted at a time when the Engineer is present and shall not exceed the vertical and lateral limits as prescribed by the Engineer.
- B. The voids left by removal of unsuitable material shall be filled with material consisting of either; (1) special backfill; or (2) Class B concrete; whichever is ordered by the Engineer. Special backfill material shall be compacted to 100% density as specified under Compaction Requirements. Such preparation shall be at the cost of the Contractor.
- C. Payment for this work shall be by Change Order.

3.05 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

- A. All unsuitable and excess excavated materials shall be disposed of by the Contractor. Disposal shall be at an off-site location selected by the Contractor unless a disposal site is indicated on the Drawings.
- B. Off-site disposal shall be in accordance with applicable government regulations.
- C. On-site disposal shall be in accordance with applicable government regulations.

3.06 REMOVAL OF WATER

- A. The Contractor shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the work and shall keep said excavations dry until the structures to be built or pipelines to be placed therein are completed. No

water shall be allowed to rise over or come in contact with masonry until the concrete and mortar has attained a satisfactory set, except in cases where the concrete has been trimmed into place with the approval of the Engineer. In water bearing sand, well points and/or sheeting shall be supplied together with pumps and other appurtenances of ample capacity to keep the excavation dry as specified.

- B. The Contractor shall dispose of water from the work in accordance with the Specifications and the requirements of the applicable government regulations without damage to adjacent property or structures.

3.07 SHEETING, SHORING, AND BRACING

- A. The Contractor shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all adjacent and neighboring structures from damage by settlement.
- B. Bracing shall be arranged so as not to place a strain on portions of completed work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the Contractor shall be responsible for all damage to newly built work and adjacent and neighboring structures.
- C. The Contractor shall furnish, install and leave in place, construction sheeting and bracing as designated on the Drawings.
- D. Construction sheeting and bracing, placed by the Contractor to protect adjacent and neighboring structures, may be left in place if desired by the Contractor, and agreed to by the Engineer.

3.08 BACKFILL

- A. Unless otherwise specified or directed, material excavated in connection with the work may be used for backfilling, other filling purposes, and as required for new grading contours insofar as it is of satisfactory character as determined by the laboratory. No material shall be used for backfilling that contains stones, rock, or pieces of masonry greater than 6 in., frozen earth, debris, earth with an exceptionally high void content, organic material, or marl. No large pieces of rock or masonry shall be deposited closer than twenty-four (24) inches from the completed outside surface or any structure.
- B. No backfill shall be placed against any structural elements until the strength level of the in-place concrete shall have attained the specified design strength. The Engineer may test in-place strength using non-destructive procedures of ASTM C803.
- C. Backfill shall be placed in uniform layers not exceeding six (6) inches in depth. Each layer shall be placed, then carefully and uniformly compacted to the specified density.
 - 1. Backfill shall be brought up evenly on all sides of the structure to avoid unbalanced lateral forces.
 - 2. The compaction equipment shall be capable of compacting the soil to the required density at the required moisture content and achieve a relatively uniform density from top to bottom of the lift.
- D. In no case will backfill material from a bucket be allowed to fall directly on a structure, and in all cases the bucket must be lowered so that the shock of the falling earth will not cause damage.
- E. Structures with intermediate floors or top slabs, which give lateral support to the walls, shall have these elements in place and shall have obtained the specified design strength prior to backfilling. In the case of structures with walls which are unsupported such as open topped tanks and retaining walls, the latest placed section of wall shall have obtained the specified design strength prior to backfilling.
- F. Where structural slabs or footings are to be placed on a backfilled area, a selected backfill or, where called for on the Drawings, special backfill material shall be used.
- G. Backfilling over the top of any structure will require the approval of the Engineer. The in-place strength of the concrete top slab shall be determined as discussed in Paragraph B for walls.

1. The backfill may be placed on the structure with a crawler tractor with an attached front blade having a maximum gross weight of 14,000 lbs. No heavier compaction equipment shall be permitted on the structure.
2. Two (2) feet of loose backfill shall be maintained between the top slab of the structure and the tracks of the crawler tractor at all times.

H. Placing and compacting:

1. Place backfill and fill materials in layers not more than eight (8) inches in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.09 EMBANKMENT

- A. In making fill for embankment, the surface of the existing ground shall be cleared, grubbed, plowed and (if required) stepped so as to enable bond or firm bearing for the new fill and with any cross ditches filled and tamped to the prevailing grade. The materials for these fills shall be selected of approved materials free from organic matter and placed in horizontal layers not exceeding six (6) inches in thickness when loose, each layer being thoroughly compacted. Materials shall not be placed in the fills too wet to allow for proper solidification and rolling, or when fill or foundation is frozen. If fill material is too dry, it shall be moistened by sprinkling with water to optimum moisture content.
- B. As fills progress, the top shall be kept crowned or sloped for drainage. No roadway shall be laid upon the fill until it has fully settled.
- C. Fills which abut or contain concrete or masonry structures shall be placed with care to avoid undue or unbalanced loads on these structures.
- D. Following the completion of embankment, all berms and slopes shall be neatly and evenly dressed to proper elevation, grade and dimension.
- E. The Contractor will be held responsible for the stability of embankment and shall repair all damage thereto or failure therein within the period of guaranty, unless such damage or failure resulted definitely from the acts of others. Excavation or grading for forming benches and steps in original ground in order to place embankment shall be part of this work.
- F. Where fill is to be placed on undisturbed side slopes steeper than one (1) vertical to six (6) horizontal, benches shall be formed into the slope before any of the backfill is placed. These benches shall be cut at vertical intervals at no more than two (2) feet and shall have a horizontal dimension of not less than three (3) feet. The backfill material shall be placed in six (6) inch horizontal layers and each layer shall be thoroughly compacted to the specified density by approved methods before a succeeding layer is placed.

3.10 MUD MATS

- A. Excavation for structures with mud mats, as shown on the Drawings or a field directed by the Engineer, shall be excavated in two stages as follows or as field directed:

1. Excavation shall be to an elevation of one (1) foot above bottom of mud mat elevation.
2. Excavation of the one (1) foot for an area that can be mud matted that same day.

B. The Contractor shall provide means for removing dirt and water from the mud mat before pouring and placing the structural slab.

3.11 EXCAVATION OF ROCK

1. Where rocks, boulders, granite, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the Work, and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger buildings or structures whether on or off the site.
2. Do not use explosives without written permission from the Engineer.

3.12 GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth the finished surfaces within specified tolerance.
3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'10", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Grading outside building lines:

1. Grade areas adjacent to buildings to achieve drainage away from the structures, and to prevent ponding.
2. Finish the surfaces to be free from irregular surface changes, and:
 - a. Shape the surface of areas scheduled to be under walks to line, grade and cross-section, with finished surface not more than 0.10 ft. above or below the required sub-grade elevation.
 - b. Shape the surface of areas scheduled to be under pavement to line, grade, and cross-section, with finished surface not more than 0.05 ft. above or below the required sub-grade elevation.

3.13 COMPACTING

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698.
- B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the soils engineer:
 1. Structures:
 - a. Compact the top eight (8) inches of sub-grade and each layer of fill material or backfill material at 95% of maximum density.
 2. Lawn and unpaved areas:

- a. Compact the top eight (8) inches of sub-grade and each layer of fill material or backfill material at 90% of maximum density.
 - b. Compact the upper twelve (12) inches of filled areas, or natural soils exposed by excavating, at 85% of maximum density.
- 3. Walks:
 - a. Compact the top eight (8) inches of sub-grade and each layer of fill material or backfill material at 90% of maximum density.
- 4. Pavements:
 - a. Compact the top eight (8) inches of sub-grade and each layer of fill material or backfill material at 90% of maximum density.
- C. Moisture control:
 - 1. Where sub-grade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of sub-grade or layer of soil material to prevent free water from appearing on surface during or subsequent to compacting operations.
 - 2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
 - 3. Soil material that has been removed because it is too wet to permit compacting, may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the soils engineer.

3.14 FIELD QUALITY CONTROL

- A. Secure the soils engineer's inspection and approval of sub-grades and fill layers before subsequent construction is permitted thereon.
- B. Provide at least the following tests to the approval of the soils engineer:
 - 1. At paved areas, at least one (1) field density test for every 2000 sq. ft. of paved area, but not less than three (3) tests;
 - 2. In each compacted fill layer, one (1) field density test for every 2000 sq. ft. of area, but not less than three (3) tests.
- C. If, in the soils engineer's opinion based on reports of the testing laboratory, sub-grade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Section 01410 of these Specifications.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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GRANULAR BACKFILL

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work Included: The Contractor shall furnish all the materials from the top of bedding to the pavement sub-grade for and shall properly place and compact sand and/or gravel backfill, as approved, over conduits, pipelines and elsewhere, when ordered by the Engineer, when they are located under pavement or cross under roads, drives and elsewhere when backfill is required to be accomplished without future settlement, and only when and as called for by the Drawings or as may be ordered by the Engineer.
 - 1. Backfill specified under Trench Excavation, Bedding and Backfill, or under classes of work for cradle and for compacted backfill around and over pipe to the limits indicated on the drawings for polyvinylchloride pipe, reinforced concrete pipe, ductile iron pipe or for other items of this contract when specifically so specified will be included in their respective items and will not be classified as Granular Backfill.
 - 2. Sand, gravel, or other granular material that is excavated from the project area as part of the excavation shall be consumed before granular backfill can be imported unless such "native" material is deemed unsuitable for use in the project by the Engineer.

1.02 RELATED WORK

- A. Including but not limited to the General Conditions, Supplementary Conditions and Sections of Division A.
- B. All applicable Divisions of the Technical Specifications.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Fine aggregates shall be well graded from coarse to fine and be free of dirt and shall be of an aggregate size conforming to Number 56, 6, 67, or 68 specified in AASHTO M 43 and shown in ODOT Specification 703-1.
- B. Approved bank run sand and/or gravel, with clay loam or silt under five percent (5%) in acceptable.

PART THREE - EXECUTION

3.01 INSTALLATION

- A. Granular backfill, when called for by the Drawings or ordered by the Engineer, for trench backfill shall be properly graded and placed in layers not over six (6") inches in depth, with voids reduced to a minimum, and thoroughly compacted with mechanical equipment, or as directed by the Engineer, so as to prevent after settlement. The placing of this material shall be continued until the required depth is compacted, and the top of this backfill shall be finished to the lines and grades called for by the drawings, or as ordered by the Engineer. Should settlement occur, the Contractor must add and compact additional fill, and he must maintain the backfill at the required sub-grade until the project is satisfactorily completed.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all the materials from the top of bedding to the pavement sub-grade for and shall properly place and compact special backfill, as approved, over conduits, pipelines and elsewhere, when ordered by the Engineer, when they are located under pavement or cross under roads, drives and elsewhere when backfill is required to be accomplished without future settlement, and only when and as called for by the contract drawings or as may be ordered by the Engineer.
- B. Backfill specified under Trench Excavation, Bedding and Backfill, or under classes of work for cradle and for compacted backfill around and over pipe to the limits indicated on the drawings for vitrified pipe, reinforced concrete pipe, ductile iron pipe or for other items of this contract when specifically so specified will be included in their respective items and will not be classified as Special Backfill.
- C. Gravel, or other granular material that is excavated from the project area as part of the excavation shall be consumed before special backfill can be imported unless such "native" material is deemed unsuitable for use in the project by the Engineer.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Fine aggregates shall be well graded from coarse to fine, and tested by means of laboratory sieves shall conform to the following requirements:

(U.S. Standard Sieve Series)	Weight Passing
3/8"	100
No. 4	95-100
No. 8	70-95
No. 16	45-80
No. 30	25-60
No. 50	10-30
No. 100	1-10
No. 200	0-4

- B. Bank run sand and/or gravel, free of organics and vegetation and with clay loam or silt under five percent (5%) is acceptable.

PART THREE - EXECUTION

3.01 PLACING

- A. Special backfill, when called for by the drawings or ordered by the Engineer for trench backfill, shall be properly graded and placed in layers not over six (6") inches in depth, with voids reduced to a minimum, and thoroughly compacted with mechanical equipment, or as directed by the Engineer, so as to prevent after settlement. The placing of this material shall be continued until the required depth is compacted, and the top of this backfill shall be finished to the lines and grades called for by the drawings, or as ordered by the Engineer. Should settlement occur, the Contractor must add and compact additional fill, and he must maintain the backfill at the required sub-grade until the project is satisfactorily completed.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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BORED AND JACKED PIPELINE INSTALLATION

PART ONE - GENERAL

1.01 SCOPE

- A. This work shall consist of the underground construction of a pipeline across the roadway right-of-way, or other facility as indicated on the plans and as specified herein without interruption to the use of the roadway. The work shall be performed in accordance with all permits issued by the owner of any facility being crossed by the pipeline. Also included is the excavation by horizontal drilling or by tunneling methods, the removal and disposal of excavated material, the placing and jointing of pipe inside the casing, and the furnishing of all labor, superintendence, tools, equipment, and materials necessary to completely construct the carrier pipe inside the jacked casing pipe. All pits which are constructed to facilitate this work shall be excavated, sheeted, braced, maintained, backfilled, etc. in complete accordance with the provisions of the construction specification for the pipeline of which the pipeline crossing is a part.

PART TWO - PRODUCTS

2.01 MATERIAL

- A. The casing pipe shall be welded steel pipe meeting or exceeding the requirements of ASTM A252, Grade B Specifications, of the thickness and size indicated by the specifications and drawings. The casing must be of adequate thickness to withstand all dead and live loads plus the forces exerted during the jacking process. All joints in the casing shall be welded.

PART THREE - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Bored, jacked or tunneled installations shall have a bore hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating.
- B. The use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited.
- C. If during installation an obstruction is encountered which prevents installation of the pipe in accordance with this specification, the pipe shall be abandoned in place and immediately filled with grout.

3.03 BORE AND JACK

- A. This method consists of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.
- B. The boring operation shall be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.
- C. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The casing shall be carefully aligned and jacked to grade as called for by the drawings.
- D. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, procedures as outlined in Section 3.01 must be implemented immediately.
- E. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 1/2 inch (13 mm). If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than approximately 1 inch (25 mm), grouting (see Section 3.05) or other methods approved by the Engineer, shall be employed to fill such voids.
- F. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.

- G. Plans and description of the arrangement to be used shall be submitted to the Engineer for approval and no work shall proceed until such approval is obtained.
- H. Any method that employs simultaneous boring and jacking for pipes over 8 inches (203 mm) in diameter that does not have the above approved arrangement **will not be permitted.**
- I. Hardwood blocks shall be securely attached to the carrier pipe with stainless steel bands and shall be used as skids and/or pipe supports.
- J. A felt wrapping which is one-quarter inch (1/4") thick shall be provided between each annular masonry closure and the carrier pipe.
- K. The pipe shall be carefully aligned and jacked to grade as called for by the drawings. Contractor shall check to insure line and grade are maintained throughout the boring and jacking operation. Line and grade shall be checked at least a minimum of the 1/3 points of the total length of the bore.
- L. The construction of all pits shall not be terminated more than five (5) working days prior to the commencement of actual casing placement or tunneling operations.
- M. In any event, no pits shall be left open longer than five (5) working days unless tunneling, casing installation, or carrier pipe installation are actively in progress.
- N. Blasting will not be permitted under or near railroad tracks and facilities.

3.05 SUPPORT OF EXCAVATION

- A. Design plans and computations for the pits, stamped by a Professional Engineer, must be submitted by the Contractor at time of application prior to start of construction
- B. The sheeting shall be designed to support all lateral forces caused by the earth, railroad and other surcharge loads.
- C. After construction and backfilling, all sheet piling within 10 feet (3.0 m) of centerline track must be cut off 18 inches (457 mm) below final grade and left in place.
- D. All excavated areas are to be illuminated (flashing warning lights not permitted), fenced and otherwise protected as directed by the Chief Engineer or his designated representative.
- E. The railroad live load used shall be a Cooper E-80 loading. This loading consists of 80 kip (356 kN) axle loads spaced 5 feet (1.5 m) on centers.
- F. An impact factor of 1.75 (multiply live load by the impact factor) shall be used for depth of cover up to 5 feet (1.5 m) on centers.
- G. The values shown in Table 1 shall be used for depth of cover up to 5 feet (1.5 m). Between 5 and 30 feet (1.5 and 9.1 m), the impact factor is reduced by 0.03 per foot (0.1 per m) of depth. Below a depth of 30 feet (9.1 m), the impact factor is 1.

Table 1

Live loads, including impact, for various heights of cover for a Cooper E-80 loading.

Height of Cover		Load	
feet	(meter)	lb/sq ft	(kPa)
2	(0.6)	3800	(162.8)
3	(0.9)	3150	(150.8)
4	(1.2)	2850	(136.5)
5	(1.5)	2550	(122.1)
6	(1.8)	2250	(107.7)
7	(2.1)	1950	(93.4)
8	(2.4)	1700	(81.4)
9	(2.7)	1500	(71.8)
10	(3.0)	1300	(62.2)
12	(3.7)	1000	(47.9)
14	(4.3)	800	(38.3)
16	(4.9)	625	(29.9)
18	(5.5)	500	(23.9)
20	(6.1)	400	(19.2)
25	(7.6)	250	(12.0)
30	(9.1)	150	(7.2)

- H. To determine the horizontal pressure caused by the railroad loading on a sheet pile wall or other structure adjacent to the track, the Boussinesq analysis shall be used. The load on the track shall be taken as a strip load with a width equal to the length of the ties, 8-1/2 feet (2.6 m). The vertical surcharge, q (psf), caused by each axle, shall be uniform and equal to the axle load divided by the tie length and the axle spacing, 5 feet (1.5 m). For the E-80 loading this results in:

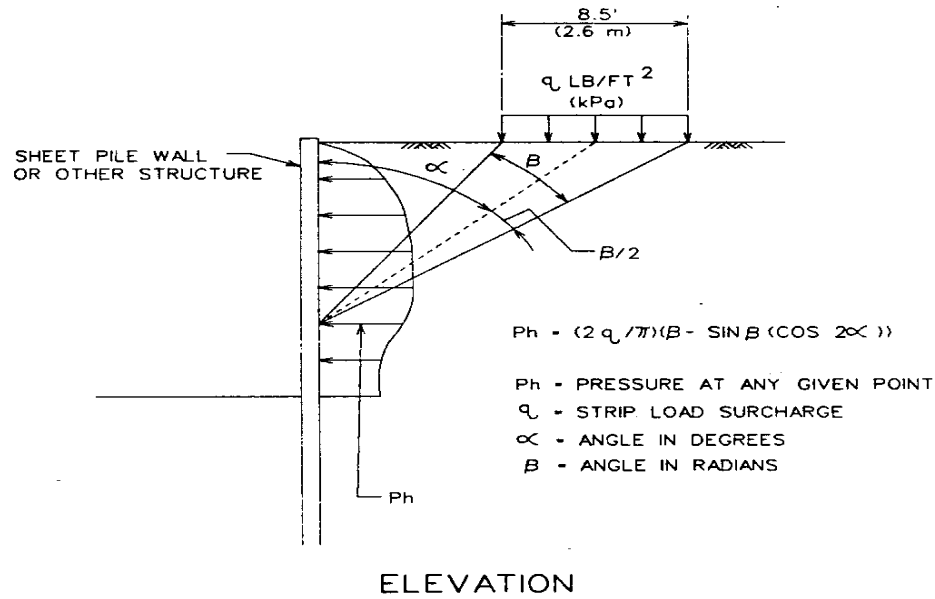
$$q = 80,000 / (8.5 \times 5) = 1882 \text{ psf.}$$

The horizontal pressure due to the live load surcharge at any point on the wall or other structure is P_h and can be calculated by the following:

$$P_h = (2q/\pi)(\beta - \sin \beta(\cos 2\alpha)) \quad (\text{See Plate})$$

- E. The vertical and horizontal pressures given above shall be used unless an alternate design method is approved by the Chief Engineer. Proposals to use an alternate design method must include acceptable references and a statement explaining the justification for choosing the alternate method.

LATERAL PRESSURE DIAGRAM



LATERAL PRESSURE DUE TO STRIP LOAD

3.06 GROUTING

- A. For jacked and tunneled installations a uniform mixture of 1:6 (cement:sand) cement grout shall be placed under pressure through the grout holes to fill any voids which exist between the pipe and the undisturbed earth.
- B. Grouting shall start at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the pipe.
- C. A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.
- D. When jacking, grout holes tapped for no smaller than 1-1/2 inch (33 mm) pipe, shall be cut into the pipe. Three grout holes, equally spaced around the circumference and 4 feet (12.2 m) longitudinally shall be provided.
- E. Immediately upon completion of jacking operations, the installation shall be pressure grouted.

3.07 EXPERIENCE

- A. Horizontal boring, tunneling, and jacking is a specialized type of construction, and, the Contractor shall demonstrate that he is fully qualified and has satisfactorily completed at least three (3) such projects.

3.08 TESTING

- A. The carrier pipe sewer shall be tested in accordance with the testing specification for the type of pipeline and pipe material installed.

PART FOUR – SPECIAL PROVISIONS

PIPE DATA SHEET (For Crossings And Longitudinal Occupancy)		
	PIPE DATA	
	CARRIER PIPE	CASING PIPE
CONTENTS TO BE HANDLED	DOMESTIC SEWAGE	GROUT
NORMAL OPERATING PRESSURE	ATMOSPHERIC	ATMOSPHERIC
NOMINAL SIZE OF PIPE	12-INCH	20-INCH
OUTSIDE DIAMETER	13.2-INCH	20-INCH
INSIDE DIAMETER	12.64-INCH	19.312-INCH
WALL THICKNESS	0.28-INCH	.344-INCH
WEIGHT PER FOOT	34.8	72.28
MATERIAL	DUCTILE IRON	STEEL
PROCESS OF MANUFACTURE	CENTRIFUGALLY CAST	ELECTRIC RESISTANT WELD
SPECIFICATION	AWWA 151	API 5L
GRADE OR CLASS	562	GRADE B
TEST PRESSURE	350 PSI	490 PSI
TYPE OF JOINT	PUSH-ON	WELDED
TYPE OF COATING	ASPHALTIC	EPOXY
DETAILS OF CATHODIC PROTECTION	NONE	NONE
DETAILS OF SEALS OR PROTECTION AT ENDS OF CASING	8" MASONRY	NONE
METHOD OF INSTALLATION	BORE & JACK	BORE & JACK
CHARACTER OF SUBSURFACE MATERIAL AT THE CROSSING LOCATION	WELL-DRAINED SANDY CLAY	WELL-DRAINED SANDY CLAY
APPROXIMATE GROUND WATER LEVEL	BELOW 10 FEET	BELOW 10 FEET
SOURCE OF INFORMATION ON SUBSURFACE CONDITIONS (BORINGS, TEST PITS, OR OTHER)	SOIL CONSERVATION SERVICE	SOIL CONSERVATION SERVICE

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SODDING, SEEDING AND MULCHING

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work Included: Installation of topsoil, as necessary, supplying all seed, sod, soil conditioning materials, and mulching materials and the incorporation of these materials into the work as specified.
 - 1. The Contractor shall place stockpiled topsoil in those areas requiring seeding or sod. If the quantity of stockpiled topsoil is insufficient, the Contractor shall furnish and install additional topsoil as required to complete the work.
- B. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. All relative sections within Division 2 of the Contract Specifications

1.02 QUALITY ASSURANCE

- A. State and local code requirements shall control the removal, stock piling and installation of all materials specified herein. Enforcement agencies include but are not limited to:
 - 1. Ohio Dept. of Transportation

1.03 SUBMITTALS

- A. Prior to the use or placement of materials or products specified herein and accordance with the General Requirement and supplements thereto, Contractor shall submit manufacturers materials specification, handling instructions, installation requirements and application rates for all materials and products specified herein.
- B. Certification of imported topsoils is required to ascertain compliance to the requirements specified herein.

1.04 JOB CONDITIONS

- A. Final restoration of the ground surface must be completed within twenty (20) days of the completion of the pipeline installation or temporary ground cover, as approved by the Engineer, must be provided by the Contractor.
 - 1. Temporary ground cover shall not permit the erosion of the ground surface during wet weather period nor create a dust environment during dry weather conditions.

PART TWO - PRODUCTS

2.01 LIME

- A. Agricultural ground limestone with a minimum total neutralizing power of ninety (90) and at least forty (40) percent passing a No. 100 sieve and at least ninety-five (95) percent passing a No. 8 sieve shall be used at the rate of thirty (30) pounds per 1000 square feet of area.

2.02 FERTILIZER

- A. Superphosphate shall be applied at the rate of thirty (30) pounds per 1000 square feet of area.
- B. 12-12-12 fertilizer shall be applied at the rate of twenty (20) pounds per 1000 square feet of area.

- C. The above fertilizers may be premixed in the proportion of sixty (60) pounds of superphosphate and forty (40) pounds of 12-12-12 fertilizer and applied at the rate of fifty (50) pounds per 1000 square feet of area.
- D. Fertilizer of analysis other than 12-12-12 (but in the same approximate ratio) may be used varying the rate of application to apply the specified ingredient quantities. Deviations are to be approved by the Engineer.
- E. If liquid fertilizer is used, the Contractor shall present to the Engineer for approval the control methods he proposes to employ to assure thorough mixing of the specified fertilizers and methods he proposes to employ to assure that specified amounts are uniformly applied.
- F. Fertilizer and liming materials shall be applied separately but can be tilled or otherwise incorporated into the soil in the same operation.

2.03 SEED

- A. Seed shall be vendor mixed, delivered in original bags and shall be proportioned as follows:

<u>Common Name</u>	<u>Proportion by Weight</u>
Kentucky Bluegrass	40%
Creeping Rye Grass	40%
Annual Rye Grass	20%

- B. Supplier's name and analysis of seed is to be submitted to the Engineer.

2.04 MULCH

- A. Mulching material shall be straw or other material approved by the Engineer and shall be free of weed seeds and foreign material that detract from their effectiveness as mulch or which may be injurious to growth of plants.

2.05 SOD

- A. Sod shall be well-rooted Kentucky Blue Grass (*POA pratensis*) grown on a mineral soil and obtained from a commercial sod nursery. Sod shall be free of all noxious weeds such as wild mustard, thistles, quack grass, etc. and reasonably free from dandelions, crabgrass, etc.
- B. Sod shall have been recently mowed to a height of not more than two (2) inches and shall be cut in strips not less than three (3) feet long nor more than six (6) feet long and shall be cut in a uniform width of not over eighteen (18) inches.
- C. Sod shall be delivered to the job within twenty-four (24) hours after being cut and shall be installed within thirty-six (36) hours after being cut.
- D. During wet weather the sod shall be allowed to dry sufficiently to prevent tearing during handling and placing and during dry weather have been watered before lifting to insure its vitality and to prevent dropping off of soil during handling.

2.06 TEMPORARY EROSION CONTROL

- A. Erosion control fabric shall consist of biodegradable or photodegradable materials of yard interwoven with strips of paper or extruded plastic mesh interwoven with curled wood fibers and shall be installed per manufacturer's instructions. Erosion control fabric shall be Hold/Gro as manufactured by Gulf States Paper Corporation, Curlex Blankets as manufactured by American Excelsior Company or approved equal.

2.07 PERMANENT EROSION CONTROL

A. Permanent erosion control fabric shall be a nylon reinforcement nylon flexible soil reinforcement matting resistant to ultraviolet light degradation.

B. Matting shall be 7020 Enkamat, as manufactured by American Enka Company, or equal.

C. Matting Characteristics

1. Material

- a. Nylon 6 \pm 0.5% by weight Carbon Black

2. Dimensional

- a. Weight (g/sq.m.) 405 \pm 7%
- b. Thickness (mm) (minimum) 18 (0.8 in.)
- c. Width (cm) 97 (38 in.)
- d. Roll Length (m) 100 (330 ft.)
- e. Filament Diameter (mm) (minimum) 0.40

3. Tensile Properties

- a. ASTM D1682

4. Strength (kg/m - minimum)

- a. Length Direction 140
- b. Width Direction 80

5. Elongation (% - minimum)

- a. Length Direction 50
- b. Width Direction 50

6. Resiliency

- a. Immediate recovery
3 cycles at 100 psi 80

7. Exposure Properties

- a. 80% Strength Retention
- b. Temperature Range (°F) -100 to 250
- c. pH Range 3 to 12

2.08 CROWN VETCH (CORONILLA VARIA)

A. Areas to be seeded with Crown Vetch shall be seeded with the following mixture:

33 percent Crown Vetch
67 percent Perennial Rye Grass (*Lolium perenne*)

B. The inoculant for treating Crown Vetch seed mixture shall be a pure culture nitrogen - fixing bacteria selected for maximum vitality, not more than one (1) year old. All cultures are subject to approval of the Engineer.

C. All seeds shall be inoculated or treated with the proper amount of the approved culture mixed with sufficient water to thoroughly wet the seed with the solution. When seed is sown hydraulically, four (4) times the amount of inoculant required above shall be placed in the slurry and thoroughly mixed immediately before

seeding. Seed shall be sown within twenty-four (24) hours after treatment with the inoculant.

- D. Crown Vetch is best planted in early spring but shall be planted before September 1st. Late planting losses shall be replaced by the Contractor at no cost to the project.

2.09 IMPORTED TOPSOIL

- A. Topsoil shall comply with ODOT Section 653.03 and shall not contain grass, roots, and debris harmful to plant growth and be free of pests, pest larvae and matter toxic to plant and animal life.

PART THREE - EXECUTION

3.01 PLACING TOPSOIL

- A. Topsoil shall be placed to a depth of four (4) inches for those seeded and sodded areas shown on the Drawings. The work shall be performed in accordance with applicable portions of ODOT Section 653.

3.02 APPLYING LIME AND FERTILIZER

- A. Before applying lime and fertilizer, areas to be seeded or sodded shall be inspected by the Contractor and all surface debris of sufficient size to interfere with the operation of spreaders or cause non-uniform application shall be removed. All tree roots of 3 inches in diameter and within 4 inches of finished grade shall be removed. All roots from living trees regardless of location with respect to finished grade shall be accepted as found and protected from further injury.
- B. Apply lime and fertilizer in the amounts specified under 2.01 and 2.02. Fertilizers shall be applied separately from liming material, but both can be incorporated into the soil by tilling or other method to a depth of four (4) inches in the same operation.

3.03 SOWING AND SODDING

- A. All areas to be seeded shall be free of rock and other foreign material one (1) inch or greater in any dimension. Hand raking will be required if machine cleaning does not produce results equivalent to hand raking. Around structures or in any other area where machine cleaning is impracticable hand raking shall be employed.
- B. If seedbed becomes compacted prior to seeding or sodding, it shall be re-cultivated to produce a friable condition before seeding and sodding. Rock or other debris turned up by re-cultivation shall be removed as specified under 3.03 A at no additional cost to the Owner.
- C. Seed shall be thoroughly mixed and uniformly sown over the prepared area at the rate of four (4) pounds per 1000 square feet. Seed shall be sown dry or hydraulically. Seed shall not be sown when the ground is frozen or muddy or when weather conditions would prevent proper soil preparation, interfere with sowing, or prevent proper incorporation of seed into the soil.
- D. Following seeding of grasses or legumes, the area shall be raked, dragged, or otherwise treated so as to cover the seed approximately 1/4 inch.
- E. Within forty-eight (48) hours after sowing seed, vegetative mulch shall be evenly distributed at the rate of approximately two (2) tons per acre. Mulching material shall be kept in place with asphalt emulsion applied at the rate of fifty (50) gallons per ton of mulch material specified, netting or by other methods approved and required to prevent mulch displacement. Asphalt emulsion shall conform to AASHTO M140 or ASSHTO M208, be non-toxic to plants and shall be so prepared that it will not change in storage or transport. Mulch which is displaced shall be restored at once but only after repair and restoration of seeding and preparatory work that preceded mulching and which suffered damage due to mulch displacement.
- F. Areas to be sodded shall be prepared as specified in 3.01 and 3.02. Before sod is placed, the sod bed shall be dressed so that sod, when laid, will meet proposed finished grades and grades of existing structures, walks, drives, and adjacent lawn areas.

- G. Sod shall not be laid when the temperature is below 32 degrees F. nor when sod itself or sod bed is frozen.
- H. Sod shall be lifted from trucks or storage piles and placed by hand with joints tightly butted and not overlapping. Transverse sod joints shall be staggered at least one (1) foot. Sodded surface shall be free of gaps, cracks, and openings. After laying, the sod shall be watered thoroughly and be tamped or lightly rolled to bring it into close contact with the sod bed and to insure tight joints between strips.
- I. Sod laid on slopes shall be laid with long edges of the strip parallel to the contour and laying shall start at the bottom of the slope.
- J. On slopes of two (2) to one (1) or steeper and six (6) feet or over in height measured on the slope each strip of sod shall be held in place by stakes two (2) feet apart. Stakes shall be wood not less than 1/2 x 3/4 x 12 inches and shall be driven flush with the sod with the flat side parallel to the contour and adjacent rows of stakes staggered.

3.04 WATERING OF AREA

- A. The Contractor shall provide whatever devices are required such as hoses and tank trucks to distribute water and sprinklers to apply it. Hydro-seeders or pressure tanks may be required with a nozzle that will produce a spray that will not dislodge mulch material.
- B. Sodded areas, including the sub-grade, shall be kept thoroughly moist for two (2) weeks after sodding.

3.05 MAINTENANCE

- A. In seeded lawn areas, where designated the Contractor shall provide law cutting for three successive mowings seven (7) days apart for acceptable lawns. Unacceptable lawns shall be maintained by the Contractor until accepted.
- B. Acceptance shall be based upon achieving a uniform stand of the specified grasses. If some areas are satisfactory and some are not, acceptance may be made in blocks, provided they are definable or bounded by readily identified permanent surfaces, structures, or other reference means. Partial acceptance decisions shall be made by the Engineer. Excessive fragmentation into accepted and unaccepted areas shall be avoided. Unaccepted areas shall be maintained by the Contractor until acceptable.
- C. Maintenance of sodded areas shall consist of watering for two (2) weeks following completion of sodding work and mowing during this two (2) week period as dictated by weather and rate of growth. Sodded areas shall be protected from traffic as necessary by erection of barriers.

3.06 SEEDING DATES

- A. Spring-sown lawns shall be completed by May 30th and fall-sown lawns shall be completed by October 15th.

3.07 PERMANENT EROSION CONTROL

- A. Permanent erosion control measures shall be taken in the areas designated on the construction drawings. In these areas, the erosion control netting (see 2.07) shall be replaced with a nylon flexible soil reinforcement matting resistant to ultraviolet light degradation.
- B. The matting shall be installed as per the manufacturers instructions. The matting shall be placed over the slopes, which shall be smooth and free of ruts and rocks. Material shall be installed with a two to three (2-3) inch overlap, pinned at three to five (3-5) foot intervals with the peaked side down. Material shall be placed in vertical strips from top to bottom. There shall be a twelve (12) inch upslope trench backfilled to bury the pinned upper edge of the matting.
- C. The seed shall then be distributed as per the requirement stated in 3.03.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PAVEMENT CONSTRUCTION, REPAIR AND REPLACEMENT

PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all of the equipment, labor and materials necessary to install, replace, and/or restore existing pavement structures together with their respective appurtenances as shown on the plans and as specified herein. This work shall include the entire sub-grade preparation, sub-base, base, intermediate pavement course(s), and finish pavement courses together with guttering, tack and/or prime coating, and other pertinent work as necessary to meet the conditions of this contract.

1.02 REPAIR OR REPLACEMENT WORK

- A. For the repair and/or replacement of all existing pavement structures and their respective appurtenances that are removed and destroyed or otherwise damaged by the Contractor in the course of his performance of the work required under this contract, the Contractor shall furnish all equipment, labor, and materials as necessary to properly restore to a condition equal to that at his entry; and to the satisfaction of the Engineer, the Ohio Department of Transportation, ODOT Item 253, the County Engineer, City Engineer, all cinder, slag, gravel, water-bound macadam, bituminous macadam, asphalt and roadways in strict accordance with the drawings and as specified herein.
- B. In general, this item will include stone, slag, cinders, gravel, asphalt and other bituminous materials and curbs, gutters, driveway culverts, and the demolition, excavation and removal of existing roadways.

1.03 REFERENCE TO OTHER PARTS

- A. Other sections of these specifications shall apply, as and where applicable to this Section and such sections will be the same as though they were included in this section.
- B. For all old work where pavement is being repaired and/or replaced as a result of damages occurring thereto during the course of the work of this contract, all clearing and grubbing, removal and storage of topsoil, excavation and/or placing of compacted fill and granular backfill, shall be done as required under other parts of these specifications.

PART TWO – PRODUCTS

2.01 MATERIALS

- A. Generally, for all repair and replacement work, all new materials shall match the existing and adjoining work in both composition and quality unless otherwise ordered, specified herein, and/or shown on the drawings. In any stone roadway, the material used for stone fill shall conform to the existing material.

PART THREE - EXECUTION

3.01 ROADWAY SUB-GRADE

- A. The entire area to be occupied by the roadways and parking areas shall be cleared, topsoil removed and stored, and the excavation or compacted fill made as required and brought to the proper elevations per ODOT Item 203. Pipe trenches and other excavations shall be backfilled as required, and thoroughly compacted within the limits of the roadways or parking areas.
- B. After the surface of the sub-grade has been properly shaped and before any stone or slag is placed, the entire sub-grade shall be thoroughly rolled and compacted to a depth of 12 inches per ODOT Item 204. Rolling shall be done with an approved type of self-propelled roller, weighing not less than ten (10) tons. All hollows and depressions which develop during the rolling shall be filled with acceptable materials, and the sub-grade re-rolled. The process of filling and rolling shall be repeated until no depressions develop, and the entire sub-grade has

been brought to a uniform condition of stability.

- C. All places which, in the opinion of the Engineer cannot be properly rolled shall be tamped with hand held mechanically or pneumatically powered tampers.
- D. In making the compacted fill and in doing the final sub-grade rolling, the Contractor shall see that the material to be compacted and/or rolled has the proper moisture content to secure maximum compaction. When, in the opinion of the Engineer, the material is too wet, the compacting shall be delayed until the material has dried sufficiently. When, in the opinion of the Engineer, the material is too dry, the material shall be sprinkled with water in an amount to secure the proper moisture content.

3.02 AGGREGATE BASE

- A. Following sub-grade preparation, the Contractor shall spread and fill aggregate base to the depth, grades and lines as shown on the Contract Drawings. The road base material is to conform to ODOT Construction Material 304, consisting of screened crushed stone, crushed slag or approved equal.
- B. After the surface of the aggregate base has been properly shaped, the base is to be compacted. When vibrating equipment is used in conjunction with other methods of compaction, the compacted depth of a single layer shall not exceed 6 inches. When vibrating compaction equipment is not used, the maximum compacted thickness of one layer shall not exceed 3 inches. When the required compacted depth of the base course exceeds 6 inches, the base shall be constructed in two or more layers of approximately equal thickness.

3.03 CONSTRUCTION

- A. All pavement work shall be done in strict accordance with the specifications of the governmental body concerned and the latest ODOT specifications as applicable such as ODOT Item 401, Item 402, Item 403, Item 407, Item 408, Item 409, Item 410, Item 411, Item 421, Item 422, Item 441, Item 442, Item 446 and Item 448, or at the direction of the Engineer.
- B. All pavements disturbed by the Contractor's operations shall be relayed to the thickness of the adjoining pavement and, in all cases; the restoring of pavements shall apply both to foundation courses and to the wearing surface.
- C. Should cracks or settlements appear in adjoining pavements, the paving shall be removed to the extent necessary to secure firm and undisturbed bearing and shall be replaced in a satisfactory manner.
- D. No permanent pavement shall be installed, repaired, and/or restored unless, or until, in the opinion of the Engineer, the condition of the backfill is such as to properly support the pavement.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.00 SCOPE

- A. The installation of all piping, fittings, valves, hydrants, etc. in the performance of pipeline construction work shall include the making of one or more types of pipe joints as specified herein.
- B. Related Work
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. Section 02625 Ductile Iron Pipe & Fittings
Section 02634 PVC Pipe (AWWA C900)

1.02 QUALITY ASSURANCE

- A. All pipe joints shall conform to their respective ANSI, AWWA and ASTM specifications regarding materials, assembly, etc. as herein after specified.

1.03 SUBMITTALS

- A. Prior to the use or placement of pipe joint materials or products specified herein, the Contractor shall submit manufacturer's material specifications and recommended handling and installation procedures.

PART TWO - PRODUCTS

- 2.01 In general, the pipe joint products shall be a product of (or supplied by) the pipe manufacturer supplying the pipe being jointed.
- 2.02 Under Part Three - Execution of this specification is further product information which may be included for each joint type.

PART THREE - EXECUTION

3.01 PUSH-ON TYPE JOINTS

- A. Push-on type of joints for cast iron and ductile iron pipe and PVC pipe shall be made where shown on the plans and as specified herein in strict accordance with the manufacturer's recommendation.
- B. No more than one joint at a time shall be "pushed home". In the event that two (2) or more joints are "pushed home" simultaneously, the Contractor shall remove all pipe which was not pushed home "one at a time" and remove and discard the "used" gaskets and relay the pipe "one at a time".
- C. Rubber gaskets shall be rubber O-ring type shaped to fit the particular inside configuration of the bells of the pipe being installed and shall produce a leak-free piping system.
- D. Immediately prior to assembly, thoroughly clean all pipe surfaces which the rubber gasket contacts, insert the gasket properly and lubricate the joint surfaces.
- E. All ends shall be square to the pipe barrel and shall be kept in a straight and square alignment to the receiving bell during assembly.
- F. No weight will be allowed for nor payment made for the gasket or lubricant used, but the cost thereof shall include in the unit price bid for compression joint cast iron and/or ductile iron pipe and fittings.

- G. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be both square to the pipe barrel (longitudinal axis) and beveled similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.
- H. All push-on type joints for cast iron and ductile iron pipe, including their respective appurtenance shall conform to ANSI 21.1 (AWWA C111).
- I. All push-on type joints for PVC pipe shall be integral bell push-on type meeting the requirements of ASTM D3139. Gaskets shall be rubber ring type meeting the requirements of ASTM F-477.

3.02 COMPRESSION JOINTS FOR PRESTRESSED CONCRETE CYLINDER PIPE

- A. Compression joints for prestressed concrete cylinder pipe shall be made in accordance with AWWA C 301 and with the requirements of the particular item specification(s) for prestressed concrete cylinder pipe.

3.03 COMPRESSION JOINTS FOR ASBESTOS CEMENT PIPE

- A. Compression joints for asbestos cement pipe shall be made in accordance with the requirements of AWWA C 400 for asbestos cement pipe. All pipe ends, pushing home methods, pipe cutting, etc. shall be similar to that specified in the foregoing specifications.

3.04 FLANGED JOINTS FOR CAST IRON/DUCTILE IRON PIPE AND FITTINGS

- A. Flanged joints shall conform to AWWA C 110 or ANSI A21.10. Flanged joints shall not be installed underground except within structures as indicated on plans or directed by the Engineer.
 - 1. All flanged joints shall be thoroughly bolted with through, stud or tap bolts of required size.
- B. Appurtenances used to make flanged joints shall include: 1/8" thick red rubber gaskets, bolts having American Standard Heavy Unfinished Hexagonal Head and Nut dimensions in conformance with ANSI B.18.1, and material for bolts and nuts shall conform to ASTM A 575 or A 576.
 - 1. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series, and nuts shall be hexagonal cold pressed with well fitting threads.
 - 2. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches.
 - a. In lieu of cadmium plating, galvanizing will be acceptable.
 - 3. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or as called for on the contract drawings.
- C. All nuts and bolts that come into contact with water shall be painted with two (2) heavy coats of Inertol No. 49 thick, made for bolts, studs, nuts or gaskets used for flanged joints, and the cost thereof shall be included in the unit price bid for flanged cast/ductile iron pipe and flanged cast/ductile iron fittings.

3.05 FLANGED JOINTS FOR PRESTRESSED CONCRETE CYLINDER PIPE

- A. Flanged joints for prestressed concrete cylinder pipe and for steel pipe shall be installed as shown on the drawings. Flanges shall be either cast steel, forged or rolled steel, or properly welded and machined fabricated steel plates welded to pipe cylinder with two (2) continuous welds. They shall have plain faces and shall be faced true and smooth at right angles to the axis of the pipe and shall be spot faced on the back. Drilling shall conform to ANSI one hundred twenty-five (125) pound standards. All bolts for flanges and for other types of bolting shall conform to ASTM A 307, Grade A, except where one or both flanges are cast iron, in which case bolts shall be Grade B.

- B. All bolts used in the finished work for flanges and tied joints for concrete pipe shall be of medium open hearth or electric furnace steel. The ends of all bolts must be finished to a standard radius in an acceptable manner. All screw threads shall be American Standard Coarse Thread (N.C.). Stud bolts shall be used to make the flanged joints on pipe. All nuts shall be hexagonal, cold pressed, semi-finished and made of medium open hearth, electric furnace or Bessemer process steel. All dimensions shall be according to American Standard Heavy. Bolts and nuts shall be galvanized before shipment and not primed. Gaskets for flanged pipe shall be full-faced rubber one-sixteenth (1/16) inch thick equal to Rainbow Style 9 as manufactured by the U.S. Rubber Company.
- C. All forged or rolled steel pipe flanges shall conform to ASTM A 181, Grade 60.
- D. All structural steel shall conform to ASTM A 36.
- E. Iron Castings must be smooth and free from blowholes and other defects and the material shall conform to ASTM A 48, Class 30 B.

3.06 MECHANICAL JOINTS

- A. All mechanical joints including their respective appurtenances shall conform to ANSI 21.11 (AWWA C111).
- B. M.J. Bolts
 - 1. All mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with cadmium plated tee head bolts and nuts of high strength, heat treated cast iron or other approved materials having minimum yield strength of forty-five thousand (45,000) pounds per square inch and an ultimate tensile strength of seventy thousand (70,000) pounds per square inch.
 - 2. Joint bolts shall be tightened by the use of approved wrenches and to a tension recommended by the pipe manufacturer. Overstressing of bolts to compensate for poor installation practice shall not be permitted.
- C. M.J. Gaskets
 - 1. Gaskets for water service shall be plain rubber gaskets made of first grade plantation rubber in accordance with ANSI 21.11.
 - 2. Gaskets for sludge, gas, waste lines, etc., shall be plain rubber gaskets tipped with Thickol or ASTM D2000, Type SA-710, or equal.
- D. Glands shall be of high strength cast/ductile iron.
- E. Where connections are made between wrought iron pipe and mechanical joints, an approved type of transition gasket and fitting shall be used in the mechanical joint in accordance with the manufacturer's standards and recommendations.
- F. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be both square to the pipe barrel and beveled similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.
- G. If sections of pipeline are "pre-assembled" at a location other than the intended final resting location of the piping, so as to include a fitting or line valve, the Contractor shall handle such "pre-assembled" sections so as to avoid deflections greater than allowed in published data normally provided by the respective pipe manufacturer. Such sections shall be limited in length to include no more than a standard length of pipe plus one (1) fitting and shall contain no more than two (2) pre-assembled joints. Any excessively deflected "pre-assembled pipe" shall be disassembled, the gaskets shall be discarded, and all reassembly (if it be repeated) all at the Contractor's risk and expense.
- H. Where joints are underground, bolts and nuts shall be painted with two (2) heavy coats of Inertol No. 49 thick, or an approved equal.
- I. Where shown on the drawings, or ordered, mechanical joints shall be provided with approved harnesses to affect

tied joints.

- J. No special payment will be made for lock type joints, glands, bolts, nuts or gaskets used for mechanical joints, but the cost thereof shall be included in the unit price bid for mechanical joint cast/ductile iron pipe and mechanical joint cast/ductile iron fittings. Payment on a tonnage basis will be based on the body weight of the pipe or fittings only and will not show additional weight of accessories.
- K. Approved harnesses to affect tied joints will be paid for as a part of their respective pipeline construction.

3.07 BALL AND SOCKET JOINTS

- A. Ball and socket joints shall be made where shown on the drawings and shall conform to AWWA C 111 and shall be subject to the approval of the Engineer.
- B. Ball and socket joints (river crossing) shall be restrained, boltless and capable of deflecting up to fifteen (15) degrees and shall be installed in accordance with the manufacturer's recommendations.
- C. Ball and socket joints shall be as manufactured by Clow Corporation, American Cast Iron Pipe Company or equal.

3.08 GROOVED-END JOINT COUPLINGS

- A. Grooved-end joint couplings for ductile iron piping shall be used where indicated on the drawings. Grooved and joint couplings shall be watertight, and designed for the working pressures specified for the piping system with which they are to be used. Couplings shall be self-centering and shall engage and lock in place the grooved pipe and pipe fitting ends, in a positive couple. Where grooved-end joint couplings are shown on the drawings, pipe grooves shall be located such as to provide a flexible-type joint which provides for linear and angular movement. Coupling housing clamps shall be fabricated in two (2) or more sections of malleable iron castings, conforming to the requirements of ASTM A 47, Grade 32510. Coupling gaskets shall be molded synthetic rubber, conforming to ASTM D 2000, Grade 3BA615A14-B13. Bolts and heavy nuts shall conform to ASTM A 183. Grooved, hinged flange adapters with gaskets, shall be furnished for making valve or flanged connections, and shall be constructed of the same materials as used for the couplings.
- B. Pipe grooving shall be done by the manufacturer and in accordance with the pipe coupling manufacturer's specifications.
- C. Field grooving of pipe shall not be permitted, except for occasional field make-up pieces when permitted by the Engineer.
- D. Grooved-end joint couplings shall be Victaulic, Dresser or equal.

3.09 MEGA LUG

Mechanical joint restraint, for ductile iron pipe and/or for C900/C905 PVC pipe, shall be incorporated into the design of the follower gland (Glands shall be manufactured of ductile iron conforming to ASTM A536-80). The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 65-45-12 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision. Torque limiting twist-off nuts sized same as tee-head bolts, shall be used to insure proper actuation of the restraining wedges. For ductile iron pipe, the restraint shall be the Series 1100 Megalug restraint as produced by EBAA Iron, Inc. or equivalent and for C900/C905 PVC pipe, the restraint shall be the EBAA Iron Series 2000 PV or equivalent.

Restrained Joint-Features Required

Pipe Material	Ductile Iron Pipe	C900/C905 PVC Pipe
Joint Type	Mechanical	Mechanical
Sizes	3" thru 48"	4" thru 24"
Rated Water Pressure 350 psi 250 psi	16" and smaller 18" thru 48"	- -
Tested to	-	UNI-B-13-92
UL Listed for Approved	3" thru 24" 3" thru 12"	Same as DIP Same as DIP
Available Product Manufacturer	EBAA Iron	EBAA Iron
Catalog I.D.	Series 1100 Megalug	Series 2000 PV

M.J. PVC Joint Restraints for C900 3" thru 12" shall be pressure rated: 200 psi for DR14, 150 psi for DR 18, 100 psi for DR 25.

M.J. PVC Joint Restraints for C905 14" thru 24" shall be pressure rated: 235 psi for DR18, 165 psi for DR 25.

For C900/C905 PVC pipe bells restraint rings shall be made of ductile iron components. All ductile iron shall conform to ASTM A536. A split ring shall be used behind the bell and a serrated restraint ring shall be used to grip the pipe. A sufficient number of bolts shall be used to connect the bell ring and the pipe ring. The combination shall have a minimum working pressure rating of 150 psi. The restraint shall be the Series 1600 for C900 and Series 2000 for C905 as produced by the EBAA Iron, Inc or equivalent.

When used in lieu of threaded or welded flanged spool pieces, restrained flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible ANSI/AWWA C115/A21.15. Restraint for the flange adapter shall consist of individually actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial lengths of pipe to be field cut to allow a minimum 0.6" gap between the end of the pipe and the mating flange without affecting the integrity of the seal. For PVC pipe, the flange adapters will have a pressure rating equal to the pipe. For Ductile Iron Pipe, the flange adapter shall have a safety factor of 2:1 minimum. The flange adapter shall be the Series 2100 MEGAFLANGE adapter as produced by the EBAA Iron, Inc. or equivalent.

When called for in the plans, flexible expansion joints shall be installed in the location indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53. Each flexible expansion joint shall be pressure tested against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30 inches and larger). Each flexible expansion joint shall consist of an expansion joint designee and cast as an integral part of a ball and socket type flexible joint, having a minimum of 15 degrees deflection per ball and 4-inches minimum expansion. All internal surfaces and seal contact surfaces parts shall be lined with a minimum of 15 MILS of fusion bonded epoxy conforming to the application requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500-volt spark test conforming to said specifications. All flexible expansion joints shall be FLEX-TEND as manufactured by EBAA Iron Inc. or equivalent.

3.10 BOLTLESS RESTRAINED JOINT

- A. Boltless restrained joints shall be used where called for on the drawings or as directed by the Engineer to provide restraint against external forces or against separation due to internal pressure.
- B. Types of boltless restrained joints acceptable are "Super-Lock" by Clow Corporation, "Lok-Fast" by American Cast Iron Pipe Company, "Lok-Tyte" by United States Pipe and Foundry Company or equal.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install all ductile iron pipes at the locations shown on the drawings or as directed by the Engineer.
- B. To assure that the iron is suitable for satisfactory drilling and cutting, the chemical constituents shall meet the physical property recommendations of ASTM A 536.
- C. Related Work:
 - 1. Including, but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. All applicable Divisions of the Technical Specifications.

1.02 QUALITY ASSURANCE

- A. All ductile iron pipe shall meet AWWA C151.

1.03 SUBMITTALS

- A. The Contractor shall submit shop drawing, including the manufacturer's material specifications and recommended handling and installation procedures.

PART TWO - PRODUCTS

2.01 PIPE WALL THICKNESS

- A. The minimum wall thickness of the pipe barrel shall be that indicated in ANSI A21.50 (AWWA C151) for laying condition "2", 150 psi internal working pressure and a surge pressure increase of 100 psi. Class shall be as shown on drawings, indicated in specifications or established by the Engineer.

2.02 COATING AND LINING

- A. The outside surface of all ductile iron pipe shall be shop coated with either a coal tar or asphalt base bituminous material. If this coating material is found to be damaged prior to the pipe trench being backfilled, the Contractor shall provide and apply additional material of that required to repair the damages. The Contractor shall have sufficient coating material available at the job site prior to laying the pipe.
- B. All pipe used within buildings and structures and which are to receive field coats of paint shall not be coated with any black bituminous paint. Such pipe, after proper cleaning, shall be painted with one (1) coat of primer paint that will be compatible with the field coats. Painting specifications included in the Contract Documents, shall be followed for cleaning and painting.

2.03 JOINTS

- A. Mechanical Joints and Push-on Joints including their respective appurtenances shall conform to ANSI 21.11 (AWWA C 111).
- B. Flanged joints shall conform to AWWA C 110 or ANSI A21.10. Flanged joints shall not be installed underground except within structures as indicated on plans or directed by the Engineer.
- C. Appurtenances used to make flanged joints shall include 1/8" thick red rubber gaskets, bolts having American Standard heavy unfinished hexagonal head and nut dimensions in conformance with ANSI B.18.1, and material for bolts and nuts shall conform to ASTM A 575 or A 576.
- D. Ball and socket joints (river crossing) shall be restrained, boltless and capable of deflecting up to fifteen (15)

degrees and shall be installed in accordance with the manufacturer's recommendations.

2.04 FITTINGS

- A. All standard and special cast iron/ductile iron castings shall conform to the latest applicable AWWA and/or ANSI specifications for pressure fitting with end conditions as specified herein. AWWA C 110 (ANSI 21.10) shall be applicable for all short-bodied cast iron/ductile iron fittings.
- B. Fittings for pipe sizes of twelve (12) inches in diameter and smaller shall be rated for 250 psi working pressure; fittings for pipe sizes of fourteen (14) inches diameter and larger shall be rated for 150 psi working pressure in accordance with ANSI C 110. Fittings for higher working pressures will be noted on the plans.
- C. The end conditions of each fitting shall be as required to accommodate the joining requirements for the particular pipe material being connected to the fitting in accordance with the piping layout shown on the plans. The particular pipe material to be connected to the fitting is specified elsewhere in these specifications.
- D. The outside surface of all buried cast iron/ductile iron fittings shall be shop coated with either a coal tar or asphalt base bituminous material. If this coating material is found to be damaged prior to the pipe trench being backfilled, the Contractor shall provide and apply additional material of that required to repair the damages. The Contractor shall have sufficient coating material available at the job site prior to laying the pipe.

2.05 POLYETHYLENE ENCASEMENT

- A. The ductile iron pipe, fittings and appurtenances buried underground, shall be encased with 8 mil polyethylene film conforming to ANSI A21.5 (AWWA C 105), unless noted otherwise.

PART THREE - EXECUTION

3.01 INSTALLATION

- A. Process and Pressure Pipe and Fittings
 - 1. Pipe and appurtenances shall be installed true to line, grade, and location, with joints centered, spigots home, pipe properly supported and restrained against movement, and all valve stems.
 - 2. All elbows, tees, plugs, etc. shall be properly anchored, blocked, or otherwise restrained to prevent movement of the pipe in the joints due to internal or external pressure.
 - 3. The open ends of all pipes and special castings shall be plugged or otherwise closed with a watertight plug to the approval of the Engineer before leaving the work for the night, and at other times of interruption of the work. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.
 - 4. Where new or existing pipe requires cutting in the field, it shall be done in a manner to leave a smooth end at right angles to the pipe centerline.
 - 5. Just prior to joining the pipes, the surfaces of the joint rings shall be wiped clean and the joint rings and rubber gaskets shall be liberally lubricated with an approved type of vegetable oil soap. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned. Before the joint is fully "home" the position of the gasket in the joint shall be determined by means of a suitable feeler gauge supplied by the pipe manufacturer. If the gasket is found not to be in proper position, the pipes shall be separated and the damaged gasket replaced. The pipe is then forced "home" firmly and fully. In its final position, the joint between the pipes shall not be deflected more than 1/2 in. at any point.
- B. Flanged Joints for Cast Iron/Ductile Iron Pipe and Fittings
 - 1. Flanged joints shall conform to AWWA A21.10 or ANSI C 110. Flanged joints shall not be installed underground except within structures as indicated on plans or directed by the Engineer.
 - a. All flanged joints shall be thoroughly bolted with trough; stud or tap bolts of required size.
 - 2. Appurtenances used to make flanged joints shall include 1/8" thick red rubber gaskets, bolts having American

Standard heavy unfinished hexagonal head and nut dimensions in conformance with ANSI B.18.1, and material for bolts and nuts shall conform to ASTM A 575 or A 576.

- a. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series and nuts shall be hexagonal cold pressed with well fitting threads.
 - b. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches.
 1. In lieu of cadmium plating, galvanizing will be acceptable.
 - c. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or as called for on the contract drawings.
3. All nuts and bolts that come into contact with water shall be painted with two (2) heavy coats of Inertol No. 49 thick, made for bolts, studs, nuts or gaskets used for flanged joints, and the cost thereof shall be included in the unit price bid for flanged cast/ductile iron pipe and flanged cast/ductile iron fittings.

C. Mechanical Joints

1. All mechanical joints including their respective appurtenances shall conform to ANSI C 111 (AWWA 21.11).
2. M.J. Bolts
 - a. All mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with cadmium plated tee head bolts and nuts of high strength, heat treated cast iron or other approved materials having minimum yield strength of forty-five thousand (45,000) pounds per square inch and an ultimate tensile strength of seventy thousand (70,000) pounds per square inch.
 - b. Joint bolts shall be tightened by the use of approved wrenches and to a tension recommended by the pipe manufacturer. Overstressing of bolts to compensate for poor installation practice shall not be permitted.
 - c. All nuts and bolts which come into contact with water shall be stainless steel type 316.
3. M.J. Gaskets
 - a. Gaskets for water service shall be plain rubber gaskets made of first grade plantation rubber in accordance with ANSI 21.11.
 - b. Gaskets for sludge, gas, waste lines, etc. shall be plain rubber gaskets tipped with Thiokol or ASTM D2000, Type SA-710, or equal.
4. Glands shall be of high strength cast/ductile iron.
5. Where connections are made between wrought iron pipe and mechanical joints, an approved type of transition gasket and fitting shall be used in the mechanical joint in accordance with the manufacturer's standards and recommendations.
6. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be both square to the pipe barrel and beveled similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.
7. If sections of pipeline are "pre-assembled", at a location other than the intended final resting location of the piping, so as to include a fitting or line valve, the Contractor shall handle such "pre-assembled" sections so as to avoid deflections greater than allowed in published data normally provided by the respective pipe manufacturer. Such sections shall be limited in length to include no more than a standard length of pipe plus one (1) fitting and shall contain no more than two (2) pre-assembled joints. Any excessively deflected "pre-assembled pipe" shall be disassembled, the gaskets shall be discarded, and all reassembly (if it be repeated) all at the Contractor's risk and expense.
8. Where joints are underground, bolts and nuts shall be painted with two (2) heavy coats of Inertol No. 49 thick, or an approved equal.

9. Where shown on the drawings, or ordered, mechanical joints shall be provided with approved harnesses to affect tied joints.
10. No special payment will be made for lock type joints, glands, bolts, nuts or gaskets used for mechanical joints, but the cost thereof shall be included in the unit price bid for mechanical joint cast/ductile iron pipe and mechanical joint cast/ductile iron fittings. Payment on a tonnage basis will be based on the body weight of the pipe or fittings only and will not show additional weight of accessories.
11. Approved harnesses to affect tied joints will be paid for as a part of their respective pipeline construction.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor shall, under Section 02638 shall furnish all the materials for and shall properly install at the location shown on the contract drawings or as directed by the Engineer all high density polyethylene (HDPE) forcemain and fittings necessary for the proper completion of the work included under this contract.
- B. All sewer pipes shall conform to American Society of Testing Materials Specifications, as set forth for the various classifications of pipe shown on the plans and/or in the proposal of these specifications. No old pipe or specials that have previously been used will be allowed in the herein specified work.
- C. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.

1.02 SUBMITTALS

- A. The Contractor shall furnish catalog data and specifications for approval describing in detail all pipe and specials proposed to be furnished under this Contract and a letter certifying that all such materials will be made to meet the applicable ASTM Specifications for the various classifications of pipe shown on the plans and/or in the proposal of these specifications.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. All HDPE forcemain pipe used, as covered under Section 02638, shall conform to ASTM F714, with end being designated for the type of joint as specified herein.
- B. Dimensions: Unless otherwise shown, the minimum thickness of the barrel of the pipe shall be Dimension Ratio (SDR) 21-80 PSI.
- C. Pipe and fittings shall be made from virgin PE compound as defined and described in ASTM D3350.
- D. Materials of construction, including joints and fittings, shall be suitable for exposure to raw sewage, and shall also be UV stabilized with either 2% carbon black or titanium dioxide.

2.02 JOINTS AND FITTINGS

- A. Thermal Butt-Fusion: All joints for PE pipe shall be of the thermal butt-fusion conforming to ASTM F2620.
- B. Other: Connections to pipe of different materials shall be made with adapters designed to join those materials.

2.03 DIMENSIONS

- A. SDR 17 required.
- B. Pipe intended to be straight shall have a maximum deviation from straightness of 1/16 inch per lineal foot when measured in accordance with ASTM D 2122.

2.04 INSPECTION

- A. All pipe and fittings will be inspected by the Engineer or his authorized representative immediately prior to installation.

PART THREE - EXECUTION

3.01 STORAGE

- A. All HDPE fixtures and pipe, if stored outside, shall be covered with an opaque material to protect it from the sun's rays.

3.02 INSTALLATION

- A. Cutting of all pipes shall be done with sharp tools. The ends of each pipe shall be reamed until all burrs or fins are removed.
- B. Pipe joints shall conform to respective industry standards.
- C. Installation of the pipe shall be in accordance with ASTM recommended practice D2321.
- D. Pipe shall be firmly bedded throughout the full length with the exception of where bell holes are required. Where unstable soil conditions occur under buildings, support shall be made from the underside of the structural slab by an approved type hanging device embedded in the concrete.
- E. After installation of the water main is complete, restore drilling and receiving pits to equal or better condition than originally found.

3.03 TESTING

- 1. All pipe sections, specials and jointing materials shall be carefully examined for defects and no piece shall be laid that is known to be defective. Any defective piece discovered installed shall be removed and replaced with a sound one in a manner satisfactory to the Engineer at the Contractor's expense.
- 2. Defective material shall be marked with permanent ink marker or lumber crayon and removed from the job site before the end of the following day.
- B. Field testing
 - 1. All materials, process of manufacturing and finished pipe shall be subject to inspection and approval.
 - 2. The Engineer may select one sample of pipe on the job site of each production run of each size and type of pipe to be tested by the laboratory. The Contractor shall furnish the first test piece or pipe core and any additional sample required because of failures. Should the sample fail to meet specifications, retests shall be conducted by the laboratory in conformance with the specifications listed herein for that particular pipe material.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

SANITARY AND/OR STORM SEWER CONSTRUCTION

PART ONE - GENERAL

1.01 SCOPE

- A. This work shall consist of the construction of a sanitary and/or storm sewer in accordance with these specifications and in reasonably close conformity to the lines and grades indicated on the plans or as established by the Engineer.
- B. This work shall include excavating for pipe, fittings, thrust blocks and other appurtenances, clearing and grubbing and the removal of all materials necessary for placing the pipe, except removals listed separately; furnishing and placing granular or concrete bedding and granular backfill as required, constructing and subsequently removing all necessary cofferdams, cribs, and sheeting, pumping and dewatering, making all pipe joints as required, installing all necessary pipe, joining to existing and proposed appurtenances as required, performing leakage tests as specified and restoration of disturbed facilities and surfaces.
- C. Arrangements for and the performance of all tests shall be the Contractor's responsibility. Additional information is in Section 2235, Trench Excavation.
- D. Related work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Pipe, fittings, specials, manholes, joint materials, thrust blocks, and other appurtenances shall be the size and kind specified in the proposal and shown on the plans.
- B. Concrete sanitary sewer main shall be coal tar coated upon its interior surface with two (2) applications of Bitumaster Super Service Block as manufactured by Tar Products Division of the Kop-Coat, Inc., Pittsburgh, PA, or approved equal.

PART THREE – EXECUTION

3.01 EXCAVATION

- A. Sewer trenches must be excavated with vertical sides from the bottom of the trench to one (1) foot above the top of the sewer, from which point sides may slope to ground surface, except that in streets or roadway, trenches must be excavated with vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to provide free working space on each side of the sewer according to the size of the sewer and the character of the ground; but in every case there shall be sufficient space between the sewer and the sides of the trench to make it possible to thoroughly ram the backfilling around the sewer and to secure tight joints, but in no case less than nine (9) inches on either side of pipe. In no case, however, shall the width of the trench at the top of the sewer exceed the dimensions as shown on the Contract Drawings. In no case will it be permitted to excavate sewer trenches with sides sloping to the bottom.

3.02 LAYING PIPE

- A. The Contractor shall furnish all of the proper tools and equipment required for the safe, proper handling and laying of all pipe, fittings, and specials that are to be installed in this work. All storage, handling, laying, and backfill methods shall be performed so as to avoid damaging either the interior or the exterior surfaces of all pipe fittings, specials, joint materials, or other appurtenances, and any such damage shall be remedied at the

Contractor's expense, as approved or directed by the Engineer.

- B. Before any pipe is lowered into the trench, it shall be inspected for damage, and any unsatisfactory lengths shall be rejected. Cast metal pipe and fittings shall be inspected for cracks by ringing with a light hammer while suspended. The interior and exterior of each pipe length used shall be cleaned as necessary to remove all dirt or other foreign material before it is inspected. The interior of the pipe shall be kept clean until the work is accepted.
- C. No pipe shall be laid in water, mud or when trench conditions or weather is unsuitable for such work, except by permission of the Engineer.
- D. If mud, surface water, leaves and/or other debris have been permitted to enter the strung-out pipe, the inside shall be cleaned as directed by the Engineer and before the pipe is lowered into the trench.
- E. Pipe shall not be pushed off the bank nor shall it be permitted to fall into the trench. Each type of pipe, fitting, special or other appurtenances shall be handled in strict accordance with recommendations of its respective manufacturer.
- F. No rocks, stones, metal, concrete, bricks, pavement pieces, wood, soil lumps or other hard materials too big to pass through a six (6") inch screen shall be permitted within six (6") inches of the pipe after it is laid in the trench. Any pipe endangered by such debris shall be subject to removal and disposal at the Contractor's expense as and when directed by the Engineer.
- G. When pipe laying is not in progress, the open ends of installed pipe shall be closed by appropriate means to prevent the entrance of dirt and water.
- H. Pipe lengths shall not be deflected at the joint to any greater degree than recommended by the manufacturer of the particular joint being used. Where deflections in excess of such recommendations are necessary, the appropriate specifications for the particular type of pipe being installed shall govern the mode of accomplishing such excessive deflections. All pipe deflections shall be performed only with the Engineer's approval.

3.03 JOINTING PROCEDURES

- A. The particular method of making up pipe joints shall be governed by the type of pipe material and type of joint in accordance with the Drawings and/or specifications.

3.04 ANCHORAGE

- A. All force mains, and sewers where shown on the Drawings shall be provided with a reaction backing or shall be restrained by attaching suitable metal rods, clamps, anchored fittings or harnessed joints, as shown on the plans or as specified so as to prevent movement.
- B. Reaction backing shall be of concrete, with steel reinforcement as required, unless otherwise shown on the Drawings. Backing shall be placed between solid ground and the fitting or other part of the pipeline to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that as indicated on the plans. The backing shall be so placed, unless otherwise directed, that the pipe and fitting joints will be accessible for repair.
- C. Steel tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing. Steel rods or clamps shall be painted with three (3) coats of an approved bituminous paint or coal tar enamel.

3.05 BACKFILLING

- A. Backfilling shall be accomplished in a two-step procedure as follows: 1) Partial backfill before leakage tests and 2) Completion of backfill after tests. Departure from this procedure due to traffic or other conditions shall be approved by the Engineer.
- B. All backfill in trenches under street pavements shall be thoroughly compacted as specified, using approved

mechanical tampers or jetting equipment before replacing any pavements, either permanent or temporary. Backfill may be sprinkled, if necessary, at the time of backfilling to maintain the optimum moisture content at the time of compaction.

3.06 TESTING OF BACKFILL COMPACTION

- A. Testing of the quality of the backfill compaction shall include either of the herein specified methods depending upon which backfill method was used by the Contractor. The following specified field tests shall be completed by an independent laboratory and testing firm approved by the Engineer.
 - 1. If the backfill was compacted using mechanical tamping equipment, the following compaction testing method will be used. A nuclear densometer shall be on site for the compaction testing of the eight (8) inch loose lift layers as they are compacted. The time of testing and location shall be as selected by the Engineer.
 - 2. Or, a "dutch cone" soil compaction testing procedure with a minimum of one (1) test hole per three-hundred (300) feet of trench backfilled. The location of the test hole shall be selected by the Engineer.
 - 3. Pavement replacement shall not occur until one of the above tests have been completed and the results have been certified by the testing firm and received and reviewed by the Engineer.

3.07 LINE AND GRADE

- A. The Contractor will be required to set up and use batter boards located at every established grade and line point. A line shall be set on these batter boards at an elevation such that it is parallel to the invert grade line and on the proper centerline of the pipe. Not less than three (3) batter boards shall be set before any pipe is placed. A grade stick provided with a bracket on the bottom shall be used to locate the pipe at the proper elevation and a plumb bob shall be used to locate it on line.
- B. In lieu of the above method the Contractor may, if he has suitable equipment and a capable operator, use a laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Engineer. The laser beam shall be of no greater power than 2.5 milliwatts (0.0025 watts). A continual visual check shall be provided by the laser equipment. The Engineer will provide reference points for line and grade in sufficient numbers to make possible the efficient use of the laser beam equipment.
- C. No sewer pipe shall be laid until a sufficient length of trench has been properly prepared to permit laying at least twelve (12) feet of pipe at one time. No pipes shall be laid except in the presence of the Engineer and no pipes shall be covered or backfilled until they have been examined and directions given to cover the same.

3.08 SERVICE CONNECTIONS

- A. In general, and as called for on the Drawings, as required or as ordered, provision shall be made in the sewers for service connections by inserting a tilted-up "Tee" branch for each service connection with a branch of size called for by the Contract Drawings but never less than six (6) inches, in the sewer at the location shown, where required or ordered. The Contractor shall construct a riser, where so required, as per detail, in such a manner that the top of the riser shall be not less than seven (7) feet below grade or at such elevation as to properly receive the required service connection with full regard to elevation of service sewer and slope from building or structure to the sewer which shall be not less than one percent (1%). Risers are to be encased in brick or concrete as shown on the Contract Drawings.
- B. Reconnecting of existing service shall each consist of the furnishing and installing of the Tee-branch and all curbed and straight pipe as required, the removal of such existing service laterals as is necessary, and the furnishing and placing of all materials to securely plug the discontinued service to the old sewer and make proper connection to the new sewer. All excavation required to complete the reconnections shall be included.
- C. The Owner may increase the number of connections or delete some connections as the sewer is being built, or increase the size of connections when it deems such advisable. Concrete for encasement of risers and of

supporting pipe shall be placed in a manner to preserve alignment and avoid disturbance of joints.

3.09 PROTECTION OF SEWER

- A. After the sewer or drain is completed and trench backfilled, the Contractor shall maintain barricades and keep traffic off freshly backfilled trenches until the backfill has consolidated, but in no event shall traffic be permitted on backfill in less than seventy-two (72) hours after the trench has been properly backfilled and compacted.

3.10 SANITARY AND STORM SEWER TESTING

- A. Prior to final payment for and acceptance of the sanitary sewer installation, visual inspection of all sanitary sewers shall be as specified.
- B. After the completion of any sanitary sewer or any portion thereof, a leakage test shall be made by the Contractor under the supervision of the Engineer. Testing is to be conducted over the entire length of the sewer pipe installation.
- C. All pipes which do not meet the testing requirements must be repaired or replaced and then retested, all at the Contractor's expense, until it meets the requirements.

3.11 INFILTRATION AND EXFILTRATION TESTS FOR SEWER PIPE

A. Preparation

- 1. Before sections of sewers may be tested for infiltration or exfiltration, all house leads from it must be constructed to limits called for and plugged or capped and all trenches backfilled and compacted.
- 2. Sewers to be tested shall be clean and free from construction debris. Sand, dirt, concrete, or other materials shall be completely removed in a manner that will not damage the sewer pipe.
- 3. Pipe joints shall be watertight. The Contractor shall repair manholes and pipe joints as required to stop all visible leaks. Seepage permitted through walls or patched joints shall be at the discretion of the Engineer, but in no instance will the specified allowable infiltration be exceeded.
- 4. Where sewers are above the ground water table, the Contractor may flood the trench or air test the sewer to find and repair leaks prior to exfiltration tests.
- 5. The materials and methods for repairing leaks shall be submitted to the Engineer for approval before beginning work.

B. Inspection

- 1. After a sewer has been cleaned and all repairs made as specified, the sewer shall be inspected and approved by the Engineer before conducting infiltration or exfiltration tests.
- 2. Sewers thirty-six (36) inch diameter and larger shall be inspected from the inside. Inspection of sewers smaller than thirty-six (36) inch diameter from the inside shall be at the discretion of the Engineer.
- 3. Smaller sewers shall be inspected using closed circuit television.
- 4. Where called for on the Drawings or specified, smaller sewers may be inspected by lamping between manholes in lieu of closed circuit television.
- 5. The Contractor shall furnish all lights, carts, television, and other equipment and labor required to assist the Engineer in the inspection.

C. Test sections

1. The maximum length of a sewer test section shall be 900 linear feet. Every manhole shall be included in one (minimum) test section.
2. The Contractor shall furnish and install bulkheads, sewer plugs, weirs, water level tubes, lighting, and other equipment required to conduct the tests in locations and as directed by the Engineer.
3. Infiltration
 - a. Where the ground water level is above the top of the pipe, the sewer shall be tested for infiltration.
 - b. The Contractor shall plug or bulkhead the sewer to isolate the test section and install a weir in the pipe at the outlet manhole. The weir shall be direct reading, of an approved design, calibrated to read gallons per day.
 - c. Where the ground water level is below the top of the sewer pipe, and if the trench can be flooded and the level maintained above the pipe for the test period, the Contractor may test the pipe for infiltration.
4. Exfiltration
 - a. Where the ground water level is below the top of the pipe, the sewer shall be tested for exfiltration.
 - b. The Contractor shall bulkhead or plug each end of the designated test section and fill with water to the elevation directed by the Project Engineer. The test shall be performed with a minimum positive head of 2 feet. Exfiltration will be computed from the loss of water as measured in the manholes.
5. Allowable leakage
 - a. The test in each section shall be continued for at least twenty-four (24) hours and, if its measured leakage during that period exceeds 100 gallons per inch of diameter per mile of pipe, the Contractor shall locate the points of leakage and make necessary repairs, continuing the work until leakage is reduced to the permissible maximum as specified.
 - b. The amount of infiltration allowed for storm sewers shall be limited to reasonable seepage, except that, if specified, the total in any section shall not exceed the amounts allowed for sanitary sewers as herein specified.
6. Air tests: In lieu of testing exfiltration by water means, pipe twenty-four (24) inches in diameter or smaller may be tested by means of low pressure air, but only after a request has been submitted to the Engineer for review and the Contractor receives written approval from the Engineer to air test.

3.12 AIR TESTING (ASTM F-1417)

- A. Air testing will be conducted as the project is being installed. At no time will more than 900 feet of pipe be installed before air testing is performed.
- B. After backfilling a manhole-to-manhole reach of sanitary sewer line, the contractor shall, at his expense, conduct the Line Acceptance Test. The test shall be performed according to the stated procedures and under the supervision of the Owner and/or the Engineer.
- C. Equipment used shall meet the following minimum requirements and be approved by the Engineer:
 1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 3. All air used shall pass through a single control panel.

4. Three (3) individual hoses shall be used for the following connections:
 - a. From control panel to pneumatic plugs for inflation.
 - b. From control panel to sealed line for introducing the low-pressure air.
 - c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
- D. Testing procedures will be as follows: All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. The sealed pipe shall be pressurized to 5 psig. The plugs must hold against this pressure without having to be braced.
- E. After a manhole-to-manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole. Low-pressure air shall be slowly introduced into this sealed line until the internal air pressure reaches approximately 4 psig.
- F. At least two minutes shall be allowed for the air pressure to stabilize. When the pressure has stabilized and is at or above 3.5 psig, the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

TABLE 1 Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe Indicated for Q= 0.0015

NOTE 1—See Practice UNI-B-6-90.

NOTE 2—Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

- G. In areas where ground water is known to exist, the Contractor shall install a 1/2-inch diameter capped pipe nipple, approximately ten (10) inches long, through the manhole wall on top of one of the sanitary sewer lines entering the manhole. This shall be done at the time the sanitary sewer line is installed. Immediately prior to the performance of the Line Acceptability Test, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The plastic tube shall be vertical and a measurement of the height, in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. Air test pressure is to be increased by 0.433 psi for each foot the ground water is above the invert of the sewer line being tested. The allowable drop of one (1) pound and the timing of the test remain the same.
- H. If a Line Acceptability Test is being conducted on more than one (1) manhole reach of pipe, the entire section

being tested shall meet the Line Acceptability requirements as if only one (1) of the manholes reach in the section were being tested.

3.13 MAINTENANCE OF EXISTING DITCHES

- A. The Contractor shall use the utmost care in maintaining ditches and other waterways, and, if either bottoms or banks of such ditches are disturbed, they shall be promptly restored and maintained for the life of the guaranty period. Similar care shall be used in preventing damage to existing paving by caving of trench walls and undermining such paving. If paving is damaged, the Contractor shall repair same at his own expense.

3.14 CLEARING SITE AND RESTORING DAMAGED SURFACES

- A. Upon completion of the backfill work, the Contractor shall immediately remove and dispose of all surplus materials including dirt and rubbish.
- B. Unless otherwise called for on the plans, the Contractor shall replace all pavement, sidewalks, sod, or other surfaces disturbed to a condition equal to that existing before the work was started, furnishing all materials, labor, equipment, etc., at no additional cost to the Owner.
- C. All restoration of lawns shall be performed in accordance with these specifications as a part of performing the work as specified herein.
- D. All restoration of driveways, sidewalks, roadways and shoulders (berms) shall be in accordance with these specifications as a part of performing the work as specified herein.
- E. Upon completion of the foregoing work, all tools and other property belonging to the contractor shall be removed, and the site shall be left in good condition.

PART FOUR – SPECIAL PROVISIONS

4.01 N/A

END OF SECTION

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PRE-CAST CONCRETE MANHOLES

PART ONE - GENERAL

1.01 SCOPE

- A. Under this Section, the Contractor shall furnish and construct pre-cast concrete manholes, including drops and manhole stacks of types and at locations shown on the Drawings.
- B. This Section includes additional excavation for manhole furnishing and installing concrete of classes called for, brick, Portland cement mortar, reinforcing steel, pre-cast concrete pipe, integral base sections, bottom riser sections, transition sections, riser sections, eccentric cones, flat slab tops and adjusting rings, flexible manhole connections, pipe for drop connections, plugging lifting holes, pointing joints, forming channels through manhole bottoms, making watertight connections to new and existing sewers, and other work incidental to manhole construction.
- C. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. All applicable Divisions of the Technical Specifications.

1.02 DEFINITIONS

- A. The various types of manholes are as shown on the Drawings or in the Standard Details.

1.03 SUBMITTALS FOR ENGINEER'S APPROVAL

- A. Manufacturer's Shop Drawings and Certificates:
 - 1. Pre-cast Concrete Manhole Sections and Specials
 - 2. Flexible Joints
 - 3. Manhole Frame and Covers
- B. Supplier's Certificates:
 - 1. Reinforced Concrete Pipe Manhole Sections.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Pre-cast Concrete Pipe Manhole Sections:
 - 1. Pre-cast concrete pipe manhole sections, transition sections, eccentric cones, flat slab tops, and adjusting rings shall conform to ASTM Specification C478. Reinforcing in transition sections shall be equal to that specified for wall sections of the larger diameter.
 - 2. Joints shall be O-ring type conforming to ASTM Specification C443.
 - 3. The standard length of riser sections shall be forty-eight (48) inches in length of thirty-two (32) inch or sixteen (16) inch to meet required dimensions and as specified.
 - 4. Openings for connecting pipes in riser sections bottom riser sections, and integral base sections, and for access in flat slabs shall be preformed or cored by the manufacturer. Cutout openings shall be made immediately after the pipe is removed from the casting form. All cored openings for sewer pipe connections shall have flexible joints.

5. Pre-cast integral base sections shall be of monolithic construction. The bottom of the section shall be six (6) inch thick minimum and contain a minimum steel reinforcing of No. 5 Rebar at 12 in c-c each way in top of the slab. Walls shall meet ASTM Specification C478.
 6. Specified manhole steps shall be factory installed to provide a continuous ladder of sixteen (16) inch C/C rung spacing. Steps shall be placed in the forms and cast in pipe wall or placed immediately after the pipe is removed from casting and carefully mortared in place with non-shrink mortar to insure a watertight joint. If the outer surface of the pipe wall is pierced, the patch shall be completely covered with a bituminous sealer.
 7. Where pressure tight manhole frames and covers are called for, threaded inserts shall be cast in eccentric cones or flat slab tops and holes formed or cored in adjusting rings to match bolt size and spacing specified for manhole casting.
- B. Manhole Steps:
1. Manhole steps shall be specified in Section 02739 and installed as shown on the Drawings.
- C. Manhole Frames and Covers:
1. Manhole frames and covers shall be as shown on the Drawings or in the Standard Details or as indicated in the Special Provisions.
 2. Where pressure tight manhole covers are called for, lid seals shall be a continuous round rubber gasket supplied by the manufacturer.
- D. Mortar:
1. Mortar used for the structures herein specified shall conform to Specifications for Mortar for unit Masonry, ASTM Designation C 270 Type S, containing no masonry cement. The mortar shall be composed of one (1) part Portland cement to two (2) parts sand by volume.
 2. Materials for non-shrinking mortar shall be Sauereisen F-100 Grout as manufactured by Sauereisen Cement Co., Pittsburgh, Pennsylvania; Five-Star Grout as manufactured by U.S. Grout Corp., Old Greenwich, Connecticut; or equal.
- E. All cast-in-place concrete used for forming channels in manhole bottoms shall be Class B as specified in Section 03120.
- F. Reinforcing steel used in cast-in-place concrete shall meet the requirements of Section 03200.
- G. Joints for pre-cast pipe openings shall be "Reseal" type as manufactured by Price Brothers Company, "Lock-Joint Flexible Manhole Sleeves" as manufactured by National Pollution Control Systems, Inc., or equal.
- H. Brick used for catch basin and manhole construction shall conform to Specifications for Sewer and Manhole Brick (made from clay or shale), ASTM Designation C 32, and shall be Grade "MS" unless otherwise specified.

PART THREE - EXECUTION

3.01 LOCATION AND CONSTRUCTION

- A. Location and type of manhole installed shall be as shown on the Drawings or directed.
- B. Construction shall be in conformance with details shown on the Drawings and as specified.

3.02 EXCAVATION

- A. Excavation for manhole construction shall be prepared as directed in applicable paragraphs of Section 02222.

3.03 INSTALLATION OF INTEGRAL BASE SECTIONS

- A. Class B concrete shall be poured so as to provide a minimum of four (4) inch thick pad under the entire area of the manhole base. Place the manhole on the pad before the concrete is completely set so that final leveling adjustment can be made.

- B. Six (6) inch granular backfill bedding can be used in lieu of Class B concrete at the direction of the Engineer.

3.04 CHANNELING MANHOLE BOTTOMS

- A. The bottoms of all manholes shall be channeled to conduct flow in the planned direction.

3.05 PRE-CAST CONCRETE RISER SECTIONS

- A. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the flat slab top.
- B. Pipe section joints shall be pointed and lifting holes filled with non-shrinking mortar.

3.06 INSTALLATION OF MANHOLE FRAMES

- A. Manhole frames and covers shall be installed to grades shown on the Drawings or as directed.
- B. Adjustment of manhole castings shall be made using specified brick or pre-casting adjusting rings and Portland cement mortar joints. The entire outer surface of adjusting rings and manhole castings shall be plastered with one (1) inch minimum Portland cement mortar unless otherwise detailed on the Drawings or directed.
- C. Each pressure tight manhole casting shall be anchored in place using four (4) 5/8-inch stainless steel bolts with nuts as detailed on the Drawings or as directed.
- D. The maximum depth of adjustment below any manhole casting shall be eighteen (18) inches

3.07 STANDARD TEST METHOD FOR CONCRETE SEWER MANHOLES BY THE NEGATIVE AIR PRESSURE (VACUUM) TEST PRIOR TO BACKFILL 1 (ASTM C 1244-02)

A. Scope

1. This test method covers procedures for testing precast concrete manhole sections when using the vacuum test Method to demonstrate the integrity of the installed materials and the construction procedures. This test method is used for testing concrete manhole sections utilizing mortar, mastic, or gasketed joints.
2. This test method is intended to be used as a preliminary test to enable the installer to demonstrate the condition of the concrete manholes prior to backfill.
3. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

4. This test method is the companion to metric Test Method C 1244M; therefore, no SI equivalents are shown in this test method.

NOTE 1—Vacuum test criteria presented in this test method are similar to those in general use. The test and criteria have been widely and successfully used in testing manholes.

NOTE 2—It should be understood that no correlation has been found between vacuum (air) and hydrostatic tests.

B. Referenced Documents

1. **ASTM** Standards:

- a. C 822 Terminology Relating to Concrete Pipe and Related Products.
- b. C 924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
- c. C 969 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

C. Summary of Practice

1. All lift holes and any pipes entering the manhole are to be plugged. A vacuum will be drawn and the vacuum drop over a specified time period is used to determine the acceptability of the manhole.

D. Significance and Use

1. This is not a routine test. The values recorded are applicable only to the manhole being tested and at the time of testing.

E. Preparation of the Manhole

1. All lift holes shall be plugged.
2. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

F. Procedure

- 1 The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.
- 2 A vacuum of 10 in. Hg shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. Hg.
- 3 The manhole shall pass if the time for the vacuum reading to drop from 10 in. Hg to 9 in. Hg meets or exceeds the values indicated in Table 1.
- 4 If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.
- 5 Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (see Practice C 969), or other means.

TABLE 1 Minimum Test Times for Various Manhole Diameters in Seconds

Depth (ft) _____									
	30	33	36	42	48	54	60	66	72
	Time, in seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PRECAST CONCRETE MANHOLES & VAULTS**PART ONE - GENERAL**

1.01 SCOPE

- A. Under this Item, the Contractor shall furnish and construct precast concrete manhole sections and precast special units used as wet wells, valve vaults, meter vaults, and similar structures at locations shown on the Drawings and/or scheduled.
- B. This Section includes furnishing and installing precast manholes and special precast units, related concrete, brick, reinforcing steel, integral bases, flat slab tops, adjusting rings, flexible connections, wall penetrations, appurtenances that become an integral part of the structural unit, plugging lifting holes, pointing joints, making watertight connections to new and existing pipe, and other work incidental to the construction of the precast structures shown.

1.02 DEFINITIONS

- A. The type of precast sections and special precast units shall be as shown on the Drawings or in the Standard Details.

1.03 SUBMITTALS FOR ENGINEER'S APPROVAL

- A. Manufacturer's Shop Drawings and Certificates:
 - 1. Precast Concrete Manhole Sections and Special Precast units
 - 2. Flexible Joints or other wall penetrations as applicable.
- B. Supplier's Certificates: Reinforced Concrete Pipe Manhole Sections.

PART TWO - PRODUCTS

2.01 PRECAST CONCRETE MANHOLES & SPECIAL UNITS

- A. Precast concrete manhole sections, flat top slabs, and adjusting rings shall conform to ASTM C478.
- B. Joints shall be O-ring type conforming to ASTM Specification C443.
- C. The standard length of riser sections shall be 48 in. Lengths of 32 in. or 16 in. shall be used to meet required dimensions and as specified.
- D. Openings for connecting pipes in riser sections and for access in flat slabs shall be preformed or cored by the manufacturer. Cutout openings shall be made immediately after the pipe is removed from the casting form. All cored openings for gravity sewer pipe connections shall have flexible joints.
- E. Precast integral base sections shall be of monolithic construction. The bottom of the section shall be 6 in. thick minimum and contain 0.32 sq. in. minimum of steel reinforcing each way in top of the slab.
- F. Manhole steps shall be factory installed to provide a continuous 16 in C/C rung spacing ladder. Steps shall be placed in the section forms and cast into the wall or placed immediately after the pipe is removed from casting and carefully mortared watertight with non-shrink grout. If the outer surface of the pipe wall is pierced the patch shall be completely covered with a bituminous sealer.

2.02 MANHOLE STEPS:

- A. Manhole steps shall be of polypropylene plastic, reinforced with a 3/8 in. Grade 60 steel reinforcing rod. Steps of similar cross section and dimensions to that shown on the Drawings or specified may be submitted for approval.

- B. Manhole steps for new structures shall be M.A. Industries Model PS-1, or equal. Manhole steps for existing structures shall be M.A. Industries Model PS1-PF or equal.
- C. Cast iron or aluminum manhole steps will not be permitted.

2.03 MANHOLE FRAMES AND COVERS:

- A. Manhole frames and covers shall be as shown on the Drawings or in the Standard Details or as indicated in the Special Provisions.
- B. Where pressure tight manhole covers are called for, lid seals shall be a continuous round rubber gasket supplied by the manufacturer.

2.04 MORTAR:

- A. Mortar used for the structures herein specified shall conform to Specifications for Mortar for unit Masonry, ASTM Designation C 270 type S, containing no masonry cement. The mortar shall be composed of one part Portland cement to two parts sand by volume.
- B. Non-shrinking mortar shall be Sauereisen F-100 Grout as manufactured by Sauereisen Cement Co., Pittsburgh, Pennsylvania; Five-Star Grout as manufactured by U.S. Grout Corp., Old Greenwich, Connecticut; or equal.

2.05 REINFORCING STEEL:

- A. Reinforcing steel used in precast sections and special units shall meet the requirements of Section 03200 Concrete Reinforcement.

2.06 JOINTS:

- A. Joints for precast pipe openings shall be "Reseal" type as manufactured by Price Brothers Company, "Lock-Joint Flexible Manhole Sleeves" as manufactured by National Pollution Control Systems, Inc., or equal.

2.07 BRICK:

- A. Brick used for catch basin and manhole construction shall conform to Specifications for Sewer and Manhole Brick (made from clay or shale), ASTM Designation C 32, and shall be Grade "MS" unless otherwise specified.

PART THREE - EXECUTION

3.01 LOCATION AND CONSTRUCTION

- A. Location and type of precast manholes or special units installed shall be as shown on the Drawings or directed.
- B. Construction shall be in conformance with details shown on the Drawings and as specified.

3.02 EXCAVATION

- A. Excavation for precast manhole and special precast unit construction shall be prepared as directed in applicable paragraphs of Section 02220 Excavation, Backfill, and Compaction.

3.03 INSTALLATION OF INTEGRAL BASE SECTIONS

- A. Class B concrete as specified in Section 03120, shall be poured so as to provide a minimum 4-in. thick pad under the entire area of the precast structure base. Place the manhole or special unit on the pad before the concrete is completely set so that final leveling adjustment can be made.
- B. 6" Granular backfill bedding can be used in lieu of Class B concrete at the direction of the Engineer.

3.04 INSTALLATION OF BOTTOM RISER SECTIONS

- A. Unless otherwise called for on the Drawings or directed, bottom riser sections shall be placed with cast-in-place concrete bases.
- B. The base shall be of Class A concrete 9 in. thick minimum placed on undisturbed earth.
- C. The cut-out riser section shall be blocked in place above the pipe and the concrete base poured in place. Concrete shall be extended above the lower rim of the riser wall as required to provide a watertight seal around the entire circumferences of the riser section. The sewer pipe shall be bedded in concrete monolithic with the base to the first joint each way from the manholes.
- D. On straight gravity sewer runs, the Contractor may carry the sewer pipe through the manhole and break out the top half after the fill concrete has set. In all cases, sewer pipe shall extend through the manhole wall to the inside face.

3.05 PRECAST CONCRETE RISER SECTIONS

- A. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the flat slab top.
- B. Pipe section joints shall be pointed and lifting holes filled with non-shrinking mortar.

3.06 INSTALLATION OF MANHOLE FRAMES

- A. Manhole frames and covers shall be installed to grades shown on the Drawings or as directed.
- B. Adjustment of manhole castings shall be made using specified brick or precasting adjusting rings and Portland cement mortar joints. The entire outer surface of adjusting rings and manhole castings shall be plastered with 1 in. minimum Portland cement mortar unless otherwise detailed on the Drawings or directed.
- C. Each pressure tight manhole casting shall be anchored in place using four 5/8-in. stainless steel bolts with nuts as detailed on the Drawings or as directed.
- D. The maximum depth of adjustment below any manhole casting shall be 16 in.

3.07 MANHOLE STEPS

- A. Manhole steps shall be installed square, level, and plumb where shown on the Drawings in accordance with manufacturer's instructions.

3.08 SPECIAL PROVISIONS

- A. Manhole frames and covers shall be Owner's standard.

PART FOUR - SPECIAL PROVISIONS

4.01 ENTRY DOORS

- A. AS Shown on Plans

END OF SECTION

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work Included: The Contractor shall furnish and install all manhole steps used to provide access in cast-in-place and precast concrete structures as shown on the Drawings and as specified herein.
- B. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. All applicable Divisions of the Technical Specifications.

1.02 SUBMITTALS

- A. Shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work required by this Section.
- B. Manufacturer's recommended installation procedures which when approved by the Engineer, will become the basis for accepting or rejecting actual installation unless otherwise stated herein.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Manhole steps shall be of polypropylene plastic reinforced with a 3/8-inch No. 60 grade reinforcing rod as detailed in the Drawings. Steps of similar cross section and dimensions may be submitted for approval.
- B. Manhole steps shall be fabricated to provide a minimum of twelve (12) inch of step width and a minimum of six (6) inch of clearance behind the ladder rung.
- C. Cast iron or aluminum manhole steps will not be permitted.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Manhole steps shall be placed in the formwork and cast in the concrete to provide an individual rung ladder with sixteen (16) inch center-to-center rung spacing.

- C. All steps shall be square and plumb to the other steps installed, as well as being free of any warp, twist, sag, or buckle.
- D. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. The Contractor shall furnish all materials, equipment, labor and supervision necessary for the furnishing and installation of new fencing including gates and appurtenances as required, in accordance with the Contract Documents.
2. All work performed under this Section shall comply and be in accordance with all approved trade practices and manufacturer's recommendations.

B. Related Work:

1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
2. All applicable Divisions of the Technical Specifications.

1.02 SUBMITTALS

- A. Drawings for all work shall be presented to the Engineer for approval in accordance with these specifications and shall indicate size, gauge, weight and finish of all materials, method of anchorage, gate details, hardware and plan layout.

PART TWO - PRODUCTS

2.01 NEW FENCING

- A. All new fencing required to provide the enclosure shown on the Drawings shall be seven (7) feet in overall height with six (6) rows of barbed wire on forty-five degree (45°) "V" shaped vertical extension arms.
- B. Fence fabric shall be two (2) inch mesh of 9-gauge carbon steel wire and shall be galvanized after weaving.
- C. Line posts shall be galvanized two (2) inch Nominal Diameter Standard Schedule 40 steel pipe.
- D. Top rails shall be galvanized 1-1/4 inch Nominal Diameter Standard Schedule 40 steel pipe.
- E. Ends, corners, and pull posts shall be galvanized 2-1/2 inch Nominal Diameter Standard Schedule 40 steel pipe.
- F. "V" shaped extension arms supporting barbed wire shall be galvanized, inclined at forty-five degrees (45°), and shall be capable of supporting a weight of 250 lbs. applied vertically at the tip. Install six (6) rows of two-strand barbed wire consisting of 12-1/2 gauge wire with 14 gauge 4-point barbs spaced five (5) inches apart.
- G. All posts, rails and appurtenances shall be hot dipped zinc coated steel in accordance with ASTM A 120, A 123 or A 153, whichever is best applicable for the particular installation site.

2.02 NEW GATES

- A. Fabricate gate perimeter frame of 1.90" O.D. tubular members. Provide additional horizontal and vertical members to insure proper gate operation and for attachment of fabric, hardware and accessories.
- B. Assemble gate frames by welding or fittings and rivets for rigid connections. Use same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges, and tie at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" O.C. Attach hardware with rivets or by other means which will provide security against removal or breakage.

- C. Provide diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates where necessary to provide frame rigidity without sag or twist.
- D. Gates with openings up to six (6) feet wide shall be single swing gates. Gate with openings over six (6) feet wide shall have double swing gates.
- E. Gateposts for single swing gate shall be galvanized 2-1/2" nominal diameter standard schedule 40 steel pipe. Gateposts for double swing gates shall be galvanized 3-1/2" nominal diameter standard schedule 40 steel pipe.

2.03 GATE HARDWARE

- A. Hinges shall be pressed steel or malleable iron to suit gate size, non-lift-off-type, offset to permit 180° gate openings. Provide one (1) pair of hinges for each leaf.
- B. Latch shall be forked type or plunger-bar type to permit operation from either side of gate. Provide padlock eye as integral part of latch.
- C. Provide keeper for all vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
- D. Provide gate stops for all double gates, consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod or plunger bar. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. The Contractor shall erect the fencing plumb to the ground and in locations shown on the Drawings. Installation shall be according to the fence manufacturer's recommendations and to the Engineer's instructions.
- B. Line posts shall be spaced at intervals not to exceed ten (10) feet. The fence fabric shall be stretched tightly between the posts and shall extend approximately two (2) inches above the top rail. The fence fabric shall be securely fastened to the posts and to the top rail.
- C. All posts shall be set in concrete foundation to a minimum depth of thirty-six (36) inches. The diameter of the concrete foundation shall be at least twelve (12) inches for line posts and fifteen (15) inches for end corner or gateposts. The foundations shall be crowned to shed water.
- D. All terminal, corner, and gateposts shall be braced to the next post using a brace rail and a galvanized 3/8-inch truss rod with tightener.
- E. All changes in fence alignment of thirty degrees (30°) or more and all abrupt changes in grade shall be made with corner posts.
- F. Gates shall be installed plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

PART FOUR – SPECIAL PROVISIONS

DIVISION 3
CONCRETE

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Under this Section, the Contractor shall design, provide, and install all concrete formwork needed to place the cast-in-place concrete as required by the Project Specifications and Drawings.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not limited to the General Conditions, Supplementary Conditions, and the other Sections of these Specifications. See specifically Section 02220 Excavating, Backfill and Compaction; Section 03200 Concrete Reinforcement; and Section 03120 Cast-in-Place Concrete.

1.02 QUALITY ASSURANCE

- A. Products used in the work of this Section shall be produced by suppliers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.
- C. Contractor shall be responsible for the design of all formwork used on the project.
- D. In addition to complying with pertinent regulations of governmental agencies having jurisdiction, comply with pertinent provisions of ACI 347.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300 Submittals.
- B. The following product data shall be submitted for record purposes only and not for approval.
 - 1. Suppliers' data and installation instructions for proprietary materials including form coatings, ties, accessories, and manufactured form systems.
 - 2. Suppliers' recommended installation procedures, which the Contractor shall follow on the project Work.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01350 Product Requirements and Handling.

PART TWO - PRODUCTS

2.01 FORM MATERIALS

- A. Use new or like-new forms and form materials that will produce a high quality concrete surface at the locations shown on the Drawings. Materials may be reused during the progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing the required finished concrete quality. All parts of removed forms set aside for reuse shall be inspected, cleaned, and repaired as necessary. Any part or panel that has been dented, deformed or otherwise rendered unsafe or unfit for reuse shall be discarded.
- B. For footings and foundations, use Douglas Fir boards or planks secured to wood or steel stakes, constructed to shape indicated and to support the required loads.
- C. For studs, wales, and supports, use standard grade or better Douglas Fir, dimensions as required to support the loads but not less than 2" X 4". Support spacings for the various thicknesses shall be in accordance with American Plywood Association recommendations, with deflection, flexural stress and shear stress being limited to

1/270 of the span, 1500 psi and 70 psi respectively.

D. Wall forms:

1. Exposed concrete surfaces:

- a. Use 3/4" minimum thickness Douglas Fir plywood, grade B/B, class I or II, exterior, sanded both sides, comply with PS-1.
- b. Seal edges and coat both faces with colorless coating which will not affect application of applied finishes.

2. Unexposed concrete surfaces:

- a. Use 1" X 6" shiplap Douglas Fir boards, surface one side and two edges, or 3/4" minimum thickness Douglas Fir plywood, grade B/B plyform class I or II, sanded both sides, mill-oiled.

E. Column forms, if required:

1. For square or rectangular columns, use two (2) inch thick Douglas Fir planks or joists, surfaced one side and two edges, or use plywood or metal forms.
2. For rounded columns, use metal forms or patented paper tube forms approved by the Engineer.
3. Construct column forms with tight joints and securely clamped together with steel clamps.

2.02 FORM TIES

A. Hold inner and outer forms for vertical concrete together with steel ties and spreaders approved by the Engineer.

1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.
2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.

B. Ties shall be adjusted in length to permit tightening of forms, and of a type leaving no metal closer than one (1) inch from the surface. Ties shall not be fitted with any lugs, cones, or other devices, to act as a spreader within the forms, or for any purpose, which will leave a hole larger than 7/8 inch in diameter or which will leave a void back of the exposed face of the concrete.

C. Form ties for walls of tanks, sheets or other liquid-retaining structures shall be provided with a fixed water stop, centered in the form.

D. For exposed concrete surfaces, provide form ties of removable type with she-bolts equipped with permanent plugs and a system approved by the Engineer for fixing the plugs in place.

2.03 DESIGN OF FORMWORK

A. General:

1. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads without harmful deflection or distortion that might be applied, until such loads can be supported by the concrete structure.
2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
3. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
4. Design forms and false-work to include assumed values of live formwork, dead load, weight of moving equipment operated on the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.

5. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.
6. Provide truss supports when adequate foundations for shores and struts cannot be secured.
7. Support form materials by structural member spaced sufficiently close to prevent objectionable deflection.
8. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.
9. Provide formwork sufficiently tight to prevent leakage of cement paste during backup material at joints as required to prevent leakage and prevent fins.
10. Provide camber in formwork as required for anticipated deflection due to weight and pressures of fresh concrete and construction loads.
11. Any weep hole forming required shall be stainless steel or nonmetallic material.

2.04 EARTH FORMS

- A. Side forms for footing may be omitted, and concrete may be placed directly against excavation, only when requested by the Contractor and approved by the Engineer.
- B. When omission of forms is accepted, provide additional concrete one (1) foot on each side of the minimum design profile and dimensions shown on the Drawings.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the suppliers' recommendations and shop drawings as approved by the Engineer.
- B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 FORM CONSTRUCTION

- A. General:
 1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
 2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features as required.
 3. Temporary openings shall be provided, where required, to facilitate cleaning and inspection, prior to placing concrete. This is particularly required at the bottom of wall forms. Shavings, chips, and all refuse shall be removed and the forms shall be broom cleaned before any concrete is placed.
- B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
3. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
4. Provide top forms for inclined surface where so directed by the Engineer.

C. Forms for exposed concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.
3. Use extra studs, wales, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material that will produce bow.

D. Corner treatment:

1. Unless shown otherwise, form chamfers with 3/4" X 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.

E. Locate control joints as indicated on the Drawings and, where required but not shown on the Drawings, as approved by the Engineer.

F. Provisions for other trades:

1. Provide openings in concrete formwork to accommodate work of other trades.
2. Verify size and location of openings, recesses, and chases with the trade requiring such items.
3. Accurately place and securely support items to be built into the concrete.

3.05 FORM COATINGS

A. Coat form contact surface with form coating compound before reinforcement is placed.

1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces that are supposed to bond to fresh concrete.
2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

3.06 REMOVAL OF FORMS

A. General:

1. Forms shall be removed in accordance with ACI 318-77. Upon removal of forms, the Owner's Representative shall be notified by the Contractor in order that an inspection of the newly stripped surfaces may be made prior to patching.
2. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
3. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
4. In determination of the items for the removal of false-work, forms and housing, and discontinuance of heating,

consideration shall be given to the location and character of the structure, the weather conditions and other conditions influencing the setting of the concrete, and the materials used in the mix. The following periods, exclusive of days when the temperature is below 40°F, may be used as a guide in determining the minimum time after placing concrete when forms may be removed unless instructed otherwise by the Owner's Representative. Contractor shall assume all risk relative to removing the forms from the concrete structures.

Footings - 12 to 24 hours
Center under beams or flat slab - 14 days
Other floor slabs - 7 to 14 days
Walls - 1 to 2 days
Columns - 1 to 7 days
Sides of beams and all other parts - 1 day

B. Finished surfaces:

1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.
2. Release sleeve nuts or clamps, and pull the form ties neatly.
3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified in Section 03120 of these Specifications, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.

PART FOUR – SPECIAL PROVISIONS

N/A

END OF SECTION

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Under this Section, the Contractor shall provide, transport, and place all concrete required to construct conduits, pavements, curbing, foundations, slabs, walls, floors, columns, beams, tanks, roads, highways, drives and other concrete structures; and for special uses as required by the Project Specifications or as shown on the Drawings.
- B. Related Work:
 - 1. Related work includes, but is not limited to, the General Conditions, Supplementary Conditions, Section 01300 Submittals, Section 03200 Concrete Reinforcement, Section 03100 Concrete Formwork, Section 01410 Testing Laboratory Services, and all other applicable Sections of the Project Technical Specifications.

1.02 QUALITY ASSURANCES

- A. Where applicable State and local codes exist and conflict with this Section, the State and local code requirements shall control.
 - 1. Ohio Department of Transportation requirements shall apply to all road and highway work.
- B. American Society for Testing and Materials, (ASTM) and American Concrete Institute (ACI) standards as specified herein shall apply.
- C. Laboratory Services and Control
 - 1. The laboratory providing the services specified in Section 01410 shall make sample tests as required to assure that the concrete provided is of the specified quality and composition.
 - 2. Laboratory technicians shall have free access to the job and concrete production facilities at all times and receive the full cooperation of the Contractor for the preparation, storage, and transportation of concrete sample test cylinders and/or test beams.
 - 3. The laboratory shall provide the forms for testing cylinders and beams.
 - 4. The Contractor shall provide to the Owner, design mixes that include the weight in pounds of fine aggregate, coarse aggregate, cement, and water per cubic yard of concrete; the number of 94 pound sacks of cement per cubic yard of concrete; the pounds of water per sack of cement; gross weight and yield per cubic yard of concrete; weight in ounces or pounds of admixture per sack of cement; slump; air content; and compressive strength of test cylinders at seven (7) days and twenty-eight (28) days. Weight of fine and coarse aggregate shall be determined in saturated, surface dry condition. Material samples shall be provided, as required, to the Owner for verification of the design mix.
 - a. The laboratory shall, as directed by the Engineer, test and produce reports of mix designs for all concrete incorporated in the work.
 - b. Only the laboratory shall adjust concrete mixes, as required, to obtain a product in conformance with the specified limiting requirements.
 - 5. It shall be the responsibility of the Contractor to obtain mix designs for each specified class of concrete used. The Engineer shall approve the mix designs before the Contractor starts concrete production.
 - a. The mix design for pumped concrete shall conform to concrete industry standard ANSI/ACI 304.2R.
 - 6. The laboratory shall make scheduled quality control tests consisting of the following:
 - a. Test specimens (compressive strength)
 - b. Slump
 - c. Air Entrainment

7. When concrete is procured from a central batching plant or transit mixers are used, the Owner may provide a representative at such plant to check the proportioning of aggregates and water, and mixing time.

D. Schedule of Tests

1. Quality control tests for concrete each mix shall be performed as determined necessary by the Engineer.
2. Three (3) test cylinders shall be made for each 20 cu. yds. or part thereof of concrete poured each day.
3. Two (2) test beams shall be made for each 250 sq. yds. of concrete pavement placed.
4. When cylinders and/or beam samples are made, the slump and air tests shall be made using concrete from the same batch.
5. Samples of concrete tested for determining air content and slump and for test cylinders and beams shall be taken at the point of discharge into the structure unless otherwise directed by the Engineer.

E. Standard Testing Specifications

1. Test specimens shall be made in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM Designation C31.
2. Tests for compression shall be performed in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens," ASTM Designation C 39.
3. Tests of beam specimens shall be made in accordance with "Standard Test Method for Flexural Strength of Concrete" (Using Simple Beam with Center-Point Loading), ASTM Designation C 293.
4. Slump tests shall be made using "Standard Test Method for Slump of Portland Cement Concrete," ASTM Designation C 143.
5. Air content shall be determined for concrete mixes composed of sand, gravel, and stone aggregates by use of "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method," ASTM Designation C 231. Where slag aggregate is used, the air content shall be determined by the Volumetric Method, ASTM Designation C 173.
6. Should the twenty-eight (28) day strength fall below that specified for the particular class of concrete, the Contractor shall take such action as necessary to assure that the strength is not less than that specified.
7. Acceptance of concrete shall conform to ACI 301, Chapter 17.

F. Concrete Plant

1. Plant equipment and facilities shall be in accordance with applicable requirements of ASTM Designation C 94 and as specified herein.
2. Equipment shall comply with the following requirements:
 - a. The accuracy of the weighing equipment shall conform to the requirements of the United States Bureau of Standards.
 - b. Equipment shall be capable of compensating for the varying weight of moisture contained in the aggregates, or for changing the proportionate batch weights.
 - c. The equipment shall be capable of accurately controlling the weight of the cement and aggregate.
 - d. The equipment shall be so arranged as to permit the convenient removal of overweight material.
 - e. Standard testing weights and other necessary equipment for testing the accuracy of the weighing equipment shall be available at the plant at all times.
3. Plant Inspection

- a. A qualified representative of the testing laboratory shall, as directed by the Engineer, inspect the plant and determine if the necessary facilities and equipment are available and adequate for the scheduled production of concrete as specified.
 - b. If the plant does not meet requirements, the Contractor shall be informed of the deficiencies so that they may be corrected.
 - c. When, in the opinion of the laboratory representative, the plant meets the requirements for specified production, he shall so notify the Engineer in writing. The notification shall include a list of all major facilities necessary for use in production of specified concrete for use in the Project.
4. Production of concrete shall not be started until the Engineer has approved the plant for use.

G. Mixing and Transporting Concrete

1. Concrete may be mixed in portable mixers located at the job site, in central plant mixers, or in transport mixers. Mixers of all types shall conform to the requirements specified herein.
2. Transit and central plant mixed concrete shall be mixed in approved batch mixers of the rotary drum type having sufficient capacity to assure continuous delivery at the required rate, except that relatively small quantities may be hand mixed with special permission. The mixing drum shall be kept free of set concrete at all times. A water storage tank equipped with a gauge glass and an accurate measuring device shall be provided to determine the exact amount of water added to each batch. The measuring device shall be readily adjustable, and so designed that it can be locked after setting and that the amount of added water cannot be altered after such setting. Mixing shall continue at least one (1) minute at the manufacturer's rated drum speed after water, all aggregate, and cement have been added; and until every particle of aggregate is coated with mortar and the whole mass is uniform in color and homogeneous in texture. The Contractor shall supply a discharge locking device, so designed that concrete cannot be discharged in less than the required mixing time. The mixer also shall be equipped with an alarm that sounds at the end of the mixing time, and with an approved batch meter that will accurately record each batch delivered.
3. Transit mixed concrete shall be mixed completely in truck mixers equipped with the specified water-measuring control and locking device. Each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as mixing speed. Mixing shall be at the speed designated by the manufacturer of the equipment at their rated capacity. Trucks shall be equipped with counters that register the number of revolutions of the drum or blades.
4. The Contractor shall furnish two (2) delivery tickets with each load containing the following information:
 - a. Date
 - b. Producer and Plant
 - c. Job, name, and location
 - d. Truck number and time dispatched
 - e. Concrete designation and cement type
 - f. Admixture descriptions and contents
 - g. The time discharge was started and completed
 - h. Amount of concrete in load
 - i. Amount of any materials added at the site and authorized signature.

1.03 SUBMITTALS

A. Contractor

1. Plant certification
2. Cement certificate for each shipment
3. Admixture certificate
4. Concrete mix design
 - a. Design mix approval

- b. Test results
- c. Sieve analysis of coarse and fine aggregates
- d. Admixtures
- d. Pozzolan admixture, Type F

PART TWO - PRODUCTS

2.01 MATERIALS

A. Cement shall conform to the requirements of ASTM C 150 or ASTM C 595. Types as provided in Table 1.

B. Admixtures

1. Air entrainment admixtures conforming to ASTM Designation C 260 shall be introduced into the mix in quantities to entrain air as follows:

Class A, B & D	5% optimum - allowable variance 1%
Class C	6% optimum - allowable variance 2%

2. Pozzolan admixture shall conform to the requirements of ASTM Designation C 618, Class F.
3. Calcium chloride or admixtures containing more than 0.1% chloride ions are prohibited.
4. High range water reducing admixture (super-plasticizer) may be used as an option by the Contractor, but at no additional cost to the Owner.

a. The admixture shall conform to ASTM C494, Type F.

- 1) Approved products are Eucon - 37 by Euclid Chemical Company, Sikament by Sika Chemical Corporation or equal.

C. Fine Aggregate

1. Fine aggregate shall consist of natural sand composed of clean, hard, strong durable, uncoated grains, It shall be free from injurious amounts of shale, clay lumps, soft or flaky particles and other unsound or deleterious substances. It shall conform to Specifications for Concrete Aggregates, ASTM Designation C 33.

D. Coarse Aggregate

1. Coarse aggregate shall consist of gravel, slag, or broken stone composed of strong, hard, clean, durable, uncoated pebbles or rock fragments free from injurious amounts of shale, coal, clay lumps, soft fragments, dirt, glass, and organic or other deleterious substances. It shall conform to Specifications for Concrete Aggregates, ASTM Designation C 33, Size 467, 57 or 67, Class 4S. Slag shall weigh at least 75 lbs/cf.
2. For thin sections, the maximum stone size used shall be reduced when directed. For heavy sections the maximum stone size shall be increased when directed. In both cases, the gradation of other stone sizes shall be modified as directed. Crushed stone and gravel shall be washed if necessary to remove dust, dirt, or loam and if unsatisfactory shall be excluded from the work.

E. Non-shrinking Grout

1. Materials for non-shrink grout shall conform to CRD-C-621 "Corps of Engineers Specifications for Non-Shrink Grout". Approved products are Sauereisen F-100 Grout as manufactured by Sauereisen Cements Co., Pittsburgh, Pennsylvania; Five-Star Grout as manufactured by U.S. Grout Corp., Old Greenwich, Connecticut; Masterflow 713 as manufactured by Master Builders, Cleveland, Ohio and "Euco N-S" by Euclid Chemical Co.

F. Forms for Concrete

1. Forms shall be in accordance with Section 03100 Concrete Formwork and the following:
2. Forms for exposed surfaces shall be of approved material to produce a smooth surface with minimal joint marks.

3. When wood forms are used, they shall be constructed of sound top construction grade western fir or hemlock, or equivalent acceptable lumber, dressed on forming sides and neatly fitted. Joints shall be of quality to produce a smooth surface compatible with the type of finish required.
4. Plywood used for formwork shall be manufactured using waterproof glue made for this type of installation.

G. Concrete Reinforcement

1. Concrete reinforcement shall be in accordance with Section 03200 Concrete Reinforcement.

PART THREE - EXECUTION

3.01 PROPORTIONING

- A. Normal weight concrete shall be designated Class A, B, C or D and be proportioned and mixed to develop not less than the minimum compressive strength shown in Table I. (ACI 301 - Proportioning on the basis of previous field experience or trial mixtures).

TABLE 1 CONCRETE REQUIREMENTS						
Concrete	Cement Type	Min. 28-Day Compressive Strength PSI	Maximum Water- Cement Ratio	Minimum Cement Content Sack/CY	Slump Minimum	Max.
Class						
A	I	4000	0.45	6 - 1/2	1	4
B	I	2000	0.74	4 - 1/2	2	6
C	I	4000	0.50	6 - 1/2	1	4
D	II or IP	4000	0.45	6 - 1/2	1	4
Note: See paragraph 3.11 herein for the uses of the various classes of cast-in-place concrete.						

B. Water-Cement Ratio

1. Except by special permission of the Engineer, maximum amounts of water (U.S. gallons), including the surface water carried by the fine and coarse aggregates per sack (94 lbs. net) of cement shall be that listed in Table 1. Standard methods shall be used for determination of surface moisture in the aggregates.
2. Concrete of the maximum strength, density, and durability possible with the specified water-cement ratio is required. No increase of these ratios will be permitted.
 - a. Refer to ANSI/ACI 304.2R for placing concrete by pumping methods.
3. Water may be added with the approval of the Engineer, but in no case shall the maximum slump limit be exceeded.

C. Each cubic yard of concrete shall contain the minimum number of sacks (94 lbs. net per sack) of cement listed in Table 1.

1. The minimum amounts of cement listed shall be used regardless of tests and design methods used.

D. Proportions

1. The proportions of aggregate to cement for concrete of the specified water-cement ratio shall be such as to produce concrete that can be puddled readily into the corners and angles of forms and around reinforcement

without excessive spading and without segregation of materials or collections of free water on the surface. In no case shall concrete be placed which shows slumps outside the limits listed in Table 1.

2. Consistency of the concrete shall be closely regulated and the proportions of fine and coarse aggregate shall be such as to produce no harshness in placing nor honeycombing in the structures. If required, the mixture shall be modified by changing the relative volume of fine and of coarse aggregate. The Contractor shall cooperate in every way to the end that concrete of the desired quality shall be obtained.

3.02 FORMS FOR CONCRETE

- A. Concrete forms shall be in accordance with Section 03100 Concrete Formwork and the following:
- B. Erection
 1. All walls shall be plumb with level tops; all floors shall be either level or sloped toward a floor drain where provided.
 2. Forms for repeated use shall be supplied in numbers to provide for the required rate of progress. Defective forms shall not be used.
 3. Forms for all exposed surfaces of ceilings, beams and columns, and of walls of tanks, conduits and buildings shall be constructed of 3/4 inch or 7/8 inch plywood or lined by a method that assures smooth surfaces.
- C. Forms shall not be removed until the concrete has attained sufficient strength to assure structural stability under all dead and construction loads, and so that removal can be accomplished without marring concrete surfaces. The determination of when forms may be removed shall take into account temperature and humidity. Formwork that does not support the weight of concrete shall remain in place for at least 24 hours after concrete placement. Formwork supporting the weight of concrete shall remain in place until the concrete has obtained 80% of the specified 28-day strength.

3.03 PLACING CONCRETE

- A. Scheduling
 1. The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of placing concrete.
 2. Concrete shall be placed between the hours of 8:00 A.M. and 6:00 P.M. unless permission is obtained to extend that time. No slab shall be placed after 12:00 Noon on any last working day of the week.
 3. Each concrete pour shall be completed in a continuous operation with no interruption in excess of forty-five (45) minutes.
 4. No concrete shall be placed after its initial set has occurred, and no re-tempered concrete shall be used under any circumstances.
 5. When columns, brackets, or walls are to support beams or slabs, the concrete in the vertical or supporting member shall be deposited up to 1/2 inch above the bottom of the supported member and a period of at least twelve (12) hours shall elapse for settlement before placing concrete in the horizontal member.
 6. No concrete shall be placed during rain, sleet, or snow unless adequate protection is provided and approval is obtained. Rainwater shall not be allowed to increase the mixing water nor damage the surface finish.
- B. Before placing the concrete, all forms shall be thoroughly cleaned and the space to be occupied by the concrete shall be free from all laitance, silt, dirt, shavings, sawdust, and other debris.
- C. Conveying Concrete to Forms
 1. The method or device used for conveying the concrete from the mixer to its place in the work shall be such as to assure against the separation of the materials.
 2. Where placing operations involve dropping the concrete more than four (4) feet, it shall be deposited through sheet metal or other approved pipes. These pipes shall be made in sections not to exceed four (4) feet in

length.

D. Placing Concrete in Forms

1. Concrete placing shall conform to ACI 304.
2. Concrete shall be deposited at or near its final position and carried up evenly within forms, in layers not exceeding eighteen (18) inches in depth. It shall be thoroughly consolidated around and into contact with forms, reinforcement, pipes, or other shapes built into the work, by spading and vibrating. Voids or pockets of coarse aggregate shall be prevented and the completed work shall be a solid, watertight unit with smooth form surfaces. A sufficient number of workers shall be available at all times to perform the work properly. Control of methods and practices of placing shall be subject to the approval of the Engineer.
3. Where pipe or other shapes are built into the work, the concrete shall be placed from one side only and shall flow under the pipe or shape to the other side until all air is displaced.

3.04 PLACING CONCRETE DURING COLD WEATHER

- A. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
- B. When concrete is placed at or below an atmospheric temperature of 40°F, or whenever, in the opinion of the Engineer, the temperature may fall below 40°F within the curing period, the water, aggregate, or both shall be heated and suitable enclosures and heating devices shall be provided.

C. Heating of Materials

1. Heating of mixing water shall be controlled to maintain uniform temperature from batch to batch. In no case shall the water be heated to a temperature greater than 140°F.
2. Aggregate shall be uniformly heated to eliminate all frozen lumps, ice, and snow. However, the aggregate shall not be heated to a temperature of more than 100°F.

D. Placing

1. Concrete shall be placed at a temperature of not less than 50°F. and not more than 75°F. and the air surrounding the forms and deposited concrete shall be maintained within this temperature range for a period of not less than seven (7) days. The enclosures and heating devices shall not be removed at the end of this period until the temperature of the concrete has been permitted to drop, at a rate not to exceed 20°F. per twenty-four (24) hours, to within 20°F. of the atmospheric temperature. Thermometers shall be furnished by the Contractor so that the temperature within the enclosure may be determined.
2. Concrete shall not be placed in contact with materials having a temperature of less than 40°F. If necessary, the forms, reinforcing steel, and foundation materials shall be enclosed and heated before the concrete is placed.
3. The completion of suitable enclosures and the application of heat to bring the air surrounding the forms and deposited concrete to the specified temperature shall follow the placing of concrete as soon as possible.
4. Heaters shall be vented at all times. No products of combustion shall be permitted to come in contact with concrete surfaces before twenty-four (24) hours after finishing.

E. Form Insulation

1. In lieu of heated enclosures, the Contractor may protect concrete in slabs more than twelve (12) inches thick and in walls of structures by the use of insulation, if approved by the Engineer.
2. When form insulation is used, the concrete shall be placed at a temperature of not less than 50°F and not more than 75°F as directed by the Engineer, and maintained by the insulation at a surface temperature of the concrete of not less than 50°F and not more than 100°F. Sufficient thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. Whenever the surface temperature as indicated by the thermometer reading exceeds the specified maximum temperature, the forms or insulation shall be loosened or otherwise vented until the

surface temperature is within the specified limits. If the thermometer readings indicate that the minimum required temperature is not being maintained, the structure shall be promptly enclosed and heat furnished as required.

3. The insulation material shall be wind and water-resistant. Special precautions shall be taken at edges and corners to insure that such points are adequately protected. The tops of pours shall be protected by a tarpaulin, or other approved waterproof cover over the insulation.
4. At the close of the protection period, the temperature of the concrete within the form shall be gradually decreased, by loosening the forms of insulation to permit a rate of cooling not to exceed 20°F per twenty-four (24), to within 20°F of the atmospheric temperature.

3.05 PLACING CONCRETE DURING HOT WEATHER

- A. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- B. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
- C. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
- D. Wet forms thoroughly before placing concrete.
- E. Do not use retarding admixtures without the written acceptance of the Engineer.

3.06 JOINTS AND BONDING

- A. Construction joints and expansion joints shall be placed as shown on the Drawings. Approval of the Engineer must be secured for the placing of any construction joints not shown on the Drawings.
- B. Keyways shall be provided in all construction joints. Unless shown otherwise on the Drawings, the width of all keyways shall be 1/3 of the wall or slab thickness by two (2) inches deep.
- C. Horizontal Construction Joints (in walls).
 1. Lower Joint Surface Construction
 - a. Proposed joint surfaces shall be finished straight by use of temporary straight edges tacked to the inside of the form with the lower edges on the line of the joint.
 - b. Keyway shall be formed before the concrete attains its initial set.
 2. Completing Joint
 - a. Within twelve (12) hours after the keyway has been formed, the lower surface of the joint shall be thoroughly cleaned by the use of wire brushes and all laitance and loose material removed so as to expose clean, solid concrete. Care must be taken not to loosen any of the coarse aggregate in the concrete. If for any reason this laitance is not removed within twelve (12) hours after the concrete is placed, it shall be removed using such tools and methods as may be necessary to secure the results specified above.
 - b. After the lower surface has been prepared and immediately before placing concrete above the joint, the lower surface shall be thoroughly wetted and flushed and a bed of mortar composed of one (1) part Portland Cement and two (2) parts sand spread over the entire surface (two (2) inches minimum depth in wall pours). The mortar shall be thoroughly worked into all openings and crevices.

3.07 SURFACE FINISH

- A. Concrete surfaces shall be finished even and reasonably free from imperfections and roughness. Angles shall be true and edges straight.

B. Patching

1. Upon removal of forms, cavities produced by form ties, honeycomb spots, broken corners or edges, and other defects shall be cleaned, saturated with water, and completely filled, pointed and trued with a mortar mix of cement and fine aggregate of the same proportions used in the concrete being finished. Form tie holes shall be completely filled by use of a pressure gun or by a hand ramming method.
2. On all exposed surfaces, all fins and irregular projections shall be removed with a stone or power grinder, in such a way as to avoid contrasting surface textures. Holes and other areas requiring corrective work shall be coated with neat cement and patched. Except where the surface is to be painted or otherwise covered, sufficient white cement shall be substituted for the regular cement in the patching mortar to produce finished patches of the same color as the surrounding concrete.

C. General Related to Finishing:

1. After removal of forms, give the concrete surfaces one or more of the finishes specified below where so indicated on the Drawings.
2. Revise the finishes as needed to secure the approval of the Engineer.
3. Concrete surfaces which will be exposed to view in the completed construction shall have a smooth even surface. Repairs shall be made to surface as soon as forms are stripped.

D. As-Cast Finish:

1. Rough form finish:
 - a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
 - b. Remove fins exceeding 1/4" in height.
2. Smooth form finish:
 - a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with the number of seams kept to a practical minimum and in a uniform and orderly pattern.
 - b. Patch tie holes and defects.
 - c. Remove fins completely.
 - d. Unsightly ridges or lips on exposed concrete shall be removed by tooling and rubbing. All surfaces requiring rubbing shall be thoroughly washed with water after the rubbing is completed. Voids or stone pockets shall be cleaned out and patched. Wires and rods shall be cut off depressed not less than one inch below finished surface. Loose stones and all holes shall be cleaned out and the defects repaired with concrete to a smooth even surface. Holes left by removal of form ties shall be thoroughly and completely filled with patching concrete, as specified under Repairs and Patching. Plastering or cement wash will not be permitted unless otherwise specified in this section.

E. Finishing Slabs:

1. Definition of Finishing Tolerances:
 - a. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
 - b. "Class B": True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
 - c. "Class C": True plane within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.
2. Scratched Finish: After the concrete has been placed, consolidated, struck-off, and leveled to a Class C

tolerance, roughen the surface with stiff brushes or rakes before the final set.

3. Float Finish:

- a. After the concrete has been placed, consolidated, struck-off, and leveled, do not work the concrete further until ready for floating.
- b. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
- c. During or after the first floating, check the surface plane with a ten-foot straightedge applied at not less than two different angles.
- d. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
- e. Re-float the slab immediately to a uniform sandy texture.

4. Trowel Finish:

- a. Provide a floated finish as described above, followed by power trowelling and then a hand trowelling.
 1. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
 2. Provide hand trowelling when a ringing sound is produced as the trowel is moved over the surface.
 3. Thoroughly consolidate the surface by hand trowelling.
 4. Small areas may be entirely hand trowelled.
- b. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
 1. For concrete on metal deck, Class B plane tolerance is acceptable.
 2. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor coverings.

5. Broom Finish:

- a. Provide a floated finish as described above.
- b. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
- c. Unless otherwise directed by the Engineer, provide the texturing in one direction only.
- d. Provide "light", "medium", or "course" texturing as directed by the Engineer or otherwise called for on the Drawings.

6. Scratch Finish:

- a. If a surface is to receive bond-applied cementitious coating, provide a scratch finish.

7. Finish Schedule, unless otherwise indicated:

- a. Building Interiors

Floors, bases, & curbs:	Trowel finish
Other slabs:	Float finish
Exposed formed surfaces:	Smooth-rubbed finish
Other formed surfaces:	As-cast finish
- b. Building Exteriors

Slabs, drives, & walks:	Broom finish
Exposed formed surfaces:	Smooth-rubbed finish to 6 in. below grade
Other formed surfaces:	As-cast finish

- c. Pedestrian ramps & exterior steps
Trowel finish (with slip-resistant aggregate applied) landings, platforms, garage floors

- d. Tanks and Other Liquid Retaining Structures:

Slabs:	Float finish
Interior formed surfaces:	Smooth-rubbed down to 6 in. below water line when exposed to view
	As-cast finish below water line
Exterior formed surfaces:	Smooth-rubbed finish down to 6 in. below finished grade
	As-cast finish below finished grade
Other formed surfaces:	As-cast finish

- F. Concrete floor hardener shall be furnished and applied to all interior exposed concrete floors, unless indicated otherwise on the Drawings. Floor hardener shall be Lapidolith as manufactured by Sonneborn, Inc., Hornolith as manufactured by A.C. Horn, Inc., or equal. Products shall be applied in conformance with the manufacturer's instructions and as specified herewith. The hardener shall be applied diluted with water in the following proportions:

1. First application - 1 part hardener to 2 parts water
2. Second application - 1 part hardener to 1 part water
3. Third application - 2 parts hardener to 1 part water

3.08 CURING OF CONCRETE

- A. Curing of concrete shall be in conformance with ACI "Manual of Concrete Practice" Part I ACI 308 and as specified herein.
- B. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss and at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The Contractor shall provide thermometers as required by the Engineer.
- C. Horizontal units such as floor slabs and sidewalks shall be cured in two stages:
 1. Initial curing shall begin immediately after concrete finishing is complete and shall be continued for twenty-four (24) hours and shall be in conformance with one of the following methods:
 - a. The concrete shall be covered with two thicknesses of an acceptable woven fabric such as burlap thoroughly saturated with water and shall be maintained in a saturated condition for the specified period. Lap the burlap strips by half widths when placing to give greater moisture retention and aid in preventing displacement of burlap during high wind or heavy rain.
 - b. Ponding of water over the entire surface for the specified period.
 - c. Continuous application of water by means of suitable sprinkling devices for the specified period.
 2. Final curing shall last for a minimum of six (6) days and shall employ one of the following methods:
 - a. Continuation of the water curing process employed in the initial curing period.
 - b. An impervious paper or plastic covering, meeting ASTM Specification C 171, placed and maintained in contact with the concrete.
- D. Vertical elements such as walls and columns shall be cured in two stages:
 1. Initial curing shall begin immediately after the finishing of the concrete or within three (3) hours after placing operations cease. Curing shall consist of covering exposed surfaces with two (2) thicknesses of an approved

woven fabric such as burlap, thoroughly saturated with water and maintained in a saturated state by means of a soaker hose placed on top of the burlap. If form work is to be left in place for more than forty-eight (48) hours, the forms should be loosened to assure that water runs down the inside of the forms, to keep the concrete surfaces wet.

2. Upon removal of the wet coverings and formwork used for the initial curing, one of the following methods for final curing may be used:
 - a. Application of a continuous mist spray of water directly on the concrete.
 - b. Application of an impervious paper or plastic covering, meeting ASTM Specifications C 171, directly upon the surface of the concrete.
- E. When the mean daily temperature of the surrounding air is less than 40°F., the concrete shall be protected to maintain the temperature of the concrete between 50°F. and 70°F. for the curing period.
- F. Curing water shall be approximately the same temperature as the concrete to alleviate temperature-change stresses that could be detrimental to the concrete.

3.09 PROTECTION

A. Free Water

1. Concrete for structures shall not be placed in water, nor shall water be allowed to come into contact with freshly poured concrete until it has attained a sufficient set, except where special permission may have been given to place concrete under water by the Engineer.
2. Water used for cleaning the placing equipment shall be discharged outside the forms.

B. All forms and reinforcing steel, located above the concrete being placed, and all placing equipment shall be kept clean and free of hardened concrete.

C. Aluminum Inserts:

1. All aluminum materials inserted in or in contact with concrete shall have the contact surface coated with bitumastic.

3.10 MUD MATS

- A. Where called for on the plans or as directed by the Engineer, the Contractor shall construct concrete mud mats immediately after cleaning the excavation bottom, to preserve the bearing surface condition. Concrete for mud mats shall be not less than three (3) inches thick. Bottom of excavation shall be free of water, mud and loose material prior to mud mat placement.

3.11 CAST-IN-PLACE CONCRETE

- A. All reinforced concrete shall be Class A, except as otherwise specified or shown on the Drawings.
- B. Concrete used for mud mats, fill and channeling in manholes and chambers shall be Class B unless otherwise noted on the Drawings.
- C. Concrete conforming to ODOT Current Edition shall be used for all concrete pavement, curbing, driveways, and sidewalks, unless noted otherwise on the Drawings.
- D. Class B concrete may be used for encasing pipelines, fill, and pipe bedding.
- E. Where Class B concrete fill is called for an installed in or on structures, the following steps shall be taken:
 1. Scrub concrete slabs and/or walls with a stiff wire brush and streams of clean water.
 2. Apply a bonding agency with a product name of Euco-Weld as manufactured by Euclid Chemical Company or equal.

3. The Class B concrete shall then be placed and screeded to bring the surface to final grade.
- F. Class D concrete shall be used for sewerage treatment plants and sewerage pump stations, or as noted on the Drawings.

PART FOUR - SPECIAL PROVISIONS

- 4.01 Include water stop in all keyways and expansion joints in tanks that are to contain liquids. When applicable, see Specification 03150.

END OF SECTION

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PART ONE - GENERAL

1.01 SCOPE

- A. This Section includes furnishing and installing all waterstops where necessary.
- B. Related work specified elsewhere, but not limited to:
 - 1. Cast-In-Place Concrete, Section 03120.

1.02 SUBMITTALS

- A. Descriptive literature, manufacturer's bulletins, or test data concerning the product proposed.
- B. General arrangement and dimension drawings showing installation.
- C. Manufacturer's certification that materials comply with specified requirements.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Waterstops for expansion joints and construction joints shall be of virgin PVC compound corresponding to U.S. Corps of Engineers Specifications CRD C572-74, and having maximum resistance to ozone, sewage, oils, and solvents.
- B. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.
- C. Provide hog rings of grommets spaced at 12 inches on center along length of waterstop.
- D. Provide Teflon coated thermostatically controlled waterstop splicing irons for field butt splices.

2.02 FABRICATION

- A. Waterstops for construction joints shall be 6-in. wide non-tapered ribbed continuous flexible membranes not less than 3/8-in. thick. Waterstops for expansion joints shall be 9-in. wide non-tapered ribbed continuous flexible membranes not less than 3/8 in. thick with 3/4-in. I.D. hollow bulbs in the center.
- B. Flexible PVC waterstops shall be manufactured by Greenstreak, Inc., W.R. Grace & Company, or equal.

PART THREE - EXECUTION

3.01 INSTALLATION

- A. Waterstops are required at all formed joints in concrete walls and slabs which separate habitable spaces, machinery, and equipment areas from ground water or from water filled tanks, basins, flumes, manholes, etc. Waterstops shall also be placed in joints in all outside tank walls. Waterstops placed in horizontal joints shall be wired to reinforcing steel to prevent lay-over during the pouring of concrete.
- B. Field butt splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at approximately 380 degrees F. Follow approved manufacturer recommendations. Lapping of waterstop, use of adhesives, or solvents shall not be allowed.
- C. Center waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12 inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel.

3.02 FIELD QUALITY CONTROL

A. Waterstop splicing defects which are unacceptable include, but are not limited to the following:

1. Tensile strength less than 80 percent of parent section.
2. Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch.
3. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness.
4. Misalignment which reduces waterstop cross section more than 15 percent.
5. Visible porosity in the weld.
6. Bubbles or inadequate bonding.
7. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.
8. Charred or burnt material.

PART FOUR – SPECIAL PROVISIONS

N/A

END OF SECTION

CONCRETE REINFORCEMENT

PART ONE - GENERAL

1.01 SCOPE

- A. This Item includes furnishing and placing concrete reinforcing steel of the quality, type and size designated including steel dowels.

1.02 STANDARDS

- A. Concrete reinforcement shall conform to requirements of ACI 301, latest edition, "Specifications for Structural Concrete for Buildings", except as modified herein.

1.03 SUBMITTALS FOR ENGINEER'S APPROVAL

- A. The manufacturer shall submit certified results of at least one representative tensile and bending test for each size bar and fabric reinforcement furnished for contracts requiring 10,000 lbs. of reinforcing steel or more, unless otherwise required.

1.04 DELIVERY AND IDENTIFICATION

- A. Reinforcing steel, as delivered to the job site, shall be bound in bundles of either bent or straight bars identified by a numbered weatherproof tag. The tag numbers shall identify the bars corresponding to those shown on the bar lists and placement drawings.
- B. The Engineer shall be given a copy of the weigh bill and invoice for each shipment delivered.

1.05 PROTECTION

- A. All reinforcing steel, metal chairs and supports shall be stored on timber supports above the ground and out of flood areas. It shall be protected from dirt, oil, grease, and rust.

PART TWO - PRODUCTS

2.01 QUALITY AND GRADE

- A. Structures:
 - 1. Bar reinforcement shall be Grade 60 deformed bars meeting the requirements of ASTM A 615 or ASTM A 616.
 - 2. Steel fabric shall conform to "Specification for Fabricated Steel Bar or Rod Mats for Concrete Reinforcement", ASTM A 184, and shall be furnished in flat sheets.
 - 3. Sizes shall be as indicated on the drawings.
- B. Pavements, Curbing and Walks
 - 1. Dowel bars for load transfer joints shall be straight, smooth, round bars conforming to the dimensions shown on the Drawings and shall be shop coated with a suitable rust inhibitor. For expansion joints, the dowel bars shall be fitted with expansion caps.
 - 2. Longitudinal Bulkhead Joint Devices:
 - a. Hooked bolts for mechanically coupled lane tie assemblies shall have a 5/8-inch minimum shank diameter. Each assembly shall have a 24,000 lbs. minimum ultimate tensile strength.
 - b. Self-drilling anchors shall be the flush-end type of the snap-off chuck end type conforming to Federal Specifications No. FF-S-325 Group III, Type 1(a) or (c).

- c. Longitudinal lane ties shall be 5/8-inch minimum diameter deformed reinforcing bars of length to embed fifteen (15) inch minimum into each lane of pavement.
- 3. Reinforcing steel shall be deformed bars conforming to ASTM A 615, A 616, or 617, Grade 60.
- 4. Fabric reinforcement shall conform to ASTM A 184.

2.02 DETAILED DRAWINGS

- A. All detailing, fabrication accessories, and erection of reinforcing steel unless otherwise noted shall conform to the "Manual of Standard Practice for Detailing Reinforced Concrete" (ACI 315).
- B. Laps and splices unless otherwise noted shall conform to "Building Code Requirements for Reinforced Concrete" (ACI 318).

PART THREE - EXECUTION

3.01 PLACEMENT

- A. Reinforcement of the size and shape shown on the approved shop drawings, or as may be directed by the Engineer, shall be placed where indicated on the Drawings or as necessary to carry out the intent of the Drawings and Specifications.
- B. The steel shall not be bent nor straightened in any injurious manner, such as by heating in the field. Bars with kinks or bends not shown on the Drawings shall be rejected.
- C. Reinforcement shall be securely tied at intersections as often as necessary to maintain the bars in their proper position during placement of concrete.
- D. The ends of spliced reinforcing bars shall overlap not less than forty (40) bar diameters unless otherwise shown on the Drawings. The splices in adjacent bars shall be staggered.
- E. No reinforcing bars shall be driven nor forced into concrete after it has obtained its initial set.
- F. Welding of main reinforcing is prohibited.
- G. Before placing concrete in freezing weather, reinforcing bars shall be heated and kept warm to prevent concrete from freezing to the steel.
- H. Reinforcing bars may be moved within allowable tolerance to avoid interference with other reinforcing steel, conduits, other embedded items, or openings.
- I. The clear space between the outside face of reinforcing bars and the surface of concrete shall conform to the following dimensions, except as otherwise shown on the Drawings:
 - 1. Concrete not in contact with earth or water or located over water
 - a. Columns, Beams, and Girders 1-1/2 in.
 - b. Slabs and Walls 3/4 in.
 - c. Wearing Surfaces 1 in.
 - 2. Concrete in contact with or over water
 - a. All Members 2 in.
 - 3. Concrete in contact with earth
 - a. Formed Walls and Columns 2 in.
 - b. Slabs on Ground 3 in.

3.02 SUPPORTS

- A. All supports for reinforcement shall be of adequate strength, of the proper depth and number to securely hold the reinforcement in position while placing the concrete.
- B. Metal supports shall have a shape that is easily enveloped by the concrete.
- C. Metal supports in contact with formwork shall have plastic tips.
- D. Where slabs are placed on forms, only metal supports will be permitted.
- E. Where slabs are to be poured on firm ground or concrete mud mats, reinforcement may be supported by pre-cast concrete blocks or metal supports.
- F. Pre-cast concrete spacer blocks of the required thickness shall be wired to wall and column steel to assure required concrete protection. However, pre-cast concrete spacer blocks will not be permitted where walls or columns will remain exposed after forms are removed.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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CONCRETE FINISHING AND CURING

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide finishes on cast-in-place concrete as called for on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Summary of PART TWO - PRODUCTS
 - 1. Subsection 2.01: Materials
 - 2. Subsection 2.02: Sealer
 - 3. Subsection 2.03: Waterproofing
 - 4. Subsection 2.04: Other Materials
- C. Summary of PART THREE - EXECUTION
 - 1. Subsection 3.01: Surface Conditions
 - 2. Subsection 3.02: Coordination
 - 3. Subsection 3.03: Installation
 - 4. Subsection 3.04: Finishing of Formed Surfaces
 - 5. Subsection 3.05: Finishing Slabs
 - 6. Subsection 3.06: Curing and Protection
 - 7. Subsection 3.07: Sealing
 - 8. Subsection 3.08: Waterproofing
- D. Related Work
 - 1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.
 - 2. Section 03120: Cast-in-Place Concrete

1.02 QUALITY ASSURANCE

- A. Qualifications of Suppliers: Products used in the work of this Section shall be produced by suppliers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.
- C. Except as may be modified herein or otherwise directed by the Engineer, comply with ACI 301, "Specifications for Structural Concrete for Buildings".

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 2. Test data required elsewhere in this Specification.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. General:

1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes and curing.
2. As required for the Work, provide the following materials, or equals approved in advance by the Engineer.

- B. Concrete Materials:

1. Comply with pertinent provisions of Section 03120, except as may be modified herein.

- C. Curing and Protection Paper or Film:

1. Use waterproof paper or polyethylene film.
2. Approved products:
 - a. "Sisalkraft, Orange Label".
 - b. Equal products, comply with ASTM C171.
3. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896", or equal paper faced with polyethylene film.

- D. Membrane Type Curing Compound:

1. Use products conforming to ASTM C-309/type 1D/Class A and Fed. Spec. TT-C-800A Type 2/Class. Approved products include the following:
 - a. Maximent floor seal, Set Projects, Inc.
 - b. Masterseal, Master Builders.
 - c. Sealtight CS-309 Acrylic Curing and Sealing Compound, W.R. Meadows, Inc.
 - d. Kure-N-Seal, Sonneborn, Building Products Division.
 - e. "Traz" Sealer, as manufactured by Chem-Masters Corporation, Chagrin Falls, Ohio.
2. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.

- E. Floor and Deck Sealer with Hardener:

1. Approved products where no floor covering is to be installed:
 - a. Sealtight Cure-Hard Curing and Hardening Compound, as manufactured by W.R. Meadows, Elgin, Illinois.
 - b. "Polyseal 4 in 1" Curing and Hardening Compound, as manufactured by Chem-Masters Corporation, Chagrin Falls, Ohio.
2. In areas where floor covering is to be installed, the chemical must be compatible with the adhesives to be used. Liquid curing and sealing agents, as specified above, may be used if shown to be compatible.

- F. Slip-Resistant Abrasive Aggregate:

1. Provide aluminum oxide, 14/36 grading.
2. Acceptable manufacturers:
 - a. Carborundum Company
 - b. Norton Company
 - c. L.M. Schofield Company

2.02 SEALER

- A. The sealer shall be Hydrozo Clear 16 as manufactured by Hydrozo Coatings Company, Lincoln, Nebraska or an approved equal. The sealer shall be an aluminum modified siloxane material containing approximately 6% solids and be applied by an approved applicator as per manufacturer's directions. It shall pass ASTM C67-80 with a repellency rating of 96%. It shall show, in twenty-eight (28) day submersion tests, a repellency rating of 99.55%. When tested for chloride ion resistance, it shall show little or no absorption. When tested per ASTM C672, Scaling Resistance Test, it shall have a rating of "No Scaling" after 40 cycles as compared to untreated concrete that had a rating of "Severe Scaling" after 10 cycles on non-air-entrained concrete. It shall have a Moisture Vapor Transmission Rate, per ASTM C 1653-72, of 52 grams per square foot per twenty-four (24) hours at 25°C.

2.03 WATERPROOFING

- A. The waterproofing Xypex shall be as manufactured by Xypex Chemical Corporation, Richmond, British Columbia, Canada or an approved equal. The waterproofing shall be of the cementitious crystalline type that controls and permanently fixes non-soluble crystalline growth throughout the capillary voids of the concrete. The waterproofing material shall exhibit no leakage when two (2) inches, 2000 psi design samples are tested in conformance with U.S. Army Corps of Engineers' Permeability Specifications CRD C-48-73.
- B. Clear sealers or cement-based compounds which utilize sodium silicate as a "gel" are not acceptable.

2.04 OTHER MATERIALS

- A. Provide other materials, specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 FINISHING OF FORMED SURFACES

- A. General:
 1. After removal of forms, give the concrete surfaces one or more of the finishes specified below where so

indicated on the Drawings.

2. Revise the finishes as needed to secure the approval of the Engineer.
3. Concrete surfaces which will be exposed to view in the completed construction shall have a smooth even surface. Repairs shall be made to surface as soon as forms are stripped.

B. As-Cast Finish:

1. Rough form finish:
 - a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
 - b. Remove fins exceeding 1/4" in height.
2. Smooth form finish:
 - a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
 - b. Patch tie holes and defects.
 - c. Remove fins completely.
 - d. Unsightly ridges or lips on exposed concrete shall be removed by tooling and rubbing. All surfaces requiring rubbing shall be thoroughly washed with water after the rubbing is completed. Voids or stone pockets shall be cleaned out and patched. Wires and rods shall be cut off depressed not less than one inch below finished surface. Loose stones and all holes shall be cleaned out and the defects repaired with concrete to a smooth even surface. Holes left by removal of form ties shall be thoroughly and completely filled with patching concrete, as specified under Repairs and Patching. Plastering or cement wash will not be permitted unless otherwise specified in this section.

C. Unspecified Finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.

1. Rough form finish:
 - a. For all concrete surfaces not exposed to public view.
2. Smooth form finish:
 - a. For all concrete surfaces exposed to public view.

3.05 FINISHING SLABS

A. Definition of Finishing Tolerances:

1. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
2. "Class B": True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
3. "Class C": True plane within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.

B. Scratched Finish: After the concrete has been placed, consolidated, struck-off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.

C. Floated Finish:

1. After the concrete has been placed, consolidated, struck-off, and leveled, do not work the concrete further until ready for floating.

2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
3. During or after the first floating, check the planeness of the surface with a ten-foot straightedge applied at not less than two different angles.
4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
5. Re-float the slab immediately to a uniform sandy texture.

D. Trowelled Finish:

1. Provide a floated finish as described above, followed by a power trowelling and then a hand trowelling.
 - a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
 - b. Provide hand trowelling when a ringing sound is produced as the trowel is moved over the surface.
 - c. Thoroughly consolidate the surface by hand trowelling.
 - d. Small areas may be entirely hand trowelled.
2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
 - a. For concrete on metal deck, Class B plane tolerance is acceptable.
 - b. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor coverings.
 - c. The inside of the chlorine contact tank shall be very carefully trowelled, with a hard smooth finish acceptable to the Engineer.

E. Broom Finish:

1. Provide a floated finish as described above.
2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
3. Unless otherwise directed by the Engineer, provide the texturing in one direction only.
4. Provide "light", "medium", or "course" texturing as directed by the Engineer or otherwise called for on the Drawings.

F. Unspecified Finish: If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as applicable:

1. Scratch finish:
 - a. For surfaces scheduled to receive bond-applied cementitious applications.
2. Floated finish:
 - a. Only in areas directed.
3. Trowelled finish:
 - a. For floors intended as walking surfaces.
 - b. For floor scheduled to receive floor coverings or waterproof membrane.

- c. For parking areas.
- 4. Non-slip finish (trowelled finished with slip-resistant aggregate applied):
 - a. For exterior platforms, steps, and landings.
 - b. For interior and exterior pedestrian ramps and walks.
 - c. For garage floors.

3.06 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Preservation of Moisture:
 - 1. All concrete shall be cured in a manner which will prevent loss of moisture from the concrete surface and keep the concrete in a continuously moist condition for at least seven days.
 - 2. Unless otherwise directed by the Engineer, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.
 - a. Ponding or continuous sprinkling.
 - b. Application of absorptive mats or fabric kept continuously wet.
 - c. Application of sand kept continuously wet.
 - d. Continuous application of steam (not exceeding 150°F) or mist spray.
 - e. Application of waterproof sheet materials specified in Part 2 of this Section.
 - f. Application of other moisture retaining covering as approved by the Engineer.
 - g. Application of the curing agent specified in Part 2 of this Section or elsewhere in the Contract Documents.
 - 3. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
 - 4. Cure concrete by preserving moisture as specified above for at least seven (7) days.
 - 5. If forms are removed sooner than seven (7) days after placement of concrete, curing shall be continued until at least seven (7) days have elapsed by application of the curing and sealing or curing and hardening compound of type specified in this Section, or as otherwise allowed by the Engineer. No compound shall be used which will adversely affect the application of any coatings, adhesives, waterproofing or damp-proofing or any other finishes indicated for the concrete surface on the Drawings or elsewhere in the Specifications. Any dyes in curing compounds used on exposed concrete must be fugitive-type.
 - 6. Where hardeners are required on a floor, the floors shall be cured and hardened simultaneously as specified in this Section or an Engineer approved equal and compatible with any topping or finish which will be applied to the slab.
 - 7. The Contractor shall make arrangements with the curing and hardening material manufacturer to make available at no cost to the Owner the services of a field representative to clarify to the Contractor the proper application of the products under prevailing job conditions.
- C. Temperature, Wind and Humidity:
 - 1. Cold Weather:
 - a. When the mean daily temperature outdoors is less than 40°F, maintain the temperature of the concrete between 50°F and 70°F for the required curing period.

- b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
 - c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
 - 2. Hot Weather: When necessary, provide windbreaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
 - 3. Rate of Temperature Change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5°F in any one-hour period, or 50°F in any 24-hour period.
- D. Protection from Mechanical Injury:
- 1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
 - 2. Protect finished concrete surfaces from damage from construction equipment, procedures, rain and running water.
 - 3. Do not load self-supporting structures in such a way as to overstress the concrete.

3.07 SEALING

- A. Unless otherwise specified, all exterior and submerged (extend sealer to two (2) feet above liquid level) cast-in-place concrete which is not painted (Section 09900) or waterproofing (Section 03345, paragraph 3.08) shall be sealed with two (2) coats of the specified sealer, Type "B" Waterproofing in section 03535.
- B. All work shall be done in strict accordance with the manufacturer's printed instructions. The sealer shall be applied with approved equipment and shall be removed from any surfaces not specified to be coated.
- C. All interior concrete floor subject to vehicle traffic shall receive sealer at the rate of 1.5 PSF.

3.08 WATERPROOFING

- A. All below grade exterior concrete walls shall receive two (2) coats of Type "A" Waterproofing as per section 03535. Coverage shall extend to two (2) feet above liquid level.
- B. The construction joints shall receive one (1) coat of Xypex Concentrate on all joint surfaces between pours.
- C. All work shall be done in strict accordance with the manufacturer's printed instructions. The waterproofing shall be applied with approved equipment and shall be removed from any surfaces not specified to be coated.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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PART ONE - GENERAL

1.01 SCOPE

- A. Under this Item the Contractor shall furnish and apply the waterproofing materials necessary for the protection of concrete surfaces.
- B. These materials shall be designed to protect the concrete surfaces against the penetration of moisture and the disintegrating influences of alkalis, acids, and frost.
- C. Other finishes for concrete surfaces are included in other sections in Division 3 as well as Section 09900 Painting.

1.02 SUBMITTALS

- A. The Contractor shall submit complete descriptive literature from the manufacturer for each type of special waterproofing material he proposes to use. If requested by the Engineer, the Contractor shall submit the manufacturer's complete formula for the special material if different from those mentioned in the specifications, in order that the Engineer may determine that the proposed materials are equal to those specified.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. The Contractor shall comply with manufacturer's recommendations as to environmental conditions under which waterproofing systems can be applied and to all applicable OSHA requirements.
- B. Interior waterproofing may be done only when the building has been thoroughly dried, by natural or artificial heat, and when the work area is properly heated and ventilated, clean, and as nearly dust free as possible. A room temperature of at least 60 degrees F shall be maintained during application and until waterproofing materials are dry.
- C. Face masks shall be used when applying toxic material in enclosed rooms or chambers, regardless of the amount of ventilation provided.
- D. Exterior waterproofing shall not be done during or immediately following rainy or frosty weather or when the temperature is below 50 degrees F or likely to drop below freezing during drying period. The application of treatment while surfaces are exposed to the hot sun, or when the temperature is above 90 degrees F, or likely to be during the drying period, shall be avoided.
- E. Waterproofing material shall not be applied in areas where dust is being generated.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. There shall be two types of waterproofing.
- B. Type A.
 - 1. Type A shall be a bituminous material in a liquid form that is suitable for cold application.
 - 2. It shall be of such a nature as to bond firmly to the concrete surface without the use of primers and to maintain sufficient elasticity to perform its protective function permanently in spite of cracks which develop.
 - a. Concrete surfaces shall be sand blasted in accordance with SSPC-SP7 Brush-off Blast Cleaning.
 - b. Concrete surfaces shall be clean and dry in accordance with ACI 515.
 - 3. In a non-potable water situation, Type A shall be "Super Service Black" by Koppers, "46-465 H.B." by Tnemec; or equal.

C. Type B

1. Type B shall be clear colorless liquid silicone polymer material.
2. It shall not alter the appearances of the surface. It shall penetrate the concrete surface pores and deposit silicones which will retard water absorption by the concrete.
3. Type B shall be "Hydrocide S-X" by Sonneborn, "Dehydratine 22" by A.C. Horn, Inc., or equal.

PART THREE - EXECUTION

3.01 PREPARATION

- A. All surfaces which are to be treated shall be thoroughly cleaned and dried in conformance with manufacturer's recommendations.

3.02 APPLICATION

A. Type A

1. Type A shall be applied to all concrete walls and columns in contact with sewage, sludge, or water from top to bottom; the underside of concrete covers and slabs on tanks and conduits; freeboard to tops of wall and to other surfaces.
 - a. In addition to the above, Type A shall be applied to exterior building walls from the footing to finish grade.
2. Type A shall be applied in two coats. Each coat shall have a coverage rate of 60 to 80 sq. ft. per gallon.

B. Type B

1. Type B shall be applied to all exposed exterior concrete surfaces of new structures above grade to a line 6 in. below finished grade, including adjoining concrete steps and platforms. The Contractor shall use application equipment recommended by the manufacturer.
 - a. Interior concrete shall be treated with two coats as specified below, unless otherwise shown on the Drawing.
2. Type B shall be applied in two coats. Each coat shall have a coverage rate of 80 to 100 sq. ft. per gallon.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

DIVISION 4

MASONRY

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SECTION 04200

MASONRY

PART ONE – GENERAL

1.01 SCOPE

- A. This section includes the furnishing of specified masonry units; accessories including wall ties, wall reinforcements, anchors, and similar embedded specialties; equipment, and labor related to the installation of masonry units as necessary for the completion of the work. Masonry includes: Bond Beams; Face Brick; Common Brick; Utility Brick; Structural Glazed Tile; Acoustical Glazed Facing Tile; Concrete Block (load bearing); Concrete Block (non-load bearing); Architectural Concrete Masonry Units; Glazed Concrete Masonry Units; Acoustical Concrete Masonry Units; Glazed Acoustical Concrete Masonry Units; Concrete Brick; Precast Concrete Lintels; Masonry Reinforcements, Joint Materials, Anchors and Ties, Accessories, Grout, and Mortar; and the installation of Glass Units, Dimensioned Cut Stone, and Cast Stone.
- B. Related work specified elsewhere, but not limited to Section 01300 Submittals, Section 01350 Product Requirements and Handling, Section 01410 Testing Laboratory Services, Section 03120 Cast-in-Place Concrete, Section 05100 Structural Steel, Section 06100 Carpentry, Section 07200 Building Insulation, Section 07652 Flexible Flashing, and Section 09900 Painting.
- C. Related products to be installed under this Section, but furnished elsewhere includes: Section 04270 Glass Unit Masonry.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with the requirements of Section 01300 and include the following:
 - 1. Prior to delivery, furnish six copies of the material manufacturer's affidavit or private laboratory tests showing that all masonry units comply with specifications.
 - 2. Present sample units at the job site, for the Engineer's approval, showing the texture and color of face brick, glazed masonry and tile, cut and cast stone, concrete block, and other finished masonry units.
 - 3. Furnish drawings showing placement and anchorage for cut stone and/or other masonry specialties to be included in the construction.
 - a. Furnish catalog sheets showing details of metal wall ties, wall reinforcements, and anchors required.
 - b. Identify brand name, catalog number, and manufacturer.

1.03 QUALITY ASSURANCE

- A. Masonry work shall conform to "Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402)".
- B. Certification:
 - 1. Clay masonry shall be tested in accordance with ASTM C67.
 - 2. Concrete masonry shall be tested in accordance with ASTM C140.
- C. Mock-ups:
 - 1. Mock-up panels shall be constructed of each type of masonry wall using proposed materials and procedures. Minimum panel size shall be 4-ft x 4-ft.
 - a. The mock-up panels shall include the selected color and texture, mortar color and tooling, bonding and joints, and reinforcement and ties.

2. Upon acceptance of the mock-up panels, the panels shall establish the standard for acceptance of the project Work.
3. Unless directed otherwise, the panels shall be constructed separate from the work and shall be retained at the job site until all masonry work has been completed and accepted.

1.04 DELIVERY, STORAGE AND HANDLING

- A. All masonry units and accessories shall be protected against adverse physical, environmental, storage, and handling conditions that could cause staining, corrosion, physical harm, or other damage.

1.05 COLD WEATHER PROTECTION

- A. Precondition masonry units and mortar sufficiently with warm water to obtain a mortar temperature of 60°F when laid.
- B. Mixing water shall be between 130°F and 165°F.
- C. The completed masonry shall be protected from rain or snow for a period of 24 hours by non-staining weather-resistant membrane and protected from freezing by use of insulating blankets and auxiliary heat as recommended by the International Masonry Industry All-Weather Council.
- D. The tops of masonry walls shall be protected with covers during the night, inclement weather, or delays during construction.
- E. Do not apply uniform or concentrated loads to newly laid masonry walls or columns for at least 3 days.

1.06 HOT WEATHER PROTECTION

- A. Masonry units shall be wetted periodically with sufficient water to prevent the rapid absorption of moisture from the mortar when laid.
- B. Finished work shall be protected from winds and sun by wet covers for a period of 24 hours.

PART TWO – PRODUCTS

2.01 MATERIALS

- A. Provide masonry units similar in texture and physical properties to the samples approved and stored for inspection at the work site.
- B. Bond beams shall be provided as shown on the Drawings, or as required, and shall consist of load bearing units filled with concrete or grout and reinforced with steel reinforcement. The reinforcement shall be continuous except through expansion joints. Where the bond beam is not broken at the expansion joint, a dummy control joint shall be formed in the bond beam.
- C. Face brick shall be ASTM C216, Grade SW, type FBS. Face brick shall be cored except for soffits, offset bands, and any other location where holes would be visible. In such locations solid brick shall be used. The size of the brick shall be either 2-1/4" x 3-3/4" x 8" or 2-1/4" x 3-5/8" x 7-5/8". Coordinating height shall be 3 courses to 8-inches.
- D. Common brick shall be ASTM C62, Grade MW. Common brick shall be used as backup in all load bearing walls and may be used anywhere that is not visible. The size of the brick shall be either 2-1/4" x 3-3/4" x 8" or 2-1/4" x 3-5/8" x 7-5/8". Coordinating height shall be 3 courses to 8-inches.
- E. Utility brick shall conform to ASTM C216, Grade SW, Type FSB. Nominal dimensions shall be 4" x 4" x 12".
- F. Structural glazed tile shall conform to ASTM C126, Grade S, 6T or 8W Series with vertical cores unless otherwise noted on the Drawings. Three courses of solid masonry units shall be provided under all structural steel beams and bar joists bearing on glazed tile. In general, all external corners, joints, and lintels shall be square, except where shown otherwise. Sills shall be bullnosed. Tile shall be a product of Stark Co.; Burn & Russell Co.; or equal. Colors shall be as indicated in PART FOUR or as selected by the Owner.

- G. Acoustical structural glazed facing tile shall conform to ASTM C126, Grade SS, Type I, 6T Series. Thickness shall be as shown on the Drawings. Colors shall be as indicated in PART FOUR or as selected by the Owner. Units shall have random face perforations and shall be furnished with vermin-resistant, chemically inert, moisture-proof, fiberglass pads, that are factory inserted in the cores.
- H. Concrete block in load bearing walls shall be ASTM C145 Grade N, Type I; or C90, Grade N, Type I. Blocks shall be nominal 8" x 16" by the thickness shown on the Drawings. All block shall be set in running bond with all intersections bonded or keyed with wall ties. Block shall be laid two courses in 16". Block shall be set with cells vertical. Two courses of solid masonry units shall be provided under all roof or beam loads, unless otherwise noted on the drawings.
- I. Concrete block in non-load bearing walls shall be ASTM C90, Grade N, Type I. Blocks shall be nominal 8" x 16" by the thickness shown on the Drawings. All units used in exposed areas shall be of uniform texture with all exposed edges free of chips.
- J. Architectural concrete masonry units shall conform to ASTM C90, Type I, normal weight. Nominal dimensions of shall be 8" x 16" by the thickness shown on the Drawings.
1. Units shall be split-ribbed type with 8 ribs per standard unit.
 2. Units shall contain integral polymer water repellant admixture. Admixture shall be Forrer Industries "Dry-Block Water Repellant Admixture", or equal.
 3. Units shall be integrally colored with mineral oxide pigments. Color shall be as listed in PART FOUR or as selected by Owner from manufacturer's standard colors.
- K. Glazed concrete masonry units shall conform to ASTM C744 and ASTM C90, Type I, normal weight. Nominal dimensions of standard unit shall be 8" x 16" by the thickness shown on the Drawings. Color shall be as listed in PART FOUR, or as selected by Owner from manufacturer's standard colors. Glazing shall be "Spectra Glaze II" as licensed by The Burns & Russell Company, or equal.
- L. Acoustical concrete masonry units shall conform to ASTM C90, Type I, normal weight. Nominal dimensions of standard unit shall be 8" x 16" by the thickness shown on the Drawings.
1. 8" and 12" thick units shall have flared slots, and sequential cavities with metal septa laminated to the back of incombustible fibrous filler in each cavity. Units shall be "Soundblox Type RSC" as licensed by The Proudfoot Co., Inc., or equal.
 2. 4" and 6" thick units shall have flared slots with metal septa laminated to the back of incombustible fibrous filler in each cavity. Units shall be "Soundblox Type R" as licensed by The Proudfoot Co., Inc., or equal.
- M. Glazed acoustical concrete masonry units shall conform to ASTM C744 and ASTM C90, Type I, normal weight. Nominal dimensions of standard units shall be 8" x 16" by the thickness shown on the Drawings. Color shall be as listed in PART FOUR or as selected by the Owner from the manufacturer's standard colors.
1. 8" and 12" units shall have flared slots, and sequential cavities with metal septa laminated to the back of incombustible fibrous filler in each cavity. Units shall be "Soundblox Type RSC" as licensed by The Proudfoot Co., Inc., or equal.
 2. 4" and 6" thick units shall have flared slots with metal septa laminated to the back of incombustible fibrous filler in each cavity. Units shall be "Soundblox Type R" as licensed by The Proudfoot Co., Inc., or equal.
 3. Glazing shall be "Spectra Glaze II" as licensed by The Burns & Russell Company, or equal.
- N. Concrete Brick shall conform to ASTM C55, Type I, Grade N.
- O. Precast concrete lintels shall have an appearance similar to the masonry units in the wall surrounding the lintel. Lintel shall be constructed as shown and shall be marked for proper location and orientation.

2.02 BAR REINFORCEMENT

- A. Reinforcement shall be grade 60 deformed bars conforming to ASTM A615 or ASTM A616 including supplementary requirement S1.
- B. Bars shall be fabricated in conformance with CRSI Manual of Standard Practice.
- C. Reinforcement shall be cold bent, and shall not be bent or straightened in an injurious manner.

2.03 JOINT REINFORCEMENT

- A. Joint reinforcement shall be manufactured with wire conforming to ASTM A82, size number W1.7 (9 gauge). Longitudinal wires shall be deformed in conformance with requirements of ACI 530.1/ASCE 6/TMS 602.
- B. Joint reinforcement shall be fabricated in truss and ladder configurations.
 - 1. Ladder type reinforcement shall have three longitudinal wires. Two wires shall reinforce back-up warp and the third wire shall act as a tie and reinforcement for the facing warp. Cross wires shall be spaced at 15" centers and shall not have moisture drip. Dur-O-Wal "Ladder Type Trirod", AA Wire Products Company "AA510 Tri-Lok", or equal.
 - 2. Truss type reinforcement shall have two longitudinal wires. Cross wire intersections shall be located at 16" maximum centers. Dur-O-Wal "Truss", AA Wire Products Company "AA600 Blok-Truss", or equal.
- C. Corners and intersections shall be factory fabricated.
- D. Joint reinforcements that incorporate adjustable ties are not permitted.
- E. Joint reinforcement shall be hot dip galvanized in accordance with ASTM A153.

2.04 PREMOLDED JOINT MATERIAL

- A. Control joint filler shall be highly compressible extrusion of four connected rubber tubes. Material shall conform to ASTM D1056, Grade 2A1. Williams Products, Inc. "Everlastic Neo-Seal IV", or equal.
- B. Shear keys shall be made of rubber conforming to ASTM D2000, M2AA-805 with minimum durometer hardness of 80 or PVC conforming to ASTM D2287, Type PVC 654-4 with minimum durometer hardness of 85. Material shall be Williams Products, Inc. Dur-O-Wal "Rapid Control Joint Rubber Compound", "Rapid Poly-Joint PVC Compound", or equal.
- C. Expansion joint filler shall be expanded neoprene conforming to ASTM D1056 Grade 2A1. Thickness shall be as shown. Filler shall be Williams Products, Inc. "Williams Neoprene Type NN1, 1040 Series", or equal.
- D. Isolation Gasket shall be expanded PVC conforming to ASTM D1056 Grade 2A1 and ASTM D1667, Grade VE41. Williams Products, Inc. "Williams Vinyl U Gasket, 1000 Series", or equal.

2.05 ANCHORS AND TIES

- A. Dovetail Anchors
 - 1. Dovetail anchor slots shall be minimum 22 gauge mill-galvanized steel. Anchor slot shall be 1" deep x 1" wide with a 5/8" throat and furnished with removable filler.
 - 2. Anchor shall be 12-gauge dovetail, factory assembled to 3/16" thick flexible wire anchor without moisture drip. Anchor shall have mill galvanized finish. Dur-O-Wal "D/A 720", AA Wire Products Company "AA200", or equal.
- B. Flexible anchors shall be 1/4" weld-on wire with 3/16" hot-dip galvanized triangular ties, Dur-O-Wal "D/A 709/710", AA Wire Products Company "AA401", or equal.
- C. Corrugated wall ties shall be 7/8" wide x 20 gauge, mill-galvanized steel. Dur-O-Wal "D/A CWT", AA Wire Products Company "AA311", or equal.

- D. Rigid straps shall be 1-1/4" wide x 1/4" thick x 2'- 0" long, ASTM A36 steel bar formed in a Z-shape with 2" legs.

2.06 ACCESSORIES

- A. Through-wall flashing shall be minimum 5-oz. weight copper sheet permanently bonded between two layers of asphalt coated glass fabric.
- B. Weepholes and brick vents shall be injection molded PVC vents. Williams Products, Inc. "Williams-Goodco Brick Vent", or equal.
- C. Hardware cloth shall be corrosion proof, biologically inert and shall not reduce bond in mortar joint. Dur-O-Wal "Dur-O-Stop", or equal.

2.07 GROUT

- A. Grout shall conform to ASTM C476. Admixtures shall not be used without written permission of Engineer.
- B. Grout shall be proportioned and mixed in accordance with ASTM C476. Minimum compressive strength of grout shall be 2000 psi. Slump shall be between 8" and 11".

2.08 MORTAR

- A. Mortar for load-bearing building walls shall conform to ASTM Specifications for Mortar for Unit Masonry, Designation C270, Type M. Mortar for partitions and non-bearing walls shall conform to ASTM Specification C270, Type N.
- B. Mortar for special use shall follow the same specifications and use either white cement or coloring added to the mortar, as required. When colored block are specified, coloring shall be added to the mortar.
- C. Mortar for underground use shall conform to ASTM Specification Designation C270, type S (A-2), but shall not contain masonry cement.
- D. Materials shall be proportioned by measuring the ingredients thoroughly mixed in a portable drum type mortar mixer or approved other methods. Mixing shall continue until the mortar is uniform in color and consistency.
- E. Only sufficient mortar shall be prepared for immediate use, and any mortar that has set shall not be re-tempered or used in the work.
- F. Setting accelerators or anti-freeze compounds shall not be used.
- G. Masonry cement shall conform to ASTM Designation C91, type II, and shall be a product of the Huron Portland Cement Co., North American Cement Corp., or equal.
- H. Mortar shall be mixed with sand of the type and gradation recommended by the cement manufacturer in proportion to volume of 1 part cement to 3 parts sand.

PART THREE – EXECUTION

3.01 GENERAL

- A. Units shall be laid in a full bed of mortar.
- B. Courses shall be carried up level with no section of wall extended more than 3 ft. above an adjacent section. When specifically permitted or required, in certain locations, courses shall be stepped as directed.
- C. Where brickwork starts on top of concrete walls, the wall shall be plastered with approved roofing cement, and approved through-wall flashing shall be thoroughly bedded in the cement and turned up outside the interior face brick. Brick laying shall then be started.
- D. The coursing of brickwork must be predetermined to assure the proper location of sills, lintels, and similar units, at their proper elevation without the use of half courses or brick pinnars.

- E. Exterior face brick, interior common brick, and backup brick shall be laid in running bond, unless shown otherwise on the Drawings. Glazed tile shall be laid in running bond, except where stacked bond is shown. Horizontal joints in all brickwork shall be such as to permit three courses in 8". Vertical joints shall be 3/8" thick. Metal wall ties shall be used in every third course for bonding. Where wall tie inserts are used in concrete walls, they shall be installed in continuous vertical lines spaced not more than 2'-6" centers and be of galvanized steel. One line of inserts shall be used wherever a brick wall abuts a concrete surface. Other anchors shall be installed at not more than 2'-0" centers. Glazed facing tile shall be bonded to brickwork by horizontal wall reinforcement, spaced not more than 16" vertically.
- F. Interior and exterior joints shall be finished concave, unless otherwise ordered.
- G. Window and doorframes shall be set plumb and true, and securely braced, and joints between brick and frames thoroughly filled.
- H. Control Joints
1. Construct vertical control joints in all brick and concrete masonry unit walls at intervals not exceeding 25'-0" except where otherwise shown on the drawings.
 2. Extend concrete brick or block jambs of all door and window openings vertically as control joints wherever the height of the masonry above or below the opening is less than the opening. Grease end of lintels or wrap with 15 pound roofing felt to permit movement at control joints.
 3. Provide control joints at all junctions of bearing and non-bearing walls. Interrupt wall reinforcing at control joints.
- I. Expansion joints, masonry flashing, flue liners, and other specialties shall be accurately installed as detailed on the Drawings.
- J. Concrete block walls shall have truss design masonry wall reinforcement in every second horizontal joint (16" C.C.) and in each joint (8" C.C.) for two joints above and below all block openings. Reinforcement shall be continuous with 6" laps and bent corners. Extra reinforcement at openings shall be extended 2 ft. beyond each side of opening.
- K. All non-painted masonry walls shall be treated with two coats as specified below, unless otherwise shown on the Drawing.
- Type B:
1. Type B shall be clear colorless liquid silicone polymer material.
 2. It shall not alter the appearances of the surface. It shall penetrate the concrete block surface pores and deposit silicones that will retard water absorption by the block concrete.
 3. Type B shall be "Hydrocide S-X" by Sonneborn, "Dehydratine 22" by A.C. Horn, Inc., or equal.
 4. Each coat shall have a coverage rate of 80 to 100 sq. ft. per gallon.
- L. Structural glazed tile walls shall be provided with a structural glazed tile coved wall base where noted on the Drawings.
- M. Tuck Pointing Procedures - All defective or other joints that require tuck-pointing shall be repaired as follows:
1. Remove mortar to a depth of at least 1/2 inch. If power tools are to be used, care shall be taken to prevent damage to existing brick.
 2. After completion of cutting, remove all loose material with a hose stream.
 3. Carefully select and proportion mortar for tuck-pointing.
 4. Wet joints thoroughly before applying fresh mortar to insure a good bond.

5. Allow water to soak into wall. Do not apply mortar to any surface visibly wet with free-standing water.
6. Pack mortar into joint in thin layers until joint is filled, then tool to a smooth concave surface.

3.02 CUT STONE

- A. Stones shall be squared and full edged with all necessary holes, chases, drips, and openings machine cut. All stones shall be cut to lie on their natural beds
- B. Anchors, supports, fasteners, and other attachments shall be secured to stones and supporting surfaces. Anchors and dowels shall be firmly placed and holes shall be filled with mortar. Pierced flashing shall be resealed.
- C. Stones shall be cleaned before setting using only water or mild cleaning compounds containing no caustics or abrasives. Stones shall be thoroughly drenched with water just before setting.
- D. Stone shall be set in a full bed of mortar. Horizontal bed joints shall be tooled 3/8" thick and match those in the brickwork. Plastic setting pads of same thickness as joint shall be placed under heavy units to prevent squeezing of mortar. Vertical joints shall be as narrow as possible. In every fourth vertical joint of all stone copings and continuous sills, a neoprene control joint meeting ASTM D1056 and C509 shall be provided. Neoprene gasket shall be 1/4" thick and shaped to the profile of the stone section with allowance for 3/8" depth of caulking. After setting, joints shall be raked and mortar smears and splashes shall be removed.
- E. All exposed surfaces of the stone shall be coated with a damp-proofing product. The exposed surfaces shall receive a clear material that does not discolor the stone. Unexposed stone surfaces shall be damp proofed with bituminous paint to within 1" of the exposed surfaces.
- F. Shop drawings shall be submitted to the Engineer showing all stone sizes and methods of anchoring and installing.
- G. After setting, all exposed cut stone surfaces such as projecting ledges, window sills, copings, and other finished stone that may be injured by subsequent operations shall be securely boxed with a non-staining wood for protection. Any damaged stonework shall be removed and replaced. Patching or concealing defects will not be permitted. All stone shall be thoroughly cleaned with soap and water, and all joints shall be carefully pointed with white cement mortar upon completion of the building.
- H. POINTING
 1. Prior to pointing, exposed faces shall be cleaned with fiber brushes, soap powder, and clean water, and shall be rinsed thoroughly.
 2. Joints shall be tooled when mortar is thumbprint hard with rounded jointer having diameter 1/8" larger than width of joint.

3.03 CAST STONE

- A. Cast stone shall be installed in accordance with manufacturing tolerances, procedures, and methods of the Cast Stone Institute.
- B. Cast copings and sills shall be formed within the tolerances given in the Section 03120.
- C. Stones shall be cleaned before setting using only water or mild cleaning compounds containing no caustics or abrasives. Stones shall be thoroughly drenched with water just before setting.
- D. Anchors, supports, fasteners, and other attachments shall be secured to stones and supporting surfaces. Anchors and dowels shall be firmly placed and holes shall be filled with mortar. Pierced flashing shall be resealed.
- E. Cast stone shall be set in a full bed of mortar. Horizontal bed joints shall be 3/8" thick and match those in the brickwork. Plastic setting pads of same thickness as joint shall be placed under heavy units to prevent squeezing of mortar. Vertical joints shall be as narrow as possible. In every fourth vertical joint of all copings and continuous sills, a neoprene control joint meeting ASTM D1056 and C509 shall be provided. The neoprene gasket shall be 1/4" thick and shaped to the profile of the precast concrete section with allowance for 3/8" depth of caulking. After setting, joints shall be raked and mortar smears and splashes shall be removed.

- F. All exposed surfaces of the cast stone shall be coated with a Type B colorless damp-proofing product that does not discolor the stone. Unexposed stone surfaces shall be damp proofed with bituminous paint to within 1" of the exposed surfaces.
- G. Shop drawings shall be submitted to the Engineer showing all stone sizes and methods of anchoring and installing.
- H. After setting, all exposed cast stone surfaces such as projecting ledges, window sills, copings, and other finished stone that may be injured by subsequent operations shall be securely boxed with non-staining wood for protection until their removal is authorized upon completion of the building. Any damaged stonework shall be removed and replaced. Patching or concealing defects will not be permitted. All stone shall be thoroughly cleaned with soap and water, and all joints shall be carefully pointed with white cement mortar.
- I. POINTING
 - 1. Prior to pointing, exposed faces shall be cleaned with fiber brushes, soap powder, and clean water, and shall be rinsed thoroughly.
 - 2. Joints shall be tooled when mortar is thumbprint hard with rounded jointer having diameter 1/8" larger than width of joint.

3.04 GLASS BLOCK

- A. Installation of Glass block shall be in strict accordance with manufacturer's recommendations. In general, the Contractor shall:
 - 1. Remove surplus mortar from the faces of the glass block at the time joints are struck or tooled. Mortar should be removed while it is still plastic using a clean, wet sponge or an ordinary household scrub brush having stiff bristles.
 - 2. Do not use harsh cleaners, acids (of any strength), abrasives or alkaline materials while cleaning glass block. Never use a wire brush to remove mortar from glass block surfaces.
 - 3. Remove mortar residues with a clean, wet sponge or cloth. Rinse sponge or cloth frequently in clean water to remove abrasive particles that could scratch glass surfaces. Allow any remaining film on the block to dry to a powder.
 - 4. After all organic sealants, caulking, and other materials have been applied, remove excess materials with commercial solvents such as xylene, toluene, mineral spirits or naphtha and follow with normal wash and rinse. Be careful not to damage caulking by over-generous application of strong solvents. Comply with solvent manufacturer's directions on label for toxicity and flammability warnings.
 - 5. Final cleaning of glass block panels is accomplished after they are completely installed. Wait until panels are not exposed to direct sunlight. Start at the top of the panel and wash with generous amounts of clean water. Dry all water from the glass block surface. Change cloth frequently to eliminate dried mortar particles or aggregate that could scratch the glass surface. To remove the dry powder from the glass surfaces, use a clean, dry, soft cloth.

3.05 RECESSES AND WALLING-IN WORK

- A. The Contractor shall attend to the walling-in at the proper positions: steel beams, steel columns, bar joists, lintels, window and door frames, anchors, anchor bolts, cutout boxes, electric conduits, downspouts, pipe sleeves, and all similar work. Contractor also shall form all flues, ventilating shafts, leader shafts, recesses, and openings in the walls for the complete performance of the other work of the Project. All aluminum materials inserted into or in contact with masonry shall have the contact surface coated with bitumastic.
- B. Provide weep holes at 32" centers horizontally in mortar joints of face brick enclosing cavity wall construction along the bottom of the cavity over the foundation. Provide a 3/8" nylon wick in the weep holes. The wick shall be cut off flush with the outside face of the masonry and extend to flashing on the cavity side.

3.06 COLD WEATHER PLACEMENT

- A. No masonry units shall be laid in weather below 40°F except by written permission of the Engineer. When such permission is granted, laying shall be in accordance with the recommendations of the International Masonry Industry All-Weather Council.

3.07 PROTECTION

- A. Units shall be protected from mortar droppings and stains.
- B. Sills, projecting belt courses, and other masonry that may be subject to damage shall be protected with non-staining building paper and substantial wood coverings.
- C. Protection shall be maintained until final acceptance of the work.

3.08 CLEANING

- A. Promptly, after completion of masonry work, all joints shall be carefully pointed and surfaces thoroughly cleaned, using dilute muriatic acid and exercising extreme care to prevent acid from contacting concrete work, cut stone, metal sash, or doors.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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DIVISION 5

METALS

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GRATING, STAIRS AND LADDERS

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide all aluminum and steel grating, stair treads and ladders, complete in place as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications
 - 2. Section 05100: Structural Steel

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
 - 2. Manufacturers' recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Test data required in this Specification.
 - 4. The Engineer may require calculations to be submitted and approved for gratings and ladders, if shop drawings are not conclusive as to the load carrying capacity of the item.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 GRATING MATERIALS

- A. Steel grating (for trench drains in vehicle areas) shall be heavy-duty welded steel type, in sections. Bearing bars shall be 1 1/2" x 1/4", spaced at 1 3/16" c.c., with cross bars at 4" maximum spacing. Grating shall be completely banded with full depth 3/16" or 1/4" edge bands. Banded sections shall be of size that will weigh between 60 and 120 pounds. Steel grating shall be as manufactured by IKG Industries (Gary Grating), Reliance Steel Products, or an approved equal.
- B. Aluminum gratings shall be of the mill finished I-Bar type, with straight parallel "I" shaped bearing bars having top and bottom flanges grooved for slip resistance. Bearing bars shall be spaced at 1 3/16" c.c., and cross bars at 4"

c.c. Aluminum gratings shall meet the following requirements:

1. Bearing bar webs shall be punched to receive the crossbars. Notching, slotting, or cutting the top or bottom flanges of bearing bars to receive cross bars will not be permitted.
2. Cross bars shall be secured to the main bars by a swaging process to prevent turning, twisting, or coming loose.
3. Bearing bars shall be made from aluminum alloy 6063-T6 or 6061-T6.
4. Cross bars shall be made from aluminum alloy 6063-T1 or 6063-T5.
5. Finish shall be standard mill as fabricated.
6. Aluminum 2 1/2" grating shall have a section modulus per foot of width sufficient to carry a uniform loading of 300 pounds per S.F. on a 7'0" span (based on a fiber stress of 12,000 psi).
7. Aluminum 1 1/2" grating shall have a section modulus per foot of width sufficient to carry a uniform loading of 100 pounds per S.F. with a concentrated load of 300 pounds on a 4'0" span (based on a fiber stress of 12,000 psi), with a maximum deflection of 1/4".
8. All gratings shall be banded with edge bands of the depth of the bearing bars, with a band thickness of 3/16" or more. Openings through the gratings with a dimension of 6" or more shall be completely banded. Smaller openings shall be rectangular and must be banded where required to support the area where equipment is located on the gratings. All grating, whether removable or not, shall be attached with no less than two (2) points of connection for each panel on each support. The attachment shall be positive of non-corrosive material, with no portion of the attachment above the top of the grating (saddle clips not permitted). Nor more than one nut and washer, or one bolt and washer, shall be removable at any one connection point (e.g. connection shall not be made with a loose bolt and nut). Removal and replacement of connections shall be such that it can readily be accomplished from the top of the installed grating.
9. The size of removable panel shall be determined by the manufacturer, but shall not exceed 140 pounds in weight.
10. Grating supports shall consist of aluminum angles set and anchored into concrete to provide a smooth, level, 1 1/2" minimum bearing surface, free of burrs, bridging, welds, or other irregularities. Suitable stainless steel anchors shall be provided. All surfaces in contact with concrete shall have a shop coat of heavy unthinned bitumastic paint. Where gratings are to be supported upon structural members, proper fastening devices as recommended by the grating manufacturer shall be provided to anchor the gratings.
11. The aluminum gratings shall be as manufactured by IKG Industries (Gary Grating), Reliance Steel Products, or an approved equal.

2.02 ALUMINUM STAIRS

- A. Stair treads shall be composed of aluminum I-Bar grating materials, and shall have a deep-faced nosing. The nosing shall be grooved and shall also have an applied abrasive material. Treads shall be designed for no less than a concentrated 400 pound loading applied at the center of the span. This loading shall be carried by the nosing and the first two bearing bars. The tread thickness shall be no less than 1-1/2". Treads shall be as manufactured by Reliance Steel Products, or an approved equal.
- B. Aluminum for structural members, plates, tubes, angles, etc., shall conform to the requirements of 6061-T6. Aluminum extrusions shall be 6351-T5 and all aluminum shall be anodized.

2.03 CHECKERED FLOOR PLATES

- A. Checkered floor plates shall be aluminum with raised diamond pattern on the upper surface. Floor plate shall be 1/4" thick and designed to support a uniform load of 200 lbs. per square foot with a deflection of not more than 1/4". Maximum fiber stress shall not exceed that allowed by the Aluminum Association. Reinforcing rib size, depth and spacing is to be determined by the floor plate fabricator. The fabricator of the floor plate shall submit calculations to the engineer for approval. Calculations shall show reinforcing rib size, spacing and weldment if calculations show that ribs are required.

2.04 ABRASIVE TREADS FOR CONCRETE STEPS

- A. Abrasive treads shall be aluminum oxide type bonded to aluminum and shall be as manufactured by Wooster Products, Inc., or an approved equal.

2.05 ALUMINUM LADDER

- A. Ladder shall be TUF Ladder as manufactured by Thompson Fabricating Co. (Birmingham, AL) or approved equal.
- B. Rung Description: The rung shall be designed to provide a non-slip power grip surface with a flat 1" wide serrated top surface and a semicircular bottom. The straight sides and semicircular bottom shall have striations of approximately 5/16" centers for gripping surface. The rung shall be an aluminum extrusion, alloy 6063-T6, of sufficient section modulus and moment of inertia to withstand the design loads.
- C. Side Rail Description: The side rail shall be 1-1/2" Schedule 40 pipe, alloy 6063-T6, 6105-T5 or 6061-T6. Pipe shall conform to ATM-B-429 or ASTM-B-221.
- D. Codes: The ladder shall meet the requirements of ANSI-A14.3.
- E. Design Loads:
 - 1. Ladder rungs shall be designed to withstand a concentrated load of 250 pounds plus 30% impact. Maximum rung deflection shall not exceed L/360. The design load shall be applied at the center of the rung on a 4" wide area.
 - 2. Ladder side rails shall be designed to withstand a minimum live load of two 250 pounds loads plus 30% impact concentrated between any two consecutive attachments.
- F. Testing: Submit test reports for the Engineer's approval to verify design loads and deflections on the rungs and rung to side rail attachments. Testing to be verified by an independent testing laboratory. The design load, 325 lbs. (250x1.3), shall be applied at the center of the rung on an area 4" wide. The test rung will be attached to the side rails in the same manner as the production ladder. Design loads shall be applied and released a minimum of 200,000 times to demonstrate fatigue resistance and a sole extended service life. Deflection shall be checked periodically and shall not exceed L/360 at any time under full design load. All completion of testing the rung and attachments to the side rail shall be inspected for cracks, looseness, distortion, bending (permanent set) or other obvious damage.
- G. Finish: Pipe for side rails shall have the same finish as handrail if the ladder is located at an opening in handrail. Rungs, cage and brackets are to be mill finish.
- H. Guarding Floor and Wall Openings and Holes [OSHA 1910.23(a)(2)]: Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening. Self-closing gates are required only where shown on plans.

2.06 ALUMINUM LADDER CAGE

- A. Cage general design and size shall be in accordance with ANSI-A-143. The cage shall be shipped knocked-down for field assembly.
- B. The prefabricated horizontal bands shall be aluminum bars, alloy 6061-T6, 3" x 1/4" for the top and bottom bands and 2" x 1/4" for the intermediate bands.
- C. The pre-cut, pre-drilled vertical bars shall be aluminum bars 1-1/2" x 3/16", alloy 6061-T6.
- D. All necessary stainless steel hardware shall be furnished for field assembly of the cage.
- E. Cages are required on ladders where shown on the plans or when length of ladder exceeds 10 feet.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to grating installation, inspect supports for correct size, layout, alignment and verify that surfaces to receive grating are free of debris. Contractor shall correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturers' recommendations and shop drawings as approved by the Engineer.
- B. Position grating sections flat, level, true, and free from rack with square ends bearing a minimum 1 1/2" on supporting aluminum angles. Band random cut ends and diagonal or circular cut exposed edges with aluminum bar welded at contact points at the direction of the Engineer.
- C. Anchor grating firmly into position as specified and as recommended by the manufacturer, or as directed by the Engineer.
- D. Install ladders with brackets supplied by the manufacturer, plus expansion bolts into the concrete walls.
- E. Wall step installation shall be as shown and shall comply with OSHA regulations for a fixed ladder.
- F. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work Included: The Contractor shall furnish all aluminum shapes, plates, bars, strips, tubes and pipes which are not a part of the structural steel or other metal systems in other Section of these Specifications.
- B. Related Work:
 - 1. Including but not limited to the General Conditions, Supplementary Conditions or General Requirements.
 - 2. All applicable Divisions of the Technical Specifications.

1.02 SUBMITTALS

- A. Shop Drawings
 - 1. The Contractor shall furnish for approval complete shop drawings showing all framed work and all connections to concrete or masonry. He shall also furnish erection drawings.
 - 2. Where the Drawings are diagrammatic, the Contractor shall design the connections using Aluminum Association design and allowable stresses and submit for approval. Where beam reactions are shown on the Drawings, the connections shall be designed to give a capacity at least equal to the reaction shown.
- B. Manufacturer's Materials Certificates
 - 1. If required, the manufacturer or supplier shall furnish certification that materials and shop welding conform to requirements of these Specifications.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Aluminum for structural members, plates, tubes, angles, etc. shall be 6061-T6.
- B. Aluminum extrusions shall be 6351-T5.
- C. All aluminum shall be anodized.

2.02 PROTECTION

- A. All material shall be kept clean and protected from the weather.

2.03 BOLTS AND NUTS

- A. All stainless steel bolts, washers and nuts shall be Type 316 stainless steel.

2.04 ANCHOR BOLTS AND INSERTS

- A. Anchor bolts and inserts for anchor bolts shall be placed before the concrete is poured. All anchor bolts and nuts shall be stainless steel, unless otherwise shown on the drawings. Galvanized bolts will not be permitted.
- B. Where permitted by the Engineer, the Contractor may use wedge type expanding anchors or adhesive anchors placed in pre-drilled holes. However, well in advance of pouring concrete he shall submit for the Engineer's

approval, drawings, information, and specifications showing the alternatives that will meet the requirements of the work.

- C. Connections to existing structures shall be made using approved expanding wedge type anchors or adhesive anchors in pre-drilled holes.
- D. Self-drilling anchors and powder-activated fasteners will not be permitted except where specified or shown on the Drawings.
- E. Where adhesive anchors are indicated on the Drawings, only that type shall be used.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 FABRICATION

- A. Provide loose bearing plates for aluminum items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.
 - 1. Direct contact between aluminum components and concrete or mortar shall be prevented by painting exposed aluminum surfaces with bituminous paint or water with methacrylate lacquer.
- B. Miscellaneous framing and supports
 - 1. Provide miscellaneous aluminum framing and supports as required to complete the work.
 - 2. Fabricate miscellaneous units to the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent grating, plates, doors or other work to be retained by the framing. Except as otherwise shown, fabricate from aluminum shapes and plates and aluminum bars, of all welded construction using mitered corners, welded brackets and splice plates and a minimum number of joints for field connection.

3.04 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Setting Loose Bearing Plates
 - 1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.
 - 2. Set loose bearing plates on wedges, or other adjustable devices. After items have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with mortar.
 - 3. Pack bedding mortar solidly between bearing surfaces and plates to insure that no voids remain.

- C. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction.
- D. Cutting, Fitting and Placement
 - 1. Perform cutting, drilling and fitting required for installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in framework for items which are to be built into concrete, masonry or similar construction.
 - 2. Fit exposed connections accurately together to form tight hairline joints. Weld those connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth.
- D. Stainless steel fasteners shall be installed where indicated on the Drawings or as required.
- E. Contact surfaces between aluminum members and areas adjacent to washers and welds shall be free of dirt, oil, loose scale, burrs, pits, and other defects that would prevent seating of the parts.
- F. Where welded construction is shown, ordered, or permitted by the Engineer, welding shall be performed in accordance with the American Welding Society "Structural Welding Code," D1.1, latest edition.
- G. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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DIVISION7

THERMAL AND MOISTURE PROTECTION

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PART ONE – GENERAL

1.01 REQUIREMENTS

- A. Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.
- B. This section covers the installation of below grade damp-proofing with coal tar coating for all exterior walls of concrete structures unless otherwise shown on Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE (NOT USED)

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

1.04 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

1.05 QUALITY ASSURANCE

(NOT USED)

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original sealed containers clearly marked with manufacturer's name, brand name, and type of material.
- B. Store materials in area where temperatures are strictly between 50 and 85 degrees F, unless otherwise approved by the manufacturer and authorized by the ENGINEER.

PART TWO – PRODUCTS

2.01 DAMP-PROOFING

- A. Asphalt compound of brush or spray consistency conforming to ASTM D 449.
- B. Acceptable products include H.B. Tnemecol 46-465 as manufactured by Themec Co., and Bitumastic 50 as manufactured by Carboline.

PART THREE – EXECUTION

3.01 INSPECTION

- A. Examine surfaces to receive damp-proofing to assure conditions are satisfactory for application of materials in accordance with the manufacturer's recommendations.

3.02 PREPARATION

- A. Clean surfaces to remove dust, dirt, oil, wax, efflorescence, and other foreign materials, in accordance with the manufacturer's instructions.
- B. Allow 3 days' drying time following washing down of substrate surfaces.
- C. Fill all cracks, voids, and honeycombs with non-shrink grout to provide sound surface for damp-proofing.

3.03 APPLICATION

- A. Do not proceed with application of materials when ambient temperature is less than 50 degrees F. or when temperatures of 40 degrees or less are predicted within a period of 24 hours after application.
- B. Do not apply damp-proofing in rainy conditions or within 3 days after surfaces become wet from rainfall or other moisture.
- C. Apply damp-proofing with a brush or with manufacturer-approved low pressure airless spray equipment with a coarse nozzle.
- D. Apply materials at rate and as recommended by the manufacturer and in two coats, or as permitted by the ENGINEER.
- E. Start application at the top of wall and work down the surface, keeping a wet edge at all times, forming a continuous, unbroken film and free from pinholes and other surface breaks.
- F. Clean spillage and overspray from adjacent surfaces as recommended by manufacturer or as directed by the ENGINEER.

3.04 FIELD QUALITY CONTROL

- A. After damp-proofing has dried, spray coat surfaces with water.
- B. Recoat surfaces that show water absorption, as recommended by manufacturer or as directed by the ENGINEER.
- C. Prevent blistering and protect surfaces from heat and direct sunlight until dried and before backfilling.
- D. Clean spillage and overspray from adjacent surfaces as recommended by manufacturer or as directed by the ENGINEER.

3.05 CLEANUP

- A. Upon completion of work, clean up all waste materials and debris and dispose of them off the site.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Protective water repellent applied directly to above grade, exterior surfaces indicated, including surface preparation and penetrating sealer application. This is a VOC compliant, water repellent for substrate protection as referenced in the following subsections:
 - 1. Applications of water-repellent system using a one-component blend of silane and siloxane in a water-based formulation (Subsection 2.04) including:
 - a. Concrete masonry units
 - b. Brick masonry units
 - c. Other porous masonry surfaces indicated
 - 2. Applications of water-repellent system using a one-component blend of silane and siloxane in a water-based formulation (Subsection 2.05) including:
 - a. Brick masonry units
 - b. Stucco or Exposed Aggregate Stucco Panels
 - c. Brush-blasted Pre-cast/Cast-In-Place Concrete
 - d. Other Porous Cementitious surfaces indicated
 - 3. Substrate applications of water-repellents using 40% silane in a water-based formulation (Subsection 2.06) including:
 - a. Architectural pre-cast concrete, vertical or horizontal surfaces
 - b. Horizontal concrete surfaces
 - c. Concrete Sub-Structure, Cast-In-Place/Pre-Cast
- B. Related Sections:
 - 1. Section 03120: Cast-In-Place Concrete
 - 2. Section 03400: Pre-cast Concrete
 - 3. Section 04200: Unit Masonry
 - 4. Section 07900: Joint Sealants

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Minimum of Five (5) Years experience in the successful application of water-based repellents.
 - 2. Manufacturer Qualifications: Manufacturer with a minimum of Five (5) Years experience in the successful production of one-component, water-based, Alkylalkoxysilane/siloxane blended technology.

- B. Mock-Up: Install mock-up at project site using acceptable water-repellent system per manufacturer's printed instructions. Obtain Engineer/Architect/Owner's approval of system, appearance and workmanship standard. Test small, remote areas to assure desired results. Perform water repellent function testing and analysis required for warranty prior to installation of complete system.

1. Mock-Up Size: Five (5) feet by Five (5) feet (Minimum)
2. Maintain mock-up during construction for workmanship comparison
3. Mock-up may be incorporated into final construction upon Engineer/Architect/Owner's approval

1.04 SUBMITTALS

- A. Refer to Division 1 for submittal procedures.
- B. Product Data: Submit manufacturer's current technical product data indicating product test results and compliance as indicated.
- C. Quality Control Submittals:
1. M.S.D.S. sheets indicating V.O.C. content and safety pre-cautions.
 2. Pre-Installation Conference: Submit report verifying project site conditions, approval of jobsite Mock-Up panels, manufacturer's instructions and requirements.
 3. Provide protection plan of surrounding areas and non-masonry surfaces.
 4. V.O.C. Certification: Submit certification of compliance that water-repellent materials furnished comply with regulations controlling the use of Volatile Organic Compounds (VOC).
- D. Contract Close-out Submittals:
1. Warranty: Manufacturer's executed standard warranty form with authorized signatures and endorsements.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect all products in accordance with the provisions in Section 01350.
- B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver water-repellent materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store and protect water-repellent materials from harmful weather conditions and at temperatures conditions recommended by manufacturer. Do not allow freezing to occur in storage or shipping. Protect from damage during construction and while stored onsite.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: In accordance with manufacturer's recommendations, substrates and ambient air temperature shall be 40 degrees F (4 degrees C) or greater and rising at installation time and remain above 40 degrees F for at least 12 hours after installation.
1. Weather Conditions: In accordance with manufacturer's instructions, do not apply water-repellents in snow, rain, fog, or mist, or when such conditions are expected. Allow surfaces to attain temperature ranges and conditions recommended by manufacturer before proceeding with water-repellent system installation.
 2. Compliance: Follow manufacturer's instructions with regard to safety, health, and other related

environmental precautions. Comply with all applicable Federal, State, and Local Environmental Regulations.

1.07 WARRANTY

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty form for water-repellent products. Include affirmation of system mock-up (test area) observation by applicator, general contractor, distributor and owner's representative required by warranty provisions. Approval by manufacturer for warranty is required prior to system application. Submit manufacturer's "Request For Warranty" and supporting documentation at completion of installation.
 - 1. Beneficiary: Issue warranty in legal name of project Owner
 - 2. Warranty Period: 5 years commencing on Substantial Completion

PART TWO - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Products specified as the standard of quality are manufactured by ChemRex Inc. of Shakopee, MN
 - 2. Address: 889 Valley Park Drive, Shakopee, MN 55379
 - 3. Telephone: 612-496-6000

2.02 RELATED MATERIALS

- A. Sealants: Refer to Division 7 Joint Sealants section for sealant requirements.
- B. Mortar Joint Repair: ChemRex Inc./Thoro Division - "Thorite 400" or "Dryjoint" installed as recommended by manufacturer.

2.03 MIXES

- A. The product is provided in a factory-blended solution to the jobsite. Mix in accordance with manufacturer's instructions using light agitation. No dilution of this product is required or allowed.

2.04 SILANE/SILOXANE FOR CONCRETE MASONRY

- A. Water Repellent Materials:
 - 1. Water-based, single component, clear water repellent for concrete masonry surfaces: "Enviroseal Double "7" H.D.".
- B. Performance Requirements:
 - 1. Water vapor transmission, ASTM E 96
Results: 80% minimum as compared to untreated samples
 - 2. Percent reduction of leakage, ASTM E 514-90;
Results: CMU walls 98.9% (minimum)
 - 3. Percent Active Ingredients - no less than 18%
 - 4. V.O.C. content; less than 400 grams/liter
 - 5. Density; 8.3 +/- 0.1 lb./gal

6. Flash Point: ASTM D 3278-82 - Results: Greater than 212 degrees F.
7. Water Repellency Test: ASTM C 140,
Results: 98.5% (minimum)
8. Depth of Penetration: Up to 3/8" (depending upon substrate).

C. APPLICATION

1. Apply water-repellent to properly prepared surfaces indicated. Apply water repellent within time restrictions after mixing and surface preparation as recommended by manufacturer.
2. Application Techniques: Apply water-repellent by low pressure spray techniques recommended by manufacturer to achieve desired results.
3. Apply one-component, water-based products from the bottom up with total saturation, providing a 6-8 inch run down. Apply water repellent material as demonstrated and approved at mock-up and not less than manufacturer's minimum recommended coverage rate. Average coverage rates will vary between 30-100 square feet per gallon depending on substrate porosity, texture and profile.
4. Match approved samples for warrantable performance, appearance, and coverage. Remove, re-apply or re-coat work not in compliance with Contract Documents or Manufacturer's Warranty Requirements.

2.05 SILANE/SILOXANE FOR BRICK MASONRY

A. Water Repellent Materials:

1. Water-based, single component, clear water repellent for brick: "Enviroseal Double "7" for Brick".

B. Performance Requirements:

1. Water vapor transmission, ASTM D 1653
Results: 49.8 grams/ft./24hrs. at 77F.(86% minimum as compared to untreated samples)
2. Percent reduction of leakage, ASTM E 514-90;
Results: Brick walls; 94.8% (minimum)
3. Accelerated Weathering (QUV), ASTM G 53;
Results: 1500 Hours - No loss in Repellency
4. Percent Active Ingredients - no less than 12%
5. V.O.C. content; less than 250 grams/liter
6. Density; 8.3 +/- 0.1 lb./gal
7. Flash Point: ASTM D 3278-82 - Results: Greater than 212 degrees F.
8. Water Repellency Test: ASTM C 67-80, Method A
Results: 96% (minimum)

C. APPLICATION

1. Apply transparent water-repellent to properly prepared surfaces indicated. Apply water repellent within time restrictions after mixing and surface preparation as recommended by manufacturer.
2. Application Techniques: Apply water-repellent by low pressure spray techniques recommended by manufacturer to achieve desired results.

3. Apply one-component, water-based products from the bottom up with total saturation, providing a 6-8 inch run down. Apply water repellent material as demonstrated and approved at mock-up and not less than manufacturer's minimum recommended coverage rate. Average coverage rates will vary between 80-175 square feet per gallon depending on substrate porosity, texture and profile.
4. Match approved samples for warrantable performance, appearance, and coverage. Remove, re-apply or re-coat work not in compliance with Contract Documents or Manufacturer's Warranty Requirements.

2.06 SILANE FOR PRECAST/CAST-IN-PLACE CONCRETE

A. Water Repellent Materials

1. Single-component, water-based, clear water-repellent, 40% Alkylalkoxysilane active ingredient, VOC Compliant; "ENVIROSEAL 40".

B. Performance Requirements: Products require the following performance standards be met or exceeded:

1. Moisture vapor transmission rate, OHD-L-35;
Results: 102% as compared to untreated samples)
2. Water Absorption Test: ASTM C 642-82 (Oklahoma DOT Std.)
Results: 0.42% absorption in 48 hour period. 1.20% 50 days
3. Scaling Resistance Test: ASTM C 672-84; (non-air entrained)
Results: 0 rating "No Scaling" - 100 cycles treated concrete; vs. 5 rating "Severe Scaling" 100 cycles Untreated concrete.
4. Percent Active Ingredients - no less than 40%
5. V.O.C. content: EPA Method 24; Results: less than 350 grams/liter
6. Density: 7.9 lb./gal. Specific Gravity - 0.95 kg/liter
7. Flash Point: ASTM D 3278-82 - Results: Greater than 200 degrees F.
8. Water Repellency Test: Alberta Transportation and Utilities Procedure type 1b, Water repellent performance, (@45% relative moisture) Results: Initial Performance - 89.4%; Post Abrasion Performance - 87.9%
9. NCHRP 244: Series II - Cube Test;
Weight Gain: Results - 85% reduction - (exceeds criteria)
Absorbed Chloride: Results - 87% reduction - (exceeds criteria)
Series IV - Southern Climate; Absorbed Chloride: 99% Reduction - (exceeds criteria)
10. AASHTO T259 & T260: Resistance to Chloride Ion Penetration; Results: Less than 0.52 lb./cu. yd. (criteria of 1.5) at 1/2inch depth; 0.00 lb./cu. yd. (criteria of 0.75) at one inch depth.

C. APPLICATION

1. Apply transparent water-repellent to properly prepared surfaces indicated. Apply water repellent within time restrictions after mixing and surface preparation as recommended by manufacturer.
2. Apply water-repellent by low pressure spray techniques recommended by manufacturer.
3. Apply single-component, water-based products from the bottom up (on vertical surfaces) with total saturation, providing an 8"-12" inch controlled run down. For horizontal application, apply flood coat to saturation working to a wet edge. The product may be poured down followed by brooming with a medium, stiff bristled push broom or equivalent.
4. Apply water repellent material as demonstrated and approved at mock-up and not less than manufacturer's

minimum recommended coverage rate, Coverages of approximately 100-200 square feet per gallon can be attained depending on substrate porosity, texture and profile.

5. Match approved samples for warrantable performance, appearance, and coverage. Remove, re-apply or re-coat work not in compliance with Contract Documents or Manufacturer's Warranty Requirements.

PART THREE - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's most recently published product technical bulletins including, installation instructions, substrate testing, surface preparation and cleaning, and post installation testing.

3.02 EXAMINATION

- A. Verify substrate conditions are acceptable for water-repellent system installation in accordance with manufacturer's instructions.
 1. General: Determine acceptable removal techniques for contaminants harmful to water-repellent performance, such as dust, dirt, grease, oils, curing compounds, form release agents, laitance, efflorescence, existing films and other water repellent coatings.
 2. CMU or Brick Masonry: Verify substrates have been installed true in plane and have cured to full load bearing capacity (28 days). Repair Concrete imperfections with ChemRex Inc./Thoro Division products "Thorite 400" repair materials installed per manufacturer's recommendations.
 3. Mortar Joints: Determine removal of loose, soft, friable mortar. Replace with ChemRex Inc./Thoro Division "Dryjoint". Cure replacement mortar at least 7 days prior to application of water repellent system.
 4. Concrete: Verify concrete substrates have cured to full load bearing capacity (14-28 days). Repair concrete imperfections with ChemRex Inc./Thoro Division Products-Thorite "400" for vertical repair or "Thoropatch" for horizontal repair installed per manufacturer's recommendations.

3.03 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during water-repellent system installation.
- B. Prior to installation, clean substrates of substances that could impair penetration or reaction of water-repellent system. Coordinate cleaning and application to avoid contamination of newly treated surfaces.
- C. Test and clean substrates in accordance with manufacturer's printed recommendations and the following National standards:
 1. ASTM D 5703, Preparatory Surface Cleaning for Clay Brick Masonry
 2. ASTM D 4261, Cleaning Concrete Unit Masonry for Coating
 3. ASTM D 4258, Surface Cleaning Concrete for Coating
 4. ASTM D 4262, Test Method for pH of Chemically Cleaned Concrete
 5. ASTM D 4259, Abrading Concrete
- D. Substrates shall be clean, dry, sound, and free of contaminants detrimental to water repellent system performance.
 1. Remove contaminants by approved methods demonstrated at mock-up.
 2. Allow cleaned, damp or water soaked surfaces to become unsaturated and dry before installation.

3. Efflorescence, mold, and mildew shall be treated, neutralized and removed prior to water repellent installation.

3.04 FIELD QUALITY CONTROL

- A. Post Installation Testing: Owner reserves the right to complete recommended testing required by the manufacturer at completion of work to assure warranty requirements, and contract compliance are met.

3.05 CLEANING AND PROTECTION

- A. Remove temporary coverings and protection of adjacent work areas. Remove over-spray coating from windows or areas not intended to be coated with hot soap-water solution or a mild detergent cleaner.
- B. Remove construction debris from site resulting from work in this section.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide building insulation where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to, perimeter insulation.
- B. Summary of PART TWO - PRODUCTS
 - 1. Subsection 2.01: Foundation Insulation
 - 2. Subsection 2.02: Other Materials
- C. Summary of PART THREE - EXECUTION
 - 1. Subsection 3.01: Surface Conditions
 - 2. Subsection 3.02: Coordination
 - 3. Subsection 3.03: Installation
 - 4. Subsection 3.04: Installation - Foundation Insulation
 - 5. Subsection 3.05: Verification
- D. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.
 - 2. Section 04200: Masonry

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experience in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Manufacturers' brochures and other written material in sufficient detail to show that the product complies with the Specifications and Drawings.
 - 2. Manufacturers' recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Test data required elsewhere in this Section.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 MATERIALS

Materials to be used shall conform to the following:

A. Blanket Type:

1. Batt Type: ASTM C665, mineral or glass fiber, Type II, Class C (non-reflective, vapor retarder membrane, one face), 6"; Owens-Corning or Manville.
2. Safing: ASTM C665, mineral fiber, Type I, 4", 4 lb. Density; USG "Thermafiber Safing".
3. Sound Batt: ASTM C665 and ASTM E136, mineral or glass fiber, Type I, 3-1/2" minimum; Owens-Corning or Manville.

B. Rigid Type:

1. Wall Boards: ASTM C612, Class 1; reflective membrane one face, 3.0 pcf density, minimum; 1-1/2" thick; Owens-Corning or Manville.
2. Ceiling Boards: ASTM C612, Class 1; 3.0 pcf density, minimum; 2" thick, for horizontal support by impaling clips; Owens-Corning or Manville.
3. Impaling Clips: Manufacturer's standard two-piece clip with mechanical attachment to metal deck, pattern as recommended by insulation manufacturer.

C. Foundation Insulation:

1. Foundation wall insulation shall be extruded polystyrene foam, with high density extruded skin and square butt edges.
2. The product shall be as manufactured by the Dow Chemical Company, or and approved equal. The "U" factor shall be 0.22 or less. Thickness shall be as shown.

D. Block Wall Insulation

1. Hollow Cores in block walls specified, shall be filled with Vermiculite or Amino-Plast Resin and Catalyst Foaming Agent Surfactant.
2. Insulation system must achieve an R-14 rating.

E. Other Materials:

1. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturers' recommendations and shop drawings as approved by the Engineer.
- B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 INSTALLATION - FOUNDATION INSULATION

- A. Install perimeter insulation 2'-0" under surface of concrete slabs on grades, where shown on the Drawings or as directed by the Engineer, and vertically 2'-0" downward between the slab edge and the foundation wall.
- B. Foundation insulation shall be cut to fit as shown, and shall be laid in place as backfill progresses. All joints shall be tight.

3.05 VERIFICATION

- A. Upon completion of the installation in each area, visually inspect and verify that all insulation is complete and properly installed.

PART FOUR - SPECIAL PROVISIONS

END OF SECTION

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FIBERGLASS ASPHALT SHINGLES

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Furnish all labor, materials, equipment and appliances required to install shingle roofing as shown on the drawings.

1.02 SUBMITTALS

- A. The Contractor is responsible for submitting all manufacturers' materials of construction to assure their conformance to these specifications.
- B. All necessary testing data to assure with conformance with these specifications is also required.

PART TWO - PRODUCTS

2.01 FIBERGLASS ASPHALT SHINGLES

A. Quality Assurance and Standards

- 1. Contract shall include all labor, material, permits, taxes, equipment, accessories and workmanship necessary to create a complete waterproof installation and to meet the manufacturer's warranty requirements.
- 2. UL Listing: Provide labeled materials which have been tested and listed by UL for Class and Rating indicated for shingle required. All work shall conform to the NRCA Roofing and Waterproofing Manual, Third Edition, unless a higher quality is noted herein. Higher quality shall be determined by the Engineer.
- 3. Product Data: Submit technical product data, installation instructions and recommendations from shingle manufacturer, including data that materials comply with requirements.
- 4. Samples: Submit full range of samples for color and texture selection. After selection, submit two (2) full-sized shingles for verification of each color/style/texture selected.
- 5. Maintenance Stock: 2% of shingles used in work.

B. Specified Product Warranty

- 1. Provide shingle manufacturer's warranty on installed work, agreeing to pay for repair or replacement of defective shingles as necessary to eliminate leaks. Period of warranty is forty (40) years from date of substantial completion.
- 2. Furnish to the Owner and Engineer a written guarantee, in triplicate, covering all roofing work for a period of two (2) years from the date of acceptance by the Owner. Cover all roofing, flashing and metal work against leaks or faulty workmanship and the repair of any damage to the structure attributed to the work. Provide guarantee similar to the type issued by the National Roofing Contractors' Association to its members.

C. Materials

- 1. Square Tab Strip Singles, UL Class "A", Mineral-surfaced, self-sealing, 3-tab asphalt fiberglass strip shingles complying with ASTM D 3018, Type 1. Color as selected by Engineer.
- 2. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - GAF Timberline - 40 year limited warranty
 - Equal manufacturers: Bird, Celotex, Elk, Manville
- 3. Asphalt-Saturated Roofing Felt: 30#, unperforated organic felt, complying with ASTM D 266 Type 1, 36" wide.

4. Asphalt Plastic Cement: Fibrated asphalt cement complying with ASTM D 2822, designed for trowel application.
5. Ridge Shingles: Job-fabricated units cut from actual shingles used.
6. Nails: Aluminum or hot-dip galvanized 11 or 12-gage sharp-pointed conventional roofing nails with barbed shanks, minimum 3/8" diameter head, and of sufficient length to penetrate 3/4" into solid decking or to penetrate through plywood sheathing (no staples allowed).
7. Metal Drip Edge: .032 sheet aluminum. Color as selected by Engineer.
8. Metal Flashing: .032" sheet aluminum, to sizes and configurations required. Color as selected by Engineer.

PART THREE - EXECUTION

3.01 FIBERGLASS ASPHALT SHINGLES

A. Preparation of Roof Deck

1. Substrate: Proceed with shingle work only after substrate correction and penetrating work have been completed.
2. Weather Conditions: Proceed with shingle work only when weather conditions are in compliance with manufacturer's recommendations.
3. Examine all roof decks over which shingles are to be applied and notify the Engineer in writing of any defects considered detrimental to the proper installation of roofing materials.

B. Workmanship

1. Apply shingles over a single layer of underlayment with a headlap of not less than 2 inches and exposure not exceeding 6 inches to the weather. Fasten shingles to sheathing using zinc-coated nails having deformed or serrated shanks, or 16 gauge zinc-coated staples.
2. At all exposed shingle edges, install standard enameled metal drip edge.
3. Cover all ridges with matching ridge shingles, laid with 5 inch exposure and nailed with two nails per shingle, 5 1/2 inches from exposed ends and 1 inch from edges of shingle.
4. Roofing materials which have become wet before, during or after installation will not be accepted. Remove and replace any roofing materials which have become wet. Do not attempt to dry out wet roofing materials.
5. At conclusion of work, clear roof of all debris and surplus materials.

C. Coordination

1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Item.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: The Contractor shall furnish all labor and material necessary for the complete installation of all gutters, downspouts, gravel stops, facias, etc. as shown on the drawings, specified herein and needed for a complete and proper installation as required by job conditions.
- B. Summary of

PART TWO - PRODUCTS

1. Subsection 2.01: Materials

- C. Related work:

Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 2. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Test data required elsewhere in this Section.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

1.05 PERFORMANCE GUARANTEE

- A. The manufacturer shall be responsible to assure himself that his meter will work on the flow stream to be monitored.
- B. The manufacturer shall provide a written performance guarantee with his submittal information.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Gutters and Downspouts – Pre-painted 0.032-inch thick aluminum 4-inch box gutter system as manufactured by Alcoa Building Products, Inc., W.P. Hickman, or approved equal. Furnish complete with straphangers, end caps, rectangular downspouts and other accessories necessary for a complete installation. Color to be selected by the Engineer.
- B. Gravel Stops and Fascias - pre-painted 0.060 inch (minimum) thick aluminum typical formed gravel stop and formed Fascia Extender System manufactured by Alcoa Building Products or W.P. Hickman Co.
 - 1. System complete with aluminum compression clamp, stainless steel fasteners, and neoprene washers. Provide full height joint cover plates with finish match fascia.

PART THREE - EXECUTION

3.01 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Hang gutters level (stopped to downspout locations) and support from strap hangers spaced not more than 32 inches apart and nailed to roof deck blocking shank roofing nails.
- C. Install end caps, and join gutter sections in accordance with manufacturer's instructions.
- D. Furnish downspouts in full length sections and securely attach to the building with aluminum downspout anchors and clips, spaced not more than 5'0" on centers.
- E. Upon completion of installation, wipe down aluminum materials with household detergent to remove dirt.
- F. Upon completion of installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. Laminated metal flashings and counter flashings
- B. Plastic flashings
- C. Self-adhering rubberized asphalt flashings
- D. Mastic for setting and sealing joints

1.02 RELATED SECTIONS

- A. Section 04200 - Masonry
- B. Section 06100 - Carpentry: Flashings at openings and sills.

1.03 REFERENCES

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets showing product characteristics and including installation instructions.
- C. Samples: Actual pieces of flashings specified, not less than 6 inches (150 mm) square.

1.05 QUALITY ASSURANCE

- A. Installation Standard: Comply with recommendations of SMACNA Architectural Sheet Metal Manual (ASMM).
- B. Installer Qualifications: Company with at least five years of successful experience in weather tight installation of flashing.
- C. Coordination: Interface flashing work with adjacent and adjoining work to ensure best possible weather resistance and durability of completed flashing.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's sealed containers and packaging, bearing manufacturer's name and product identification.
- B. Stack flashing materials to avoid twisting, bending, and abrasion. Protect materials from weather before installation.
- C. Store mastic materials in sealed containers under cover

PART TWO - PRODUCTS

2.01 MANUFACTURERS

- A. Provide products manufactured by Sandell Manufacturing Company, Inc., 310 Wayto Rd., Schenectady, NY 12303. ASD. Tel: (518) 357-9757. Fax: (518) 357-9636.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01300.

2.02 MATERIALS

- A. Copper Fabric Flashing: Laminated sheet comprised of copper sheet, asphalt mastic coated on both sides, bonded under pressure between two layers of asphalt saturated, woven glass fabric.
 - 1. Copper weight: 2-oz/sq ft (610 g/sq m).
 - 2. Copper weight: 3-oz/sq ft (915 g/sq m).
 - 3. Copper weight: 5-oz/sq ft (1525 g/sq m).
 - 4. Copper weight: 7-oz/sq ft (2135 g/sq m).
- B. Coated Copper Flashing: Copper sheet coated on both sides with a rubberized asphalt compound weighing not less than 6 oz/sq ft (1830 g/sq m)
 - 1. Copper weight: 2-oz/sq ft (610 g/sq m).
 - 2. Copper weight: 3-oz/sq ft (915 g/sq m).
 - 3. Copper weight: 5-oz/sq ft (1525 g/sq m).
 - 4. Copper weight: 7-oz/sq ft (2135 g/sq m).
- C. Copper Kraft Flashing: Copper sheet bonded on one side to waterproofed creped Kraft paper weighing not less than 3 oz/sq ft (915 g/sq m) and reinforced with heavy fibers.
 - 1. Copper weight: 2-oz/sq ft (610 g/sq m).
 - 2. Copper weight: 3-oz/sq ft (915 g/sq m).
- D. Copper Kraft Duplex Flashing: Copper sheet bonded on both sides by asphalt to heavy waterproof creped Kraft paper weighing 3 oz/sq ft (915 g/sq m) and 5-oz/sq ft (1525 g/sq m) and reinforced with heavy fibers.
 - 1. Copper weight: 2-oz/sq ft (610 g/sq m).
 - 2. Copper weight: 3-oz/sq ft (915 g/sq m).
 - 3. Copper weight: 5-oz/sq ft (1525 g/sq m).
- E. Copper Kraft Plus Lead Flashing: Copper and lead sheet adhered with asphalt to a creped Kraft duplex covering on one side that is reinforced with interspersed fiberglass strands.
 - 1. Combined weight of copper and lead: 2-oz/sq ft (610 g/sq m).
 - 2. Combined weight of copper and lead: 3-oz/sq ft (915 g/sq m).
- F. Copper Kraft Duplex Plus Lead Flashing: Copper and lead sheet bonded on both sides with asphalt to creped Kraft duplex covering that is reinforced with interspersed fiberglass strands.
 - 1. Combined weight of copper and lead: 2-oz/sq ft (610 g/sq m).
 - 2. Combined weight of copper and lead: 3-oz/sq ft (915 g/sq m).
 - 3. Combined weight of copper and lead: 5-oz/sq ft (1525 g/sq m).
 - 4. Combined weight of copper and lead: 7-oz/sq ft (2135 g/sq m).
- G. PVC Flashing: Non-reinforced polyvinyl chloride sheet; thickness and weight as follows:
 - 1. Sandell Nuflex Type 10: 0.010 in (0.25 mm) thick; nominal 11 oz/sq yd (373 g/sq m).
 - 2. Sandell Nuflex Type 20: 0.020 in (0.50 mm) thick; nominal 22 oz/sq yd (746 g/sq m).
 - 3. Sandell Nuflex Type 30: 0.030 in (0.75 mm) thick; nominal 33 oz/sq yd (1119 g/sq m).

4. Sandell Nuflex Type 40: 0.040 in (1.0 mm) thick; nominal 36 oz/sq yd (1221 g/sq m).
5. Sandell Nuflex Type 60: 0.056 in (0.50 mm) thick; nominal 60 oz/sq yd (2035 g/sq m).

H. Sando-Seal Self-Adhering Flashing: 40 mil (1.02 mm) thick membrane comprised of 32 mils (0.8 mm) of highly adhesive rubberized asphalt integrally bonded to an 8 mil (0.22 mm) high density, cross-laminated polyethylene film.

2.03 ACCESSORIES

- A. Asphalt Trowel Mastic: Cut-back asphalt containing long fibered material, in trowel grade consistency.
- B. Nuflex Mastic: Adhesive formulated for use with PVC flashing. Tacky, fast-grabbing semi-pressure-sensitive rubber or resin base adhesive suitable for bonding PVC sheet to itself and to a wide variety of building materials.
- C. Primer: Manufacturer's special primer formulated to prepare surfaces for self-adhering flashing.
- D. Reglets: Types and profiles as indicated on the drawings and as recommended by flashing manufacturer.

2.04 FABRICATION

- E. Forming: Fabricate flashings true to shape and accurate in dimension. Form pieces in longest possible lengths to minimize joints. Fold flashing at corners and at ends of pans instead of cutting.
- F. Joints: Provide not less than 4 inches (100 mm) of overlap at flashing joints.

PART THREE - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces to receive flashing are thoroughly dry, free from loose materials, and reasonably smooth, with no sharp edges or projections.
- B. Verify that locations to receive flashing are sloped so water that enters will drain to building exterior.

3.02 PREPARATION

- A. Self-Adhering Flashing: Prime all surfaces to receive self-adhering flashing, and allow drying for not less than 20 minutes prior to flashing application.

3.03 INSTALLATION

- A. General: Comply with recommendations of SMACNA ASMM.
 1. Lap joints minimum of 4 inches (100 mm) and seal watertight with mastic
 2. Carry flashing vertically as detailed, but not less than 6 inches (150 mm) above horizontal plane.
 3. Extend head and sill flashings not less than 6 inches (150 mm) beyond edges of openings and turn up to form watertight pan; seal with mastic.
- B. Masonry Flashing: Comply with requirements of Section 04200.
- C. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
 1. Carry flashing through wall and leave exposed for inspection.
 2. After inspection, cut flashing flush with surface of masonry.

D. Flashing in Frame Construction: Comply with requirements of Section 06100.

E. Flashing in Frame Construction: Install over solid backing, both vertically and horizontally. Secure in place with mastic; avoid puncturing installed flashing with nails or other fasteners.

F. PVC Flashing: Lay flashing in full trowel coat of mastic, lapping joints not less than 6 inches (150 mm). Roll surface of flashing with rubber hand roller to remove all air.

3.04 ADJUSTING

A. Remove mortar or other obstructions from weep holes at flashing locations.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide all joint sealants complete in place as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. In general, this item includes the following:
 - 1. Sealing and caulking of joints occurring at meeting of different materials at exterior and interior of building, unless otherwise indicated on drawings.
 - 2. Caulking the perimeter of all exterior frames for all entrances, louvers and doors in contact with exterior finish steel lintels.
 - 3. Sealing and caulking of exterior and interior control joints.
 - 4. Interior caulking around door and window frames.
 - 5. The Contractor shall furnish all the material for and do all work required to caulk all joints, (both inside and outside of jambs, heads, and sills) between metal doors, windows, and masonry and stone work.

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Manufacturers' specifications and other data needed to prove compliance with the specified requirements, and to show installation and interface of the work of this Section with the work of adjacent trades.
 - 2. Manufacturers' recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Test data required elsewhere in this Specification.
- C. The Contractor shall submit the following samples:
 - 1. Transparent primer for dry masonry and concrete - 1 quart.
 - 2. Primers for joints that will be under water - 1 quart.
 - 3. Gun grade sealant compound - 1 quart.

4. Sample of exterior joint between masonry and metal.
5. Sample of interior joint caulking and colors.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 CAULKING AND SEALING MATERIALS

- A. Joint sealants for concrete work, roof work, and for other work where specialized products are required shall be as shown on the Drawings, and as specified in the sections of these Specifications which relate to such work. Where other sealants are not specified as shown, the joint material shall be as specified in this section.
- B. Caulks and sealers shall be furnished in the manufacturer's standard best-performance grade, except where exposed to view, where color shall be selected and approved by the Engineer.
- C. Materials shall be provided which are carefully selected for compatibility with each other and with substrates in each joint system. All selections shall comply with the manufacturer's recommendations.
- D. The type, grade, class, hardness, and similar characteristics of material shall comply with the manufacturer's recommendations relative to exposures, traffic, weather conditions, and other factors of the joint system, for best possible overall performance.
- E. The sealants to be provided and used in this project when not otherwise specified shall conform to the following:
 1. Exterior of Building: Silicon rubber type one-part elastomeric sealant, complying with FS TT-S-001543, Class A, as recommended by manufacturer for exterior joints. Where one or both joint faces are masonry, use non-acid, porous bond type. Where both joint faces are metal, glass, plastic, or other non-porous material, use non-porous bond type.
 2. Interior of Building: For wet or damp areas, use silicone rubber-based, one-part elastomeric sealant, complying with FS TT-S-001543, Class A, compounded specifically for mildew resistance and recommended by manufacturer for interior joints in wet areas. Sealant shall pass ANSI A136.1 test for mold growth. For general interior caulking, use acrylic-emulsion or latex-rubber-modified acrylic-emulsion sealant compound, permanently flexible, non-staining and non-bleeding; recommended by manufacturer for general interior exposure.
- F. Other materials shall be as follows:
 1. Joint primer/sealer shall be used if recommended by sealant manufacturer for joint surfaces to be primed or sealed.
 2. Polyethylene tape or other plastic tape, as recommended by sealant manufacturer, shall be applied to sealant-contact surfaces where bond to substrate or joint filler needs to be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
 3. Sealant backer rod, where required, shall be compressible rod stock of polyethylene foam; polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for compatibility with the sealant.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to caulking and sealing installations, inspect work area for correct alignment and verify that surfaces to receive sealants are acceptable. Contractor shall correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturers' recommendations and shop drawings as approved by the Engineer.
- B. The sealant shall be fresh and pure and shall be delivered to the job site in sealed containers, each bearing the manufacturer's name and product designation.
- C. All surfaces shall be clean and dry before sealing or caulking. All oil, grease, friable particles, wax, dust, and coatings shall be removed. It is especially important that masonry surfaces shall be dry before application.
- D. Caulking shall be supported from the back with joint filler or backer rod.
- E. Caulking materials shall be forced in place in accordance with manufacturer's directions, and shall be finished in a workmanship-like manner, with slightly concave joint, unless otherwise noted.
- F. All sealing shall be done at temperatures above 40 degrees F.
- G. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

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DIVISION 8

DOORS AND WINDOWS

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PART ONE - GENERAL

1.01 SCOPE

- A. The Contractor, under this Item, shall furnish and properly install as shown on the Drawings, or as directed, all doors and frames required for the buildings included in this Contract.
- B. In general, the work under this Item shall include doors and frames, together with all other items as required, shown on the Contract Drawings, and/or as required by job conditions, including but not limited to:
 - 1. Aluminum Doors
 - 2. Aluminum Metal Frames
- C. Related Work
 - 1. The General Conditions, Supplementary Conditions and applicable Provisions of Division 1 are hereby made a part of this Section as fully as specified herein.

1.02 SUBMITTALS

- A. Shop Drawings and Submittals
 - 1. Submit for your approval, four copies of shop drawings showing topical construction, dimensions, finish etc. for all items, indicating all installation details, method of attachment etc., and a schedule listing the location for each opening.
 - 2. Where the work is not fully explained by drawings and/or specifications, the Contractor shall, before the execution of the work, submit for approval a detailed working drawing and description of same. The Engineer shall be at liberty to alter or amend if described is not of material, size, arrangement or workmanship best adapted for the purpose.
 - 3. Submit plastic laminate samples for approval by Engineer.
 - 4. Corner assembly of each type door and frame to be used on the project.
 - 5. Samples shall be clearly identified as to location and type of finish.

1.03 QUALITY ASSURANCE

- A. For purposes of designating type and quality for work under this Item, drawings and specifications are based on products manufactured or furnished by manufacturers listed under various sections of Item.
- B. Source - Products for use in this Item shall be of one manufacturer unless specifically shown otherwise.
- C. Erector - The erector shall be approved by the manufacturer.
- D. Comply with the current specifications of the following applicable standards:
 - 1. American Society for Testing & Materials (ASTM).
 - 2. U.S. Commercial Standards.
- E. In addition to other requirements as indicated herein, fabricate materials and components of door units to

withstand the anticipated traffic as follows for the life of the building (40 years), with normal maintenance:

1. Building entrances: 50 open/close cycles per day.
2. Wind loading: Fabricate exterior door and frame units to withstand the wind pressure loading shown or, if not shown, 20 lbs. per sq. ft. on the gross areas of the frames, doors, panels, and glass, acting inward and also acting outward.

PART TWO - PRODUCTS

2.01 MATERIALS

A. Aluminum Doors and Frames

1. Flush doors shall be as manufactured by Special-Lite, Inc., Decatur, Michigan. Construction details of similar products not fully meeting these specifications shall be submitted for approvals before bidding.
2. Flush doors shall be 1-3/4" thick and constructed of aluminum alloy rails and stiles, joined with steel tie rods, and have an inner core consisting of foamed-in-place urethane.
3. Aluminum alloy rails to be extruded 6063 T5, with a minimum wall thickness of 1/8".
4. Stiles to be tubular shape to accept hardware as specified.
5. Top and bottom rails to be extruded with legs for interlocking "rigidity weather bar". Face sheets to be locked in with extruded interlocking edges. No snap on trim will be accepted.
6. Joinery to be 3/8" tie rods, top and bottom, bolted through an extruded spline and 3/16" riveted reinforcing angels, and secured with aircraft type nuts.
7. Core to be urethane foam of 5 pounds per cubic foot density. All doors to be properly reinforced for hardware before urethane core is foamed in door.
8. Door face sheets to be backed with 1/8" tempered hardboard for added impact reinforcement.
9. Door face sheets to be E-5 pattern of 5005 alloy, .064" thick or fiberglass reinforced polyester, 0.120" thick.
10. Meeting stiles on pairs of doors to be fitted with two-part rotary astragal consisting of fixed blade and rotating gear. Blade and gear shall interlock when doors are closed, preventing insertion of any object between doors.
11. All doors shall be pre-machined in accordance with appropriate templates. For surface applied blade, doors shall have necessary reinforcement including the attachment of Rivnut blind fasteners for bolting.
12. All hardware for aluminum doors to be supplied by door manufacturer.
13. Doors shall be packaged in individual corrugated cartons. Doors shall be "floated" within cartons, with no portion of door or attached hardware to be in contact with outer corrugated shell.
14. Doors to be supplied with Model SL-11, continuous gearhinge, as manufactured by Select Products Limited. The continuous gearhinge shall be manufactured from extruded 6063, T-6 aluminum alloy with polyacetal thrust bearings. The hinge finish shall be the same as the doorframe. Stainless Steel flush screws shall be used to fasten hinge to the door and frame.

B. Door Hardware

1. All doors shall be mortised and reinforced for hinges and locks to allow field application. Hinge reinforcement shall be a minimum No. 14 U.S. gauge steel, die-formed to provide screw thread depth

equivalent to No. 10 U.S. gauge steel for 1-3/4" doors and of No. 16 gauge steel for 1-3/8" doors. All hinge accommodations shall be preformed as an internal part of the continuous vertical member forming the periphery of the unitized grid. The back-up reinforcement of hinges and lock shall be die-formed to extend no less than five (5) inches into the interior and shall join the parallel inner vertical member of the grid structure to insure a uniform distribution of torque and stresses created by operation of the door. Inserted plate-type reinforcement shall not be allowed as an acceptable method of door suspension. All doors shall be provided with built-in closer reinforcement.

C. Door Accessories

1. Door lights shall be provided as indicated on the drawings. Door lights shall be designed for glazing up to 1/4 in. thick.

D. Door Frames

1. Door frames shall be tubular extrusions of 6063 T5 Aluminum Alloy with a minimum 0.125" wall thickness. Size of framing members shall be 1.75" X 4".

E. Frame Accessories

1. Frames shall have 9 gauge steel hinge tap plate reinforcement projection welded with provisions for 4-1/2 in. x 4-1/2 in. full mortise template type hinges and 14 gauge steel strike tap plate reinforcement, extruded, and formed to the equivalent of 10 gauge projection welded.
2. Frames shall be provided for 1-1/2 pairs of hinges. Mortar guards of 26-gauge steel formed to a 1 in. depth shall be welded on. Sleeve type closer reinforcement shall be 12-gauge and furnished loose for installation in frame header when required according to the Door Schedule included in the Drawings.

F. Frames shall be rigidly attached to masonry, wood, or steel construction with masonry or stud anchors.

1. Each frame to be installed in wood or steel stud walls shall be provided with eight stud anchors.
2. Each frame to be installed in masonry walls shall be provided with six masonry anchors.
3. All anchors shall be furnished loose for field installation. All frames shall be furnished with an integral or welded-on sill anchor.

G. All doors and frames shall be thoroughly cleaned and phosphatized to inhibit corrosion and to increase the durability of the primer. One coat of baked-on universal primer shall be applied to all doors and frames.

PART FOUR – SPECIAL PROVISIONS

- 4.01. Door face sheets shall be seamless fiberglass reinforced polyester, 0.120" in thickness with a pebble-like embossed finish. Color chosen by owner from standard options.
- 4.02. Door hardware shall be corrosion resistant and lockable, keyed alike with 3 sets of keys provided to owner.

END OF SECTION

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FLOOR DOORS AND ACCESS HATCHES

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide all floor doors and access hatches complete in place as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, Division 1, and all applicable Divisions of the Technical Specifications.

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Brochures and drawings in sufficient detail to show fabrication, installation, anchorage, and interface of work of this Section with the work of adjacent trades;
 - 2. Manufacturers' recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Registered Professional Engineer's certification of design load capacity for all 300 psf, H-20 and special floor doors. Professional Engineer's registration shall be for the state in which the doors will be installed.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 FLOOR DOORS: 150 PSF

- A. Floor access doors shall be Type "K" or Type "KD" as manufactured by the Bilco Company or an equivalent.
- B. The access frame shall be 1/4" extruded aluminum with built-in neoprene cushion and strap anchors bolted to the exterior.
- C. The access door shall be 1/4" aluminum diamond plate reinforced with aluminum stiffeners as required. Cast steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be built to withstand a live load of 150 pounds per square foot, and equipped with a snap lock and removable handle.
- D. A mil finish with bituminous coating is to be applied to the exterior of the frame by the manufacturer. Hardware

shall be zinc plated and chromate sealed. Installation shall be in accordance with the manufacturer's instructions.

- E. Access door and frame for floor doors shall be of the types and sizes specified in the Standard Details contained herein.
- F. Guarantee - manufacturer shall provide a written guarantee against defects in material and workmanship for a period of five years.
- G. Provide one pogo stick receiver per door.

2.02 FLOOR DOORS: 150 PSF

- A. Floor access doors shall be Type "T" or Type "TD" as manufactured by the Bilco Company or equivalent.
- B. The access frame shall be ¼" extruded aluminum with built-in neoprene cushion and strap anchors bolted to the exterior.
- C. The access door shall be ¼" aluminum diamond plate reinforced with aluminum stiffeners as required. Cast steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the floor for easy operation. The door shall open to 90 degrees and locks automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. Doors shall be built to withstand a live load of 150 pounds per square foot, and equipped with a snap lock and removable handle.
- D. A mill finish with bituminous coating is to be applied to the exterior of the frame by the manufacturer. Hardware shall be cadmium plated. Installation shall be in accordance with the manufacturer's instructions.
- E. Access door and frame for floor doors shall be of the types and sizes specified in the Standard Details contained herein.
- F. Guarantee - manufacturer shall provide a written guarantee against defects in material and workmanship for a period of five years.
- G. Provide one pogo pole receiver per door.

2.03 FLOOR DOORS: 300 PSF

- A. Interior/exterior doors shall be Type "J" or Type "JD" as manufactured by the Bilco Company or an equivalent.
- B. Door frame shall be ¼" aluminum channel with anchor flange around the perimeter.
- C. Each door leaf shall be ¼" aluminum diamond plate reinforced to carry 300 psf liveload. Doors shall have heavy forged brass hinges, stainless steel pins, compression spring lift assistance mechanism. Each leaf shall open to 90 degrees and be held automatically in that position. Release handle shall be vinyl gripped. Door system to have snap lock with removable handle located in the lower right corner of the channel frame opposite the hinge side.
- D. Frame to receive mill-finish with bituminous coating applied to its exterior.
- E. Access floor and frame for floor doors shall be of the types and sizes specified in the plans for the intended installation.
- F. Manufacturer shall provide a written guarantee against defect in material and workmanship for five (5) years.
- G. Provide one (1) pogo stick receiver per door.

2.04 ROOF SCUTTLE FOR LADDER ACCESS

- A. Roof scuttles shall be Type "S" as manufactured by the Bilco Company or equivalent. Unit shall be weather-tight.
- B. Cover shall be 11-gauge aluminum, mill finish, with 3" beaded flange, neatly welded. Insulation shall be 1" thick fiberglass insulation, fully covered and protected by a cover liner of 11-gauge aluminum with mill finish.
- C. Curb shall be 11-gauge aluminum, mill finish, 12" high with a 3-1/2" formed flange and integral 11-gauge

aluminum cap flashing equipped with the Bilco flashing system.

- D. Curb flashing shall be 1" thick rigid fiberboard.
- E. Hardware - roof scuttle shall be complete with all manufacturers' standard hardware. All hardware shall be zinc plated and chromate sealed.
- F. Guarantee - manufacturer shall provide a written guarantee against defects in material and workmanship for a period of five years.
- G. Provide one (1) pogo pole receiver per scuttle.

2.05 SPECIAL FLOOR, VAULT AND SIDEWALK DOORS

- A. H-20 Wheel Loading
 - 1. Doors designed to withstand H-20 wheel loading shall provide as called for in the plans and shall be Bilco Type "J" or "JD" or equivalent.
- B. Pan - Type Doors
 - 1. Where the locations on the plans call for access doors in terrazzo, wood, quarry tile or other materials requiring special 1" fillable pan type door leaf, the doors shall be as manufactured by Bilco or equivalent for the design load of the receiving floor.
 - a. Pan type doors with concrete tapping will be provided only when specifically called for in the plans.
- C. Special sizes of JD-AL doors shall be manufactured for the design loads of the receiving slab and their design calculations shall be submitted for review.
- D. Provide one (1) pogo pole receiver per door.
- E. Manufacturer shall provide written 5-year guarantee against defects in material or workmanship.

2.06 POGO POLE PORTABLE SAFETY POST

- A. Provide two (2) pogo pole safety posts.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to installation, inspect supports for correct size, and layout alignment and verify that surfaces to receive material are free of debris. Contractor shall correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

PART FOUR – SPECIAL PROVISIONS

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SECTION 08700

HARDWARE

PART ONE - GENERAL

1.01 SCOPE

- A. The work required under this Section shall include all labor, materials, equipment and services necessary to furnish and deliver to the site all locks, cylinders and finish hardware to complete the work as indicated on the drawings and herein specified.
- B. In general, this item includes the following:
 - 1. Finish hardware for all swinging doors.
 - 2. Aluminum thresholds and weather-stripping for exterior and interior aluminum doors.
 - 3. Installation of all finish hardware per Hardware Schedule.
- C. RELATED WORK
 - 1. The General Conditions, Supplementary Conditions and applicable Provisions of Division 1 are hereby made a part of this Section as fully as if repeated herein.
 - 2. Section 06100 - Finish Carpentry
 - 3. Section 08105 - Hollow Metal Doors and Frames
- D. CODE COMPLIANCE
 - 1. Hardware furnished shall be in strict conformance with all State and Local Building Codes covering the labeling and classification of all required hardware.

1.02 SUBMITTALS

- A. CATALOG CUTS: Catalog cuts for all types of hardware shall be submitted, bound and indexed in a loose leaf folder indicating the manufacturer's name, type of material, etc. for all the various items covered under this heading. Three copies will be required at the time the hardware schedule is submitted for the Engineer's approval. Supplier to review types, keying, etc., of existing systems in the field to guarantee a match for quality and finish, prior to submitting to the Engineer for approval.
- B. SCHEDULES: Furnish a complete itemized finished hardware schedule, and submit to the Engineer for approval.
- C. Order no hardware until Engineer has reviewed the schedules. Approval of finish hardware schedule will not relieve the Hardware Contractor of responsibility for furnishing all necessary finish hardware items whether or not specifically mentioned therein.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. MANUFACTURERS
 - 1. Hinges - Lawrence, Stanley, Hager
 - 2. Cylinders, Locks, Latches - Russwin (cylindrical), Best Universal Lock Co., Schlage

3. Closers - Russwin, LCN
4. Kickplates, Stops - Rockwood, Baldwin
5. Weather-stripping, Thresholds, Door Bottoms - National Guard, Zero, Pemko
6. Door Holders and Stops - Sargent, Ives, Quality

B. FINISH

1. Brushed Chrome US 26D. Hinges, USP for painted doors.
2. Closers and Brackets shall have sprayed-on finish to match adjacent hardware.

2.02 DIMENSIONS

- A. Unless otherwise shown, locate hardware in connection with hinged and other swing type doors and frames as follows:
1. Entrance Door Locks - 40-5/16 inches from finish floor to center of strike.
 2. Top Hinge - Manufacturer's standard, but not more than 10 inches from head of door to center of hinge.
 3. Bottom Hinge - Manufacturer's standard, but not more than 10 inches from finish floor to center of hinge.
 4. Intermediate Hinge - Equally spaced between top and bottom hinges.
 5. Locks and Latches - 40-5/16 inches from finish floor to center of strike.
 6. Deadlocks - 60 inches from finish floor to center of cylinder.
 7. Push Plates and Door Pulls - As directed.

PART THREE - EXECUTION

3.01 PACKING AND DELIVERY

- A. All finish hardware will be delivered to the building carefully packed and properly marked to identify the portion of the work for which it is intended. All necessary screws, bolts, and fastenings will be wrapped in paper and packed with hardware.

3.02 TEMPLATES

- A. Furnish templates of locksets, butts, closers, etc. to the door and frame manufacturers to assure proper fit of hardware.

3.03 SUBMITTALS

- A. Submit Hardware Schedule to the Engineer for approval.

3.04 HARDWARE SCHEDULE as follows:

Note: All items required shall consist of Commercial Grade hardware components. Door hardware shall consist of a keyed lever lock design that is ADA compliant. This hardware shall be certified ANSI A156.2, 1989, series 4000 Grade 2. Use standard Schlage AL-series or approved equal. The following list of hardware components or approved equals to be used as required.

Butts BB1191 x US32D x NRP x 4-1/2 x 4-1/2
Threshold 2005 AFG
Set Weather-stripping 303ACV
Closer 4041 x cush-n-stop w/PA x alum x thru bolts
Kick Plates 8400 Series 8 x 2" LDW US32D
Latch Guard
(Astragal on Active Leaf by Door Manufacturer)

HAGER
PEMCO
PEMCO
LCN
HAGER
WILMONT

PART FOUR – SPECIAL PROVISIONS

N/A

END OF SECTION

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PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide all glazing complete in place as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.
 - 2. Section 08105: Hollow Metal Doors and Frames
 - 3. Section 08500: Metal Windows

1.02 QUALITY ASSURANCE

- A. Qualifications of manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
 - 2. Manufacturers' recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work;
 - 3. Test data required elsewhere in this Specification.

1.04 PRODUCT HANDLING

- A. General: Comply with pertinent provisions of Section 01350.

PART TWO - PRODUCTS

2.01 STANDARDS

- A. All glass used shall meet the requirements of Federal Specification DD-G-451a as manufactured by Libbey-Owens-Ford Glass Co., Pittsburgh Plate Glass Co., or an approved equal. All glass used shall meet the requirements of all applicable codes.

2.02 MATERIALS

A. Tempered Safety Glass:

1. All tempered safety glass shall be Tuf-flex tempered safety glass as manufactured by L.O.F. or an approved equal in sizes as shown on the Drawings or as required, and in the following thicknesses:
 - a. View Windows: 1/4" (clear and where shown on Drawings)
 - b. Exterior Passage Doors: 3/16" (used as a component in insulated glass; see below)
2. Tempered glass shall meet the quality and strength requirements of Federal Specification DD-G-1403B, and the safety criteria of ANSI Z97.1 - 1975 and Federal Standard 16 CFR 1201. All tempered safety glass shall bear a permanent monogram which signifies compliance with the Federal Standard 16 CFR 1201 and shall be tempered by the manufacturer of the base glass. Color shall be bronze.

B. Insulated Glass:

1. All insulating glass units shall consist of two pieces of 1/4" thick glass, separated by a 1/2" air space (approximately 1" overall). Insulating glass units shall be assembled by the manufacturer of the base glass. All insulating glass shall be "Thermopane", or an approved equal, and shall meet the certification requirements of I.G.C.C. for a class CBA rating. Sizes shall be as shown or as required, and shall be of the following types:
 - a. All exterior window units: float glass (bronze)
 - b. All exterior passage doors: tempered safety glass (bronze)

C. Wired Glass:

1. All wired glass shall be Type III, Class I, Kind A (flat), Form 1, (polished), Mesh M1 (welded diamond), UL Labeled; and shall be of the following thickness:
 - a. Interior passage doors: 1/4" (clear)

D. Spandrel glass shall be 1/4" thick Spandrelite" or an approved equal. Laminate 2" thickness of rigid insulation to glass interior before glazing into aluminum frames.

E. Spandrel glass in curtain wall system at perimeter to receive 2'0" x 8'0" x 2" thick rigid glass fiber reinforced poly isocyanurate plastic foam core insulation board with an effective-moisture resistant aluminum foil faced reflective finish on both sides complying with the requirements of Federal Specifications HH-I-1972/1, Class 2, ICBO, BOCA and SBCCI for exposed applications. Comprehensive strength (25 psi) and R-values to be in accordance with the ASTM Test Methods. Insulation is to be applied with adhesive directly to the back side of spandrel glass.

1. Adhesive to be "Liquid Nails LN-602" as manufactured by MAACO Adhesives, a division of SCM Corporation.
2. Insulation board shall be "Thermax Insulation Board" as manufactured by Celotex Building Products, of the Celotex Corporation.
3. Foam insulation to meet all local code and ordinance requirements for Class A (25) flame spread and smoke contributions.

F. Mirrors:

1. Mirrors to be 1/4" plate glass, slivered and heavily electroplated.
2. Mirror frames shall be 18-gauge stainless steel with 22-gauge galvanized steel back arranged for

concealed mounting.

2.03 FACTORY GLAZING

- A. All glass shall be factory glazed where possible and shall be in accordance with glazing details and materials submitted to the Engineer for approval.
- B. Glazing beads shall be extruded snap-in and drive-in type designed for wet seal or wedge type glazing.

2.04 BLOCKING AND SHIMS

- A. Setting blocks and spacer shim shall be neoprene, treated hardware or lead, shaped to required sizes and thicknesses. Material shall be compatible with the glazing sealant and frame.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturers' recommendations and shop drawings as approved by the Engineer.
- B. All items in this section shall be set in their correct locations, as shown on the Drawings, and shall be level, plumb, square and at their proper elevations and in alignment with other work.
- C. This Contractor shall cooperate with contractors of other divisions supplying related materials and coordinate his work accordingly.
- D. All glazing methods shall be in accordance with the manufacturers' installation instructions.
- E. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 CLEANING

- A. All glass in windows and doors shall be washed clean by the Contractor. All glass shall be left whole, free from cracks or other defects. Any defective glass which may appear after cleaning shall be removed and replaced with new glass by this Contractor.

3.05 BROKEN GLASS

- A. The Glazing Contractor shall replace all broken glass of every description and kind and as directed by the Engineer. This Contractor shall pay for the broken glass that he is directly responsible for.

PART FOUR – SPECIAL PROVISIONS

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DIVISION 9

FINISHES

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PART ONE - GENERAL

1.01 SCOPE

- A. Under this Item, the Contractor shall furnish all materials, equipment, and labor, and apply adequate protective coatings to all surfaces specified to be treated.
- B. In general, the work shall include the field painting of all exposed metal surfaces, except galvanized metal, aluminum, bronze, stainless steel, and shop finished surfaces; of interior exposed concrete, cement block, and gypsum board surface above ground floor or when otherwise specified; of all exposed wood surfaces; and of all exposed surfaces of pipe and pipe insulation.
- C. Cleaning and preparation of the surfaces to be painted and, where required, application of seal coat or prime coat are included under this Item.
- D. Mechanical equipment and similar items which have been specified with baked-on enamel or porcelain finish or similar finish standard with manufacturer shall not require field painting. Any injury or damage to such finished surface on new equipment prior to final acceptance of the work shall be remedied before final acceptance.
- E. Examine specifications for other trades relative to painting and paint of finish all exposed surfaces that are left unfinished by requirements of other sections.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Prepared Paint - Ready-mixed paint as manufactured by Pratt & Lambert, Inc.; The Sherwin Williams Company; The Glidden Company; Benjamin Moore & Company; The O'Brien Corporation; Pittsburgh Plate Glass Company; or approved equal. Deliver materials unopened in original containers bearing manufacturer's printed labels denoting quality and brand.
- B. Raw or Boiled Linseed Oil - Equal to the Federal Specification for that material.
- C. Turpentine - Best quality spirits of turpentine.

1.03 COLORS

- A. Paint colors will be selected by the Engineer.
- B. Before any painting work is done, the Engineer will furnish the Contractor with a set of color cards and a color schedule, showing locations of various colors. Prepare samples at the job as required until colors and textures are approved for application.

1.04 GENERAL REQUIREMENTS

- A. Number of coats and type of paint for various purposes are indicated on the Painting Schedule.
- B. Do not reduce or change painting materials except as specified by the manufacturer of the materials.
- C. Do not start work without accepting the surfaces to be finished as being suitable for first class work. Neutralize all masonry and concrete surfaces before applying painting materials.
- D. Paint grilles, registers, piping, etc., to match adjacent walls.
- E. Do not paint aluminum, copper, brass, bronze and other non-ferrous metal unless specifically designated.

PART THREE - EXECUTION

3.01 PREPARATION OF SURFACES

- A. Wood - Sandpaper to smooth even surface and then dust off. After priming coat has been applied, thoroughly fill

nail and other holes and cracks with plastic wood or putty.

- B. Steel and Iron - Remove grease, rust, scale, welding flux and dust, and touch-up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, remove by a wire brushing or sand blasting as necessary to produce a satisfactory surface for painting.
- C. Galvanized Metal - thoroughly clean with gasoline and allow to dry. Prime the metal with a top quality alkyd resin metallic zinc primer made expressly for these surfaces.
- D. General - before painting, remove hardware, accessories, plates, lighting fixtures and similar items, or provide ample protection of such items. Upon completion of each space, replace above items. When necessary, disconnect heating units to permit painting of walls behind them; replace and reconnect upon completion. Use only competent mechanics for removing and connecting above items.

3.01 APPLICATION

- A. Do not apply paint or varnish when the temperature is below 50 Degrees F.
- B. Employ only competent mechanics on the job. Allow coats to dry thoroughly before applying succeeding coats. Spread materials evenly and flow on smoothly without runs or sags.
- C. Protect all finish work of other trades from damage from painting operations with suitable covering or other means. Leave all work in clean orderly condition.

3.02 PAINTING SCHEDULE

- A. Brand names specified are Pratt & Lambert. Equivalent materials by other specified manufacturers will be acceptable.
- B. Exterior:
 - 1. Pre-Primed Metal - Paint all abraded surfaces and touch-up with same paint as shop coat. Then paint all surfaces two finish coats as follows:
Second and Third Coats - Effecto Enamel
 - 2. Un-Primed Metal
First Coat - Effecto Rust Inhibiting Primer
Second and Third Coats - Effecto Enamel
- C. Interior:
 - 1. Concrete Block Walls:
First Coat – Primafill 200
Second and Third Coat – Prohide Plus Latex Satin Enamel
 - 2. Gypsum Drywall:
First Coat – Prohide Plus P.V.A. Latex Wall Primer
Second and Third Coat p Prohide Plus Latex Satin Enamel
 - 3. Woodwork, Painted Finish:
First Coat – Interior Trim Primer
Second and Third Coat – Prohide Plus Latex Satin Enamel
 - 4. Structural Steel and Pre-Primed Metal – Paint all abraded surfaces and touch-up in field with same paint as shop coat. Then paint all surfaces two finish coats as follows;
Second and Third Coats – Effecto Enamel
 - 5. Covered Pipes:
First Coat – Prohide Plus P.V.A. Latex Wall Primer
Second and Third Coats – Same as adjoining surfaces

PART FOUR – SPECIAL PROVISIONS

DIVISION 11

WATER & WASTEWATER EQUIPMENT

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PUMPING STATIONS AND EQUIPMENT

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Work included: The furnishing and installation of one duplex pump station (Sanitary Pump Station), and all pertinent accessories, complete and in place, ready for service at the locations as shown on the Drawings, specified herein, and needed for a complete, proper installation. The work also includes all modifications required to convert the existing pump station into a storm water/combined sewer pump station.
- B. The duplex pump station shall be furnished complete with precast concrete wet well, concrete valve vaults, sump pump, submersible pump(s) and controls in a duplex configuration, all interior and interconnecting piping and valves contained or between the wet well and valve vault, electrical work, and all other accessories required for satisfactory operation. The existing pump station will require demolition of electrical and removal of the existing sanitary pumps. The existing duplex storm pumps will remain and be wired up to the new control building.
- C. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01030. Substitution of certain products in this Section identified in paragraph 1.01 B are subject to Major Equipment Evaluation.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01310 of these Specifications:
 - 1. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
 - 2. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Test data required elsewhere in the Section.
- C. Upon completion of this Portion of the Work, and as a condition of its acceptance, deliver to the engineer three copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01730 of these Specifications.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.05 REGULATORY REQUIREMENTS

- A. Electrical systems and components of the wet well pumps, including motors, cables, conduits, switch boxes, control circuits, slide rails, etc., in enclosed or partially enclosed spaces, including the raw sewage wet wells, shall

comply with the National Electric Code requirements for Class I, Division I, Group D locations. The system shall include U.L. or F.M. listed pumps, U.L. or F.M. listed guide rail system and U.L. or F.M. listed intrinsically safe control panel.

1.06 PUMP TEST

- A. The pump manufacturer shall perform a Hydraulic Institute performance test on each pump before shipment from the factory. The tests shall be non-witnessed. Six copies of a written report regarding all tests shall be submitted to the Engineer for approval prior to shipment of the pumping equipment.

PART TWO - PRODUCTS

2.01 GENERAL

- A. Design of the wet well pumps is based on the use of heavy duty explosion-proof submersible sewage pumps equivalent to that as manufactured and supplied by Flygt Corporation, Ebara Int'l. Corp, or Barnes.
- B. All pumps provided under this Section shall be provided by the same manufacturer.
- C. All products referenced by manufacturer's or supplier's name or model number are subject to "or equal" substitution procedures outlined in paragraph 1.03C (Equal Products) of Section 01340, Submittals and Substitutions.
- D. Pump Design
 - 1. Pump with its appurtenances and cable, shall be capable of continuous submergence underwater to a depth of 65 ft. without loss of water tight integrity. Pump shall be designed for automatic connection to the discharge connection elbow, guided by no less than two guide bars extending from the top of the station to the discharge elbow. Sealing of the pump discharge flange elbow interface shall be strictly by metal to metal contact. No additional diaphragm, o-ring or other sealing device will be acceptable. No portion of the pump or guidance system shall bear on the floor of the sump except the discharge connection elbow.
 - 2. The pump shall be easily removed from its chamber to ground level for inspection or service without requiring dewatering of the chamber. This shall be accomplished by utilizing a sliding guide bracket attached to the pump, two (2) guide bars adequately braced, a stainless steel chain reaching ground level, and a specially formed discharge flange that will automatically and firmly connect and disconnect with the discharge pipe without bolts, nuts, fasteners, or extreme force. Seal between pump and discharge elbow shall be metal-to-metal.

2.02 PRECAST CONCRETE CHAMBERS

- A. All precast reinforced concrete chambers shall be of the best quality of concrete pipe, free from imperfections of any kind and shall have a smooth, dense finish. All pipes shall be true in shape and dimension.
- B. The reinforced concrete base sections, riser sections and flat slab tops used for the vaults shall conform to the latest revision of "Specifications for Reinforced Concrete Manhole Sections, A.S.T.M. Designation: C478, which are hereby made a part of these specifications. The detail drawings indicate the size and configuration of the required chambers. Testing of the pipe shall also conform to A.S.T.M. C478.
- C. Each section length shall have tongue and grooved ends formed on machined rings to insure accurate joint surfaces. Diameters of tongue and grooved surfaces shall not vary from the theoretical diameters by more than one-sixteenth (1/16) in.
- D. Sections using the "O"-ring type joint shall be similarly formed but with a specially reinforced bell end. The reinforcing shall be adequate to meet all tensile stresses in the concrete caused by compressing the rubber "O"-ring.
- E. Premium type joint shall be used on all sanitary or intercepting sewers, and on combined, relief or other sewers if called for. Premium joints shall be made with rubber gaskets, Hexseal, Tylox, O-ring, or an approved equal.
- F. Gaskets shall be made of special composition rubber which will assure a permanent watertight seal and have smooth surfaces free from all imperfections. Gaskets shall conform to the latest revision of "Joints for Circular

Concrete Sewer and Culvert Pipe, Using Rubber Gaskets", A.S.T.M. Designation: C443, which are hereby made a part of these specifications.

- G. The rubber gaskets shall be installed in accordance with the manufacturer's recommendations.
- H. Vault Bases and Covers shall also be precast units as shown on the drawings. Bases, which shall be precast as a single unit, shall consist of a minimum of a 9 in. thick slab complete with a short riser section of the appropriate diameter concrete pipe, which shall terminate in a spigot type end.
- I. Covers, shall consist of a precast concrete slab, a minimum of 8 in. thick, of a diameter shown on the drawings. The cover shall be cast so that it can fit over a spigot type on the appropriate concrete type, and provide a bell and spigot type seal.
- J. Vault bases and cover not fabricated from precast concrete pipe shall be of properly reinforced five thousand (5,000) psi, twenty-eight (28) days compression strength precast concrete.

2.03 PUMP CONSTRUCTION

- A. Submersible, electrically operated pumps shall be in accordance with requirements described in the following paragraphs.
- B. The pumping units shall come complete with sliding brackets, motors, guide bars, stainless steel pull chain, aluminum access doors, power cables and all other necessary appurtenances.
- C. Each pump shall be connected to the discharge line by means of a quick disconnect sealed flange, mounted on the pump and the outlet line. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease or other devices shall be used.
- D. All major pump parts such as the casing, sliding bracket, volute, and impeller shall be of high quality cast iron. All exposed bolts and nuts shall be of stainless steel 304 or zinc chromate primer with an H.B. Tnemecol 46-465 coal tar paint. Pump exterior shall be sprayed with PVC epoxy primer, with chloric rubber paint finish. The pump impeller shall be coated with rilsan or approved equal.
- E. The impeller shall be of gray cast iron, Class 30, dynamically balanced, double shrouded and of non-clogging design. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The fit between the impeller and the shaft shall be a sliding fit with one (1) key.
- F. The pump shaft shall be stainless steel A.N.S.I. 431.
- G. A wearing ring system shall be installed to provide efficient sealing between the volute and impeller. This shall consist of a stationary wear ring made of nitrile rubber molded with a steel ring insert which is drive fitted to the volute inlet, and a rotating stainless steel A.N.S.I. 304 ring which is drive fitted to the impeller eye. An alternate system incorporating an adjustable and replaceable C.I. suction cover designed such that it may be field adjusted to maintain working clearances and hydraulic efficiencies is also acceptable.
- H. The volute shall be of a single piece design and shall have smooth fluid passages large enough at all points to pass any size solid which can pass through the impeller.
- I. Each pump shall be provided with a tandem mechanical rotating shaft seal arrangement running in an oil reservoir. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven tungsten-carbide ring or silicon carbide ring. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. The seals shall require neither maintenance nor adjustment, but shall be readily inspected and replaced. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified:

Shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower units. No conventional system requiring a pressure differential to offset external pressure and to effect sealing will be accepted. Leak detection shall be provided by mechanical system located in a chamber above the upper seal.

- J. The cable entries shall be an integral part of the stator casing. The cable entries shall be comprised of cylindrical elastomer grommets, flanked by washers and a ferrule designed with close tolerance fit against the cable outside

diameter and the entry inside diameter. This will provide a leakproof, torque free seal at the cable entrance. The assembly shall bear against a shoulder in the stator casing opening and be compressed by a brass gland nut threaded into it. Interaction between the gland nut and the ferrule moves the grommet along the cable axially instead of with a rotary motion. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

- K. Each pump shall be provided with two separate multi-conductor hypalon jacketed type SPC cable. One cable shall contain the pump motor power conductors, the other cable shall contain the stator winding thermal sensor conductors. The cables shall be provided with the free end sealed to prevent the entrance of moisture until the proper connection plug is installed. Each cable will terminate in a connection plug being furnished and installed in the field by the Electrical Contractor.

2.04 MOTORS

- A. The motor shall be FM explosion proof, Class 1, Division 1, Groups C,D, NEMA Design B, with Class F insulation for a 60 degree C maximum temperature rise above 40 degree C ambient and suitable for continuous submersible service. The motor shall be capable of 10 starts per hour while the water level varies from the top of the impeller casing to a point 12 inches above that.
- B. Each pump motor shall be supplied with sufficient power cable to extend from the motor in operating position to the underside of the top slab of the chamber with sufficient excess length to extend to a disconnecting plugs and receptacles of appropriate cable sizes, located adjacent to the access opening of the respective chamber. The plugs and receptacles for all pump cables shall be supplied by the pump supplier. If more than two (2) plugs and receptacles are required for one cable, the pump supplier shall notify the Contractor or the Electrical Contractor of the change so that additional installation costs can be added before bidding the project. The cables shall be appropriately sized by the pump supplier to account for distances from the control room to the pumps.
- C. The motor shall be separated from the cable entry junction chamber by a watertight terminal board which shall isolate the motor interior from foreign material gaining access through the pump top.
- D. The motor shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches, embedded in the end coils of the stator winding. These shall be used in conjunction with the supplemental to the external motor overload protection and wired to the control panel.

E. CONTROL PANELS

- 1. A NEMA 1 control panel shall be complete with power disconnect, pump alternator, starters, overloads, circuit breakers, control power transformers, pump on and off indicating lights, H-O-A switches, non resettable 8 digit elapsed time meters, and off - delay timer for each pump to shut off the pump after specified time. The control panels shall be designed for number of pumps as specified in Item 2.08, DESIGN PARAMETERS, below and shall be suitable for wall mounting.
- 2. The magnetic starters shall have a minimum mechanical life of 3,000,000 operations and a minimum contact life of 1,000,000 operations. The control components shall have a minimum life of 50,000 operations.
- 3. A laminated copy of as-built wiring diagram shall be permanently installed inside the cover of the panel.
- 4. The following status and control signals shall be incorporated for each pump in the control panel for remote monitoring . All relays shall be SPDT plug-in type, with dry contacts rated for 5 amps at 120 vac, continuous duty, minimum All timers, shall be plug-type, used in the control circuits shall be of digital type and rated for 5 amps at 120 vac, continuous duty.
 - a. HOA switch shall start and stop the pump when in hand mode. In automatic mode, the pumps shall be started and stopped by the relays from the level transmitters. Four relay (dry contacts, SPDT) will be provided with each level transmitter (Section 13110) as follows: all pumps off, first pump on start request, second pump on start request, and High level Alarm.
 - b. Provide the following signals at properly identified terminal strip for remote alarms.
 - 1. Pumps not running status wired in series for remote monitoring.
 - 2. High level alarm.

3. High temperature motor alarm for each pump.
5. All terminations shall be properly identified on terminal strips with wire numbers on both sides of the wire. Wire numbers shall be indicated on the drawing.
6. A detailed wiring diagram is included in the as-built drawings and a laminated copy shall be available in each panel.

2.05 PIPING

- A. The Contractor shall furnish all labor, equipment and materials to install all discharge piping within lift station and valve vault and shall include swing check valves with outside lever and weight valves, flexible couplings, elbows, tees and other hardware as shown on the drawings or as specified herein.. Where piping passes through a concrete wall, sealing shall be provided to make a watertight joint.
- B. D.I.P. pipe and fittings shall conform to AWWA Standards.

2.06 ACCESS FRAME

- A. The Contractor shall furnish, equipment and materials to install access covers as shown on the Contract Drawings for access to the wet well and valve vault.
- B. The access frame shall be 1/4 in. extruded aluminum with built in neoprene cushion and strap anchors bolted to the exterior.
- C. The door shall be 1/4 in. aluminum diamond plate reinforced with aluminum stiffeners as required. Cast steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. If not otherwise designed as shown on the drawing, doors shall be built to withstand a live load of 150 pounds per square foot, and equipped with a snap lock and removable handle.
- D. A mil finish with bituminous coating is to be applied to the exterior of the frame by the manufacturer. Hardware shall be cadmium plated. Installation shall be in accordance with the manufacturer's instructions. Manufacturer shall also guarantee against defects in material or workmanship for a period of five years under normal use, operation and service.
- E. Access frame and cover for the valve vault shall be as manufactured by the Bilco Company, Type J; or equal. Access frame and cover for the wet well shall be as manufactured by the Bilco Company, Type JD; or equal. See standard details herein.

2.07 GUIDE RAILS

- A. Pump hoisting guide rails shall be installed in and extend the full depth of the lift station as shown on the contract drawings.
- B. Rails shall be constructed of stainless steel pipe having a 1-1/2" diameter for pumps 30HP and a 2" diameter for pumps over 30HP.
- C. The guide rails shall be set plumb to insure easy removal and proper seating of the pump.
- D. Two rails shall be provided for each pump and shall be installed on opposing sides of the pump discharge to eliminate side motion and swiveling.

2.08 DESIGN PARAMETERS

- A. Sanitary Pump Station - The duplex submersible pumps shall be in accordance with the following design parameters:

Type of Pump	Submersible
Number Required	2
Arrangement	Duplex
Pumped Fluid	Raw Sewage
Liquid Temperature	0.50-25 Deg. C

Pump Speed Max	1800 rpm
Min. Nameplate HP	40
Power Requirements	460 volt, 3 phase, 60 Hz
Model	Flygt Model NS 3202.180, EBARA Model 150DLFU630, Barnes 6SHDK or Approved Equal.
Discharge Size	8 in.
Lubrication	Oil
Motor Speed	Constant

Each pumping unit shall be designed for the following operating conditions:

Rated total head, feet	78
Capacity at rated head, gpm	1300
Minimum shutoff head, feet	120
Normal operating head range, feet	73-83
Maximum (nominal) pump operating speed at rated head, rpm	1800
Maximum submergence above floor of wetwell, feet	40
Maximum bhp required at the motor for any point in the operating head range	50
Minimum overall pump efficiency at rated feet of head, percent	64
Nominal size of pump discharge	8"

1. Control Sequence

In automatic mode, the pumps shall be controlled by a continuous level signal (4-20 ma dc) from a level transmitter. At the "Pump 1" start level, one pump shall start. On falling level, the pump shall operate until the "off" level is reached and the pump shuts down. At the "Pump 2" start level, both pumps will be operated. On falling level, both pumps will operate until the "off" level is reached and the pumps shut down.

A high level alarm will initiate a telephone dialer to alert WWTP personnel that an overflow condition is pending.

- B. Storm Pump Station - The existing sanitary pump station will continue to house 2 storm water pumps that will be controlled from the new control building as follows:

Type of Pumps

Storm Pump P-1S: Original Extended Shaft Pump (unknown model) – currently not working
Storm Pump P-2S: Hydromatic Model 4S8L-4000 M4-6-77, 40 HP, 7.395" dia. Impeller, 460V/ 3PH

- Contractor to provide new power feed from proposed control building to existing control panel. Work will include the depowering of the existing sanitary pumps

- C. Sump Pump – Shall be in accordance with the following design parameters.

Type of Pump	Submersible centrifugal
Number Required	One (1)
Liquid Pumped	Sewage and other liquid from floor drain
Liquid Temperature	35°F – 75°F
Design Capacity	20 gpm
TDH	15 ft.
Minimum Horsepower	0.25 Hp
Pump Speed (range)	3400rpm
Motor Speed Control	Constant Speed
Power Requirements	120 VAC. 60 Hz
Solids Handling Capability	0.40 inches
Pump Control	Internal to the pump by float or micro switch sensing element.
Pump Discharge Size	1-1/4"NPT
Bearing Lubrication	Oil
Impeller Material	Glass Filled Thermoplastic

Pump Control Material	Glass Filled Thermoplastic
Manufacturer & Model Number	Flygt Z-25 ¼ Hp, Ebara EPD-3
No. of Liquid Level Sensors	1

2.09 SPARE PARTS

- A. The following spare parts shall be provided for each pump model type number.
 - 1. Two (2) spare impellers shall be provided for each station.
 - 2. Two (2) sets of all required "O" rings and gaskets for each pump.
 - 3. Two (2) spare sets of bearings, mechanical seals and gaskets shall be provided for each pump.
 - 4. Six (6) months supply of all necessary lubricants shall be provided for all products included in this section for each pump station.
 - 5. One dozen of each type of fuse used in the control panels.
 - 6. One box of indicating light bulbs.
 - 7. Ten percent of the number of control relays used in the control panels.
- B. The pump manufacturer shall provide all appropriate specialized pump maintenance equipment for all pumps provided, including but not limited to: impeller pullers, metric allen wrenches and adjustment tools.

2.10 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

2.11 OPERATOR TRAINING

- A. The wet well pump manufacturer shall provide factor operator training in the operation and maintenance of the equipment.
- B. Training for one (1) operator shall be provided at a minimum of one (1) one (1) day factory training session at a time recommended by the wet well pump manufacturer and approved by the Engineer.
- C. Training shall include all reasonable expenses for travel, food, lodging, etc.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the shop drawings and manufacturer's recommendations as approved by the Engineer.
- B. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 SERVICE

- A. Demonstrate to the Owner's operation and maintenance personnel the proper methods for operating and maintaining the equipment, and the contents of the operation and maintenance manual required to be submitted under Article 1.03 in this Section.
- B. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the wet well pump equipment manufacturer's field service technician certifying that:
 - 1. The equipment has been properly installed and lubricated, in accordance with manufacturer's recommendations.
 - 2. The equipment check out and initial start-up activities have been completed in accordance with manufacturer's recommendations and under the technician's supervision.
 - 3. The equipment is in accurate alignment.
 - 4. The equipment is free from any undue stress imposed by connecting piping or anchor bolts.
 - 5. The equipment has been operated under full load and that it operates satisfactorily and in compliance with the requirements of this Section.
 - 6. The monitoring and control system is working satisfactorily , which includes the level transmitters, control panels, and PID control logic. The pumps shall start and stop at various set points as stipulated above. The Contractor shall generate alarms for demonstration to satisfaction of Maintenance personnel.
- C. The Contractor shall include with his bid the on-site services of the wet well pump manufacturer's field service technician for periods, not necessarily consecutive, of two (2) eight (8) hour days each to be designated by the Engineer. This service shall be for the purpose of instruction of plant personnel.
 - 1. It is anticipated that at least one (1) of the above-mentioned two (2) days will be 6-12 months after start-up to inspect performance of the equipment and make any necessary adjustments.

PART FOUR – SPECIAL PROVISIONS

- 4.01 Sanitary Pump Station Controls- Ultrasonic level Sensor (4-20mA) to control pump start and stop with Float backup
- 4.02 The design of the precast pump station wet well shall be submitted and stamped by professional engineer licensed, bonded and insured within the State of Ohio. Design shall include design consideration included in the geotechnical engineering report conducted by PSI. Buoyancy shall be considered and accounted for during construction as well as upon completion.

END OF SECTION

PART ONE - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide and install valves and appurtenances complete as shown on the Drawings, specified, or required for a complete and proper installation.
2. Each value unit shall be furnished complete with valve; and where required, floor stand, gears, motor operator, hand wheel, chain operator, crank, lever, extension stem, guide bearing and support, brackets, gaskets, bolts, nuts, washers, and any other appurtenances necessary for the completion of this work. See Part Four for Valve Schedule and minimum specific requirements.
3. This section shall apply to and supplement all valves and appurtenances described in other Sections of these Specifications or on the Drawings.

B. Summary of **PART TWO - PRODUCTS**

Subsection 2.01:	General
Subsection 2.02:	Butterfly Valves – Air Service
Subsection 2.03:	Check Valves – Air Service
Subsection 2.04:	Gate Valves –
Subsection 2.05:	Plug Valves –
Subsection 2.06:	Pressure Relief Valves – Air
Subsection 2.07:	Mud Valves
Subsection 2.08:	Telescoping Valves
Subsection 2.09:	Pinch Valves
Subsection 2.10:	Check Valves – Swing Type
Subsection 2.11:	Check Valves – Rubber Flapper
Subsection 2.12:	Check Valves – Rubber “Duckbill”
Subsection 2.13:	Hopper Gates
Subsection 2.14:	Diverter Gates
Subsection 2.15:	Valve Boxes
Subsection 2.16:	Floor Boxes and Stands
Subsection 2.17:	Extension Stems and Stem Guide
Subsection 2.18:	Chain Wheels
Subsection 2.19:	Tee Wrenches
Subsection 2.20:	Operators
Subsection 2.21:	Painting and Fixtures

C. Related Work:

1. Documents affecting work of this Section include, but are not necessary limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications; Section 02700: Underground Piping Installation; Section 15250: Piping Insulation; Section 11900: Process Piping System; Section 11910: Exposed Piping Installation; Section 09900 Painting; Section 01730 Operation and Maintenance Manual; Section 01350 Product Requirements and Handling; Section 01300 Submittals; Section 01300 Progress Schedule.

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of satisfactory production acceptable to the Engineer.

- B. Qualifications of Installers: Use adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300 Construction Schedule.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01300 of these Specifications:
 - 1. Shop Drawings in sufficient detail to show manufacturer, model, type, accessories, ratings or class, application or use, materials of construction, sizes, appurtenances, fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 2. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - 3. Required test data.
- C. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Engineer three (3) copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01730 of these Specifications.

1.04 PRODUCT HANDLING

- A. Comply with provisions of Section 01350.

1.05 VERIFICATION OF CONTRACT DOCUMENTS

- A. The Contract Drawings indicate the required sizes and the general arrangement for all piping and equipment. Location shall be verified in the field by the Contractor. In the event it should become necessary in some cases to change the location of any of the work, the contractor shall consult with the Engineer before making any changes. Any such changes approved by the Engineer shall be made without added cost to the Owner. Under no circumstances shall the sizes indicated on the Contract Drawings be changed without first obtaining the written approval of the Engineer.
- B. The Contractor shall determine and be responsible for the proper location and installation of all required valve supports, frames, attachments, mountings, inserts, hangers, chases, sleeves, and other work required for the proper installation of valves, well in advance of the construction progress so as not to delay the work.
- C. The attention of the Contractor is directed to the possibility that this Project may include work of several trades. The final location of inserts, hangers, or other required appurtenances shall be coordinated with the work of the other trades to prevent omissions and interferences.
- D. The Contractor is especially cautioned to install no work that connects to equipment until all related shop drawings of such equipment have been approved by the Engineer. Any such work so installed by the Contractor prior to the approval of shop drawings will be at the Contractor's risk.

PART TWO - PRODUCTS

2.01 GENERAL

- A. All valves and appurtenances shall be of a well-known, experienced manufacturer approved by the Engineer and shall have the name, monogram, or initials of the manufacturer cast thereon. All valves shall be designed, equipped, and suitable for the type of operation shown by the Drawings, specified, or as directed by the Engineer.
- B. Unless otherwise specified in Part Four, valves with screw stems shall open by turning counter-clockwise, the direction being indicated by an arrow cast where easily visible to the operator.

- C. Valves shall be provided with hubs, spigots, flanges, mechanical grooves, screw ends, or other connections compatible with the pipe in which they are installed or scheduled.
- D. Unless otherwise specified, a stuffing box packed with O-ring or other approved seal shall be used to seal the stem of the valve. The seal system used shall be replaceable without removing the bonnet or rotating element. Gaskets shall be of rubber or other approved composition.
- E. All buried bolts-nuts-washers unless otherwise shown or specified shall be low alloy steel that are cathodic to the valve body and have 45,000 psi minimum yield strength. All bolts-nuts-washers installed within a structure, unless otherwise shown or specified shall be low carbon steel conforming to the mechanical and chemical requirements of ASTM A-307, Grade B.
- F. All valves shall be tested at the point of manufacture, and be watertight under operating conditions. After the valves are set in place and are ready to operate, the Contractor shall test them under working pressure and conditions herein specified and any valve found to leak shall be made watertight or replaced by the Contractor.
- G. The Contractor shall be responsible for all patents and claims pertaining to the materials, equipment and appurtenances incorporated in the performance of work under this specification and shall indemnify the Owner from all claims pertaining thereto in accordance with the General Conditions.
- H. The Contractor shall coordinate the performance of this Section with the other items involved with this Contract and/or connecting Contracts.
- I. All products referenced by manufacturer's or supplier's names or models are subject to "or equal" substitution procedures outlined in Section 01350 Submittals and Substitutions.

2.02 BUTTERFLY VALVES - AIR SERVICE

- A. Valves shall be specifically suited for air service.
- B. Butterfly valves shall meet the latest revision of AWWA C-504, Class 25 service, unless otherwise noted for another Class. Valves shall be either of a fully lugged wafer type or a flanged type design as indicated on the Contract Drawings, and have an ASTM A-126, Class B cast iron body; valve discs shall be ASTM A-126 Class B cast iron, ASTM A-48 Class 40 cast iron, or ASTM A-536 ductile iron. Seating edge of disc shall be 316 stainless steel. Valve shafts shall be stainless steel conforming to ASTM A-276. Valve bearings shall be self-lubricating, corrosion resistant sleeve type. Shaft seals shall be O-ring or standard self-adjusting split V packing and be replaceable without removing the valve shaft; Valves shall have an elastomeric seat in the body. An elastomeric seat on the disc edge is not acceptable. Seats shall be of EPDM, and be field replaceable without special tools. Elastomer thickness, not inclusive of backing rings or stiffeners, shall be a minimum of 3/8 inch for valves 6 inches and smaller, and 1/2 inch for valves 8 inches and larger. All external surfaces shall be covered with a minimum 6-mil polyamide cured epoxy coating applied over an abrasive blasted near white metal surface.
- C. Discharge butterfly valve shall have locking lever operators unless otherwise noted in PART FOUR.
- D. The valves shall be the product of Keystone, Dresser, Dezurik/BIF, or equal.

2.03 CHECK VALVES - AIR SERVICE

- A. The body, of wafer type construction, shall be designed for 25-psi air pressure.
- B. Valves shall have an EPDM sealing member suitable for continuous duty operation at 250°F.
- C. Check valves shall have cast iron bodies, ASTM A126, Class B and aluminum bronze plates. The valve shall be drilled to match standard ANSI-125 flanges.
- D. Check valves shall be Mission "Duo-Check II", Techno Check Valve, or equal.

2.04 GATE VALVES

- A. The valves, described in this section shall be resilient seated gate valves manufactured to meet or exceed AWWA C509. Valves shall be of compression type seal design, providing bubble tight shut-off with bidirectional seating ability for pressures up to 200 psi.
- B. The valve shall have a smooth, unobstructed waterway free from any sedimentation pockets. Valve shall provide a 100% port of nominal pipe size when full open. Tapping valve port shall be sized to permit a full pipe port tap.
- C. Body style shall be mechanical joint type for buried service, flange joint type for exposed service and when required, to include special end connections for tapping requirements of otherwise if indicated on the contract drawings.
- D. Stuffing boxes shall be O-ring seal type with two (2) rings located in stem above thrust collar.
- E. Thrust bearings shall be of the low friction torque reduction type, located both above and below the stem collar.
- F. Valves shall be as manufactured by American-Darling, Clow, M & H, U.S. Pipe or an approved equal.

2.05 PLUG VALVES

- A. Unless otherwise shown on the Drawings called for in PART FOUR, plug valves shall be the non-lubricated, eccentric type providing water tight shutoff to the full valve rating of 175 psig differential for valves 12-in. and smaller, and 150 psig differential for valves 14-in. and larger, with flow in either direction.
- B. Port area of valves 20-in. and smaller shall be not less than 80% of the nominal pipe area. Valves 24-in. and larger shall have port area of not less than 70% of the nominal pipe area.
- C. The valve body, bonnet, and rotating element shall be ASTM A126 Class B semi-steel. The bonnet shall be held in position with bolts and designed with either a recessed tongue and groove or two dowel pins connecting the valve body to insure proper alignment of the body and bonnet bushings.
- D. Valve bearing system shall be corrosion-resistant bushings of the permanently lubricated type provided in the body and the bonnet to support the rotating element trunnions. The bearings shall be stainless steel suitable for sewage service. Tape, sprayed, or roll-on bushings or sleeves are not acceptable.
- E. The valve body seat contacting the rotating element shall be either a welded-in overlay of not less than 90% nickel, or a corrosion resistant non-metallic fusion bonded Nylon 11, in compliance with AWWA C507, AWWA C550, and AWWA C509, latest revisions. The seating surface of the rotating element shall be Buna-N rubber (nitrile rubber), or other material recommended by the manufacturer for the liquid handled.
- F. Valves and actuators shall have seals on all shafts and gaskets on covers to prevent leakage of liquid out of, or the entry of dirt or liquid into the valve. Valves shall be designed so they can be repacked under service pressure without removing the bonnet.
- G. Packing shall be one of the following:
 - 1. Multiple split V-ring compression type with a definite packing gland, or
 - 2. Permanent non-adjustable triple lobe Buna-N (Buna-V for buried and submerged installations) O-ring shaft seal with integral cartridges through 24 inch sizes conforming to AWWA C504 and AWWA C507, latest revision.
- H. To prevent entry of dirt or liquid for buried or submerged service, all such valves shall include totally enclosed gear operator and mounting bracket. All necessary valve assembly nuts and bolts shall be 316 stainless steel.
- I. All valves 6 inches and larger, and all buried or submerged valves shall include an enclosed gear operator.
- J. Valves shall be DeZurik series 100, or approved equal.

2.06 PRESSURE RELIEF VALVES - AIR

- A. Weighted pressure relief valves shall be provided and installed where shown on the Drawings or specified in other Sections.
- B. The weight loaded pressure relief valves shall be cast iron body with cast iron weights. The cast iron weights shall be easily added or subtracted so that an adjustment can be made to accommodate the required pressure capabilities.
- C. The weighted pressure relief valves shall be as manufactured by Fuller Company, Roots Type PW, or equal.

2.07 MUD VALVES

- A. Mud Valves
 - 1. Unless otherwise noted, mud valves shall be of the rising stem type. Mud valves shall have 125 lb standard drilling, bronze mounting with machined disc and disc seat for accurate fit and tight shutoff.
 - 2. The valve body shall be cast iron.
 - 3. The stem, stem nut, disc ring, and seat ring shall be bronze.
 - 4. Extension stems, operating nut, and hand wheel shall be provided as listed in the Valve Schedule in PART FOUR or shown on the Drawings.

2.08 TELESCOPING VALVES

- A. Valves shall be capable of giving an infinitely variable discharge rate.
- B. Unless otherwise noted, telescoping valves shall be of the non-rising stem type.
- C. General contractor shall provide normal bolted, cast iron flange at elevation shown on the drawing and shall be responsible to provide sufficient straight pipe below the valve to allow for full travel of the tube inside.
- D. Each valve shall consist of an offset, cast iron, floor stand, with cut tooth pinion, and suitable guides for the operating rack. The pinion will be mounted in the head of the stand, on a shaft, and provided with a ductile iron pawl to lock the unit in any desired position, with palm pressure release. Pinion shaft is operated by a 12-inch diameter cast aluminum spoke hand wheel with rotating crank handle.
- E. The decant tube is to be of PVC pipe, smooth, stiff, concentric, connected on upper end with steel bail, threaded adjustable rod, to steel bar rack assembly.
- F. Special flange and gasket shall be provided by the equipment manufacturer for lower location with watertight ring to bolt to pipe flange by Contractor. Clearance in this seal will be only sufficient to allow tube to slip without excessive pressure. Foundation bolts for operating stand will be galvanized steel furnished with the equipment.
- G. Telescoping valves shall be of the size shown on the Drawings or listed in the Valve Schedule in PART FOUR.

2.09 PINCH VALVES

- A. VALVE CONSTRUCTION: Pinch valves shall consist of the valve body, elastomer sleeve, pinch bars, pull bars, actuator shaft, actuator base plate, actuator and assembly hardware. The valves shall be opened and closed with two mechanical pinch bars that constrict the sleeve between the bars for center-line closure. The pinch bars shall be enclosed inside the valve body. The top pinch bar shall be raised and lowered by a center actuator shaft with a polished, non-threaded surface. The lower pinch bar shall be raised and lowered with two pull bars anchored to the actuator base plate and extending through the valve body. Valves shall provide 100 percent of the port area of the joining pipe at the valve ends and, unless otherwise specified, through the entire length of the valve. Valves shall be capable of closing bubble tight against the maximum working pressure specified.
- B. VALVE BODY: Pinch valves shall be enclosed, split body design and conform to industry standard

ASME/ANSI B-16.10 dimensions, ANSI #150 flanges. Bushings shall be provided through the valve body to protect actuator shaft and pull bars.

- C. ELASTOMER SLEEVE: Pinch valves shall be equipped with a one piece, seamless flange-to-flange elastomer sleeve specifically designed for the specified service conditions. The sleeve shall also be fabricated with polyester or stronger ply cords and folds. Sleeve flanges shall also contain an internal stainless steel ring without bolt holes to allow in-line sleeve replacement by removal of the lower valve body half. Where specified, pull tabs coming from the cord ply and extending through the exterior elastomer coating shall be furnished for attachment to the pinch bars to ensure positive opening force under negative pipeline pressure. A wear monitor sensor wire shall be imbedded between the inner elastomer lining and the reinforcing cords for use with a wear monitoring alarm system. Supplier must demonstrate a minimum 5 years field experience with its' wear sensor wire. Elastomer material shall be [Select: Natural Rubber, Butyl, Nitrile (Buna N), Neoprene, EPDM, Hypalon®, or Viton®].
- D. SHOP PAINTING: All interior and exterior ferrous metal surfaces of valves and accessories shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.
- E. MATERIALS: Materials used in the manufacture of pinch valves shall be as follows:

Body

1" through 8" valves	Cast Iron
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10" and larger valves	Carbon steel
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Elastomer Sleeve	PGR, NR, N, IIR, NBR, CSM, EPDM or FPM
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Pull Bars	Stainless steel, AISI Type 316
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Pinch Bars	Stainless steel, AISI Type 316
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Actuator Stem/ Shaft	Stainless steel, AISI Type 316
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Assembly Hardware	Stainless steel, AISI Type 316
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Shop Coatings

Exterior/Interior valve body surfaces	Epoxy or TGIC Powder Coating
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- F. AUTOMATIC ACTUATION: Valves shall be actuated **electrically** by multi-turn electro-mechanical actuator [manufactured by EIM, AUMA, Rotork, Limitorque, etc.] or **pneumatically** with double-acting pneumatic cylinder, with 4-way solenoid valve. Pneumatic cylinder shall be supplied have 316 stainless steel tie rods and shaft.
1. Modulating Electro-mechanical actuators shall be supplied with 4-20mA throttling capability
 2. Modulating Pneumatic actuators: valves shall be supplied with linear positioners [3-15 psi] or [4-20mA] signal input, gauge block, manufactured by PosiFlex, PMV, ABB Bailey, Fisher, or Valtek.
- G. MANUAL ACTUATION: Valves 1 inch ID to 6 inch ID shall be supplied with hand wheel operated with a lubricated and sealed stainless steel stem screw, housing and threaded nut. Valves 6 inch ID [150 psi. service] and larger shall be provided with sealed and lubricated hand wheel or chain wheel mechanism with a gear reducer and stainless steel stem cover. Unless otherwise specified by the Owner, the direction of rotation of the wheel shall be counter-clockwise to open the valve. Manual actuators shall produce the required torque with a maximum pull of 80 pounds on the hand wheel or chain. Actuator components shall withstand, without damage, a pull of 200 pounds on the hand wheel or chain.

Chain wheels: Unless specifically required otherwise, all valves with center lines more than 7'-6" above the floor shall be provided with chain wheels and operating chains. Each chain wheel operated valve shall be equipped with a chain guide which will permit rapid handing of the operating chain without "gagging" of the

wheel and will also permit reasonable side pull on the chain. Suitable extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot dipped galvanized carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.

Position Indicators: Unless otherwise specified, each valve shall be provided with a position indicator to display the position of the pinch bars relative to fully open. The position indicator shall be mounted on the valve on the same side as the hand wheel

- H. ACCESSORIES [Optional]: Wear Monitoring System: Valve shall come equipped with a complete wear monitoring system to include an indicator control box to accept signal from the internal wear monitor sensor. Alarm box shall be equipped with power and alarm LED and a push-to-test button.
- I. ACCEPTABLE PRODUCTS: Valves shall be manufactured by RF Technologies, Inc., of Jessup, Maryland or pre-approved equal.

2.10 CHECK VALVES –SWING-TYPE

- A. Type: Full opening, swing-type check valve conforming to AWWA C508 standards. Suitable for potable or non-potable water. All working parts shall be accessible through the top of valve.
- B. Body: Cast iron; ASTM A126 Class B.
- C. Ends: Flanged ends ANSI Class 125.
- D. Seat: Bronze B62. Shall be replaceable.
- E. Disc: Cast iron, rubber faced. Cast iron ASTM A126, Class B, rubber-Buna N.
- F. Hinge Pin: Stainless steel type 304.
- G. Operator: Outside lever and adjustable weight.
- H. Manufacturer:
 - 1. M & H
 - 2. Clow
 - 3. Or Equal

2.11 CHECK VALVES – RUBBER FLAPPER

- A. Where rubber flapper Check Valves are called for, the body shall be heavy cast iron. The flapper shall be one piece Buna-N compression molded to satisfy bubble tight shut off at low pressures. The flapper shall be of steel reinforced but with no metal exposed to the media. A back flow device shall be provided to open the check valve flapper without removing the check valve. The area throughout the valve body shall be equal to the pipe area as a minimum. The area through the seat section shall be larger than the inlet and outlet of the valve. Bodies shall be cast iron ASTM A126 Grade B; Exterior paint shall be universal metal primer. Interior shall be epoxy coated or rubber lined. Valves shall be APCO Series 100 Swing Check Valve, Val-Matic Model Swing Flex or approved equal.

2.12 CHECK VALVES – RUBBER “DUCKBILL”

- A. Check Valves are to be all rubber and the flow operated check type with slip-in cuff connection. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The flexible duckbill sleeve shall be one piece rubber construction with nylon reinforcement.
- B. The outside diameter of the “cuff” portion of the valve shall be manufactured to fit snugly within the inside diameter of the thimble. The bill height shall also fit within the thimble I.D.

- C. A stainless steel band shall be installed inside the cuff portion of the valve. The band shall expand outwards by means of a turnbuckle to hold the valve in place. The band shall be pre-drilled to allow pins to be installed through the valve and into the thimble.
- D. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve. Valves shall be manufactured in the USA.
- E. Thimble insert shall be carbon steel epoxy coated per AWWA C-550. Thimble ends shall be plain and 125 pound flange.
- F. When line pressure inside the valve exceeds the backpressure outside the valve by a certain amount, the line pressure forces the bills of the valve open, allowing flow to pass. When the backpressure exceeds the line pressure by the same amount, the bills of the valve are forced closed.
- G. All valves shall be of the Series 37-G as manufactured by Tideflex Technologies, Inc. of Carnegie, PA 15106 or approved equal.

2.13 HOPPER GATES

- A. General: The gate shall be complete with all necessary appurtenances that are required for proper operation and completion of the work included under this section. Each motorized gate shall consist of a gate body, adjustable labyrinth seal, wedge gate blade design, wheels, travel assembly with electric actuator, fasteners, and structural steel frame. The gate shall be drip less and direct all seepage to a single drain.
- B. The bin gate shall be fabricated and contain components adequate to meet the following capacity and service:
 - 1. Material: Sludge removed from domestic sewage
 - 2. Maximum Bulk Density: 120 lbs per cubic foot
 - 3. Maximum Static head: 3 ft.
 - 4. Running Hours per day: 1
 - 5. Speed of travel: 1 inch per second
- C. Gate shall provide an open area at least as large as the opening of the hopper (per drawings), and be designed to operate when the hopper is full. The contractor shall verify the dimensions of the hopper and shall be fully responsible for the proper interface between the gate and hopper.
- D. Bin gate shall be as manufactured by American Bulk Conveying, Inc., or approved equal.
- E. Design: Calculations with full hopper loads, blade breakaway and running force shall be provided to confirm blade thickness and Operator selection with a safety factor of 1.5x.
- F. Frame:
 - 1. Frame shall be type 304 stainless steel of the general shapes indicated on the drawings. Frame shall be designated for maximum rigidity, and shall extend in one continuous piece for the total travel of the blade. Lifting lugs, two on each side, shall be provided.
 - 2. Frame shall be designed to be compatible with the support system shown on the drawings and shall include any reinforcement needed to support the motorized operator entirely from the frame. Design calculations shall demonstrate that the full load, breakaway force and running force can be supported by the frame, blade and actuator.
 - 3. Regreasable Rollers with needle bearings and seals with an L-10 rating of 10,000 hours shall provide and maintain positive blade/seal contact on all four sides and shall be located out of the material flow.

4. Frame shall provide a flanged connection with bolt holes drilled to match the bottom of the hopper. Nuts shall be self-locking, 304/316 Stainless Steel. A 1/4-inch closed cell neoprene gasket shall be provided around the entire frame to seal the frame and bin/hopper connection.
5. Frame shall provide a displacement pocket so that material on the end of the blade does not interfere with closing.
6. The displacement pocket area shall include a sloped drain trough to direct leakage from the top of the blade to a drain. Gates for Screenings shall also have drain rails on the other three sides sloping toward the end pocket drain to catch any seepage around the gate when closed.
7. A 1-inch male NPT flushing port and a minimum 6-inch flanged male drain fitting shall be provided on the closed end of the frame.

G. Seals & Blade (Labyrinth Design):

1. Blade and seal arrangement shall be of an adjustable labyrinth design to prevent direct flow through the seal and with stainless steel vertical sidewalls on three sides to restrict and direct seepage to the drainage trough.
2. The gate shall be equipped with heavy-duty 1/2" wide minimum one-piece hot vulcanized molded neoprene rubber seals with 1/2" diameter contact area and anti-friction Teflon coating on the surface in contact with the blade along the full perimeter. The Seals shall be retained by bolted 304 Stainless Steel bars.
3. The blade shall be of a wedge design so that the seal is not in full sliding contact with the blade during travel and shall "wedge" against the seal only at full closure.
4. The blade (sliding member) shall be one-piece minimum 1/4" thick type 304 stainless steel plate. Thickness shall be sufficient to; prevent jamming due to deflection and design calculations shall demonstrate that maximum deflection shall be 1/360 under all operating conditions.

H. Gate Operators:

1. The bin gate shall be provided with a non-raising stem (or rack & pinion) motorized operator assembly with a manual override. Motorized operator shall be ANDCO, AUMA, Limitorque or approved equal and be sized for 1.5x calculated breakaway force.
2. Motorized operator shall be completely supported by the gate frame.
3. Motorized operator shall permit the gate to be stopped or reversed at any partially open position.
4. Motor shall be squirrel-cage, TEFC, minimum, and shall operate from a 480 volt, 3 phase, 60 hertz power supply and be capable of producing not less than 1-1/2 times the required operating torque.
5. Manual override shall be provided by a chain wheel operator and de-clutching Lever. Chain shall extend to within 3 feet of the floor.

I. Electrical:

1. The gate manufacturer shall furnish and assemble all electrical equipment on the gate including motor, limit switches and conduit
2. Electrical equipment shall be furnished in accordance with the applicable requirements of Article 610 of the National Electrical Code, and the installation and wiring shall be made in accordance with Division 16, ELECTRICAL.
3. Motorized operator shall be provided with a single pole, double-throw limit switch rated at 5 amps at 120 volts AC, for remote indication of fully open and fully closed positions.

2.14 DIVERTER GATES

- A. General: The gate shall be complete with all necessary appurtenances that are required for proper operation and completion of the work included under this section. Each gate shall consist of a gate body, diverter gate, tilt bar, control shaft with bronze bearings, fasteners, and structural steel frame. The gate shall be drip less.
- B. The diverter gate shall be fabricated and contain components adequate to meet the following capacity and service:
 - 1. Material: Sludge removed from domestic sewage
 - 2. Maximum Bulk Density: 120 lbs per cubic foot
 - 3. Maximum Static head: 3 ft
 - 4. Running Hours per day: 8
- C. Gate shall provide an open area at least as large as the opening of the hopper (per drawings), and be designed to operate when the hopper is full. The contractor shall verify the dimensions of the hopper and shall be fully responsible for the proper interface between the gate and hopper.
- D. Diverter gate shall be as manufactured by American Bulk Conveying, Inc., or approved equal.
- E. Design: Calculations with full hopper loads, blade breakaway and running force shall be provided to confirm blade thickness and Operator selection with a safety factor of 1.5x.
- F. Frame:
 - 1. Frame shall be type 304 stainless steel of the general shapes indicated on the drawings. Frame shall be designated for maximum rigidity, and shall extend in one continuous piece for the total travel of the blade. Lifting lugs, two on each side, shall be provided.
 - 2. Frame shall be designed to be compatible with the support system shown on the drawings and shall include any reinforcement needed to support the tilt bar entirely from the frame. Design calculations shall demonstrate that the full load, breakaway force and running force can be supported by the frame, blade and actuator.
 - 3. Frame shall provide a flanged connection with bolt holes drilled to match the bottom of the hopper. Nuts shall be self-locking, 304/316 Stainless Steel. A 1/4-inch closed cell neoprene gasket shall be provided around the entire frame to seal the frame and bin/hopper connection.
- G. Blade: The blade (tilting member) shall be one-piece minimum 1/4" thick type 304 stainless steel plate. Thickness shall be sufficient to prevent jamming due to deflection and design calculations shall demonstrate that maximum deflection shall be 1/360 under all operating conditions.
- H. Gate Operators:
 - 1. The bin gate shall be provided with a manual tilt bar and control shaft, operator assembly.
 - 2. Manual operator shall be completely supported by the gate frame.

2.15 VALVE BOXES

- A. All buried valves shall be provided with valve boxes. Valve boxes shall be standard, three-piece screw type, cast iron adjustable boxes, with tops of boxes set flush to finished grade. Valve boxes shall not be less than 5 in. in diameter and shall have a minimum thickness at any point of 3/16 in. The cover shall have cast thereon an appropriate name for the kind of service for which the valve is used.
- B. A valve box shall be provided for each curb stop. A key shall be furnished to operate curb stops.
- C. All parts of valve boxes, bases, and covers shall be coated by dipping in a bituminous varnish.

2.16 FLOOR BOXES AND STANDS

- A. Each valve operator projecting through a floor shall be equipped with a floor box or floor stand, as shown on the Drawings or listed in the Valve Schedule in PART FOUR.
- B. Floor boxes for access to operating nuts of valves and sluice or slide gates shall be cast iron cover and body with bronze bushings, of length equal to the thickness of the concrete slab in which they are installed.
- C. Floor stands shall be made of cast iron and shall extend to a level where a hand wheel or other operator is easily operated. Floor stands shall be shop primed and field painted according to the Painting Specifications. Stands shall be anchored to the concrete slab with stainless steel bolts.
- D. Boxes and stands shall be fitted with bronze bushings to maintain proper stem alignment.

2.17 EXTENSION STEMS AND STEM GUIDES

- A. Each valve shall be provided with extension stem, when required for ease of operation. Unless otherwise specified, each extension stem shall be made of cold rolled steel, the same size as the valve stem of the valve it operates. If the extension is more than 8 feet long, intermediate stem guides shall be installed and supported from the wall by suitable brackets at a maximum spacing of 8 feet. Brackets and stem guides shall be made of cast iron and be fully adjustable. The guide block shall be bronze bushed where it contacts the extension stem. Stem guides shall be as manufactured by the Eddy Valve Co., Rodney Hunt, or equal. Secure stem guides to walls with stainless steel 5/8-inch expansion bolts.
- B. All valves that are to be operated by a T-wrench shall have a 2-inch square-operating nut at the top of the extension stem.
- C. Tee wrenches shall be supplied as required or specified. Handle shall extend to 3 feet 0 inches above finish grade.
- D. Stems for operating plug valves shall not be less than 7/8-inch diameter solid steel pipe, ASTM A36 with intermediate steady guides. Weld socket for 2 inch valve nuts to bottom of extension stems and pin sockets to nut with cadmium plated 3/8-inch bolts. Provide a permanent lever or a 2-inch square operating nut at the top of stems, in accordance with the Valve Schedule or Drawings.

2.18 CHAIN WHEELS

- A. Each valve with a manual operator within a building which is more than 5 feet 6 inches above the floor to the rim of the manual operator shall have a chain wheel with cadmium plated chain looping 3 feet 6 inches from the floor. The valve shall be oriented to permit chain-wheel operation or intermediate pulleys shall be oriented to permit chain-wheel operation.

2.19 TEE WRENCHES

- A. Two (2) tee wrenches 3 feet in length shall be supplied by the Contractor. All tee wrenches supplied shall be capable of engaging a 2-inch square-operating nut.

2.20 OPERATORS

- A. Manual Operation
 - 1. Valves shall be equipped with nut, hand-wheel, crank, chain, gears, floor stand, and other appurtenances as required for manual operation as specified, showed on the Drawings, or Scheduled. If not otherwise indicated, as a minimum, buried valves shall be equipped with a 2-in. operating nut, and valves in structures shall have hand wheels.
 - 2. Operation shall be designed so that the effort required to operate the hand wheel, lever, or chain shall not exceed 25 lbs. applied at the extremity of the lever or chain, or a 25 lb couple applied to a hand wheel. The hand wheels on valves 4 inches and larger shall not be less than 12 inches in diameter.

B. All valves 6 inches and larger, and all buried, submerged, or chain operated valves shall be gear operated. Gears of valve operation shall be sized for the working pressure and installed in such a manner that the stuffing box will be accessible for packing.

C. Electric Valve Operators

1. The operator shall be the helical and worm gear type driven by an electric motor. Operators shall be designed for either on-off or for modulating service as indicated in the Valve Schedule or as noted on the Drawings. All power gearing shall be grease lubricated. The actuator shall be in conformance with AWWA C-504. The valve manufacturer shall furnish the value of the maximum operating torque required to operate the valve as defined the Appendix to AWWA C-504. The operator manufacturer shall furnish evidence that the operator is designed to equal or exceed the torque requirements.
2. Unless otherwise noted, the operator shall be geared to operate the valve from the fully open position to the fully closed position or vice versa in approximately 60 seconds. It shall be possible to change this cycle time by substituting suitable gear trains. The operator shall be equipped with a declutchable hand-wheel for manual operation. The operator shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
3. Suitable reduction gearing shall be provided off the main shaft of the gearing, turning approximately 270 degrees while the valve performs full travel. The reduction gearing shall be equipped with the following position indicating devices for each operator:
 - a. A mechanical position indicator dial
4. Each operator shall be equipped with adjustable torque switches for overload protection in both opening and closing directions with torque switch bypass for unseating.
5. Each operator shall be equipped with four adjustable train gear limit switches. Each limit switch shall include a switch and counter gear. The setting accuracy shall be less than 1/10 turn of the operator output shaft. Two gear limit switches are for remote indication of end positions.
6. Each motor shall be 480 volts, 60 Hz, three phase, induction type as recommended by the operator manufacturer.
7. Three thermostats in series placed in the winding shall provide the motor with thermal protection. They shall interrupt the control circuit as soon as the temperature goes beyond the permissible winding temperature.
8. Each operator shall be equipped with a reversing magnetic starter. The starter shall be capable of receiving contact closures from remote sources to actuate the operator in either direction.
9. Control voltage shall be 120 volts supplied by a transformer included in the control enclosure. Each operator shall include a local OPEN-STOP-CLOSE control switch and a pad lockable LOCAL-OFF-REMOTE selector switch. Local/Remote contact shall be available for remote indication of the switch position. Remote open/stop/close capability shall be provided.
10. All electrical components shall be integral with the operator, housed in a watertight NEMA 4X enclosure and completely wired. A minimum 2-watt strip heater shall provide condensation protection.
11. A circuit breaker disconnect shall be provided with the operator.
12. Easily identifiable terminal blocks shall be provided for all external power, control, and signal connections.
13. Operators, located outdoors, shall include thermostats and space heaters in the motor and control compartments.
14. The operator shall be as manufactured by Limitorque, EIM, or equal.

2.21 PAINTING AND FINISHES

A. All iron parts shall be painted before leaving the shop.

- B. Unless otherwise specified, all internal ferrous surfaces of each valve except finished or bearing surfaces shall be shop painted with two coats of an asphalt varnish.
- C. Unless otherwise specified, all exterior ferrous surfaces of each valve except finished or bearing surfaces shall be shop painted with two coats of a universally compatible primer, or in the case of valves buried or submerged, with two coats of an asphalt varnish.

PART THREE - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 IDENTIFICATION OF VALVES

- A. Each valve installed in exposed process piping systems, shall be provided with a 1-1/2 inch minimum diameter heavy brass tag. Each tag shall bear the identifying number of the valve and an identifying letter symbol of the service line.
- B. The tags shall be attached to the valve by split-key rings soldered so that ring and tag cannot be removed. The numbers and letters shall be of block type, with 1/2-inch high numbers and 1/4-inch high letters stamped thereon and filled with black enamel.

3.03 VALVE DIRECTORIES

- A. The Contractor shall furnish schematic pipe diagrams and valve directories for each process piping system installed. Each schematic pipe diagram shall be single line showing the relative position of valves, valve numbers and the direction of flow. Each directory shall show each valve number and the location of each valve. Each diagram and directory shall be on an approved material and framed in a glazed frame with screw eyes and wires for hanging and shall be located as directed by the Engineer.

3.04 COORDINATION

- A. Coordinate shall be provided as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.05 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer.
- B. Stem guides shall be accurately aligned.
- C. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.06 TESTING

- A. Each check, gate, butterfly, and ball valve shall be submitted to operation and hydrostatic tests at the manufacturer's plant as specified in applicable AWWA Standards.
- B. Other valves shall be tested in conformance with applicable specifications.
- C. All valves shall be tested in place by the Contractor, as far as practicable under conditions for the pipelines in which they are placed, and defects revealed in valves or connections under test shall be corrected at the expense of the Contractor to the satisfaction of the Project Field Representative.

3.07 SERVICE

- A. Demonstrate to the Owner's operation and maintenance personnel the proper methods for operating and maintaining the equipment, and the contents of the operation and maintenance manual if required to be submitted under Article 1.03 of this Section.
- B. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the equipment manufacturer's field service technician certifying that the equipment:
 1. Has been properly installed and lubricated.
 2. Is in accurate alignment.
 3. Is free from any undue stress imposed by connecting piping or anchor bolts.
 4. Has been operated under full load and that it operates satisfactorily and in compliance with the requirements of this Section.

PART FOUR - SPECIAL PROVISIONS

4.01 VALVE SCHEDULE

- A. The following letter designations are used in the Valve Schedule:

Valve Type Designation

PV	Plug
CV	Check
ARV	Air & Vacuum, Sewage at high points
CVR	Check – Rubber "Duckbill"

Valve Schedule

Tag Number	Size (inches)	Operator
CV1	8"	Automatic, Swing Type
CV2	8"	Automatic, Swing Type
PV1	8"	Manual, Hand Wheel
PV2	8"	Manual, Hand Wheel
ARV (typ. All)	2"	Automatic, with Isolation Valve and drain valve
CVR	24"	Automatic

END OF SECTION

DIVISION 13
SPECIAL CONSTRUCTION

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LEVEL TRANSMITTERS AND SWITCHES

PART ONE - GENERAL

1.01 WORK INCLUDED

- A. Under this contract the Contractor shall furnish, install and place in successful operation and furnish field services for the warranty period, the specified level sensors, transmitters, switches and appurtenances as shown on the drawings and specified herein for a complete installation.

1.02 DESCRIPTION OF WORK

- A. This section includes furnishing and installing level type sensors/transmitters and switches. This Section also includes the furnishings of necessary start-up services and training of plant operating personnel in operation and maintenance of the equipment.
- B. It is the intent of this contract that the final installation shall be complete in all respects and the Contractor shall be responsible for minor details and any necessary special construction not specifically included in the Drawings or specifications.
- C. Refer to special provisions for specific project requirements.

1.03 QUALITY ASSURANCE

- A. All work performed under this section shall comply and be in accordance with all approved trade practices and manufacturer's recommendations.

1.04 STANDARDIZATION

- A. All equipment shall be of the latest and most modern design. All sensor/transmitter and switch assemblies, of the same type, shall be of the same manufacture and general model type.

1.05 SUBMITTALS

- A. Eight copies of detailed drawings and cut sheets shall be submitted for approval to the Engineer prior to manufacture eight bound copies of the Operation and Maintenance manuals including start-up, installation, storage, and spare parts list shall be supplied for each type of pressure transmitters specified herein.

1.06 TAGS

- A. The level sensor, the level transmitter and switches shall have an identifying tag (white plastic with black letters engraved on it) mounted on each piece of equipment with the following information:
 - 1. Manufacturer¹'s name
 - 2. Part number
 - 3. Serial number
 - 4. Tag number
 - 5. Calibrated range

1.07 RESPONSIBILITY AND COORDINATION

- A. Under this Contract, the Contractor shall be responsible for the purchase, storage and installation of all level sensors, transmitters and level switches. Each device shall be completely wired, tested and is suitable for operation. Conduit and signal wiring for each device shall be installed between each converter and terminals at the designated area panel or as showed on the drawings. The drawings and specifications are intended to

illustrate and define the equipment installation, however, the Contractor shall be responsible for all the details that may be necessary to properly install, adjust and place in operation the complete installation. The Contractor shall assume full responsibility for additional costs that may result from unauthorized deviations from the specifications.

- B. The level sensors and transmitters level switches provided under this Contract shall conform to the following specifications unless otherwise noted on the instrument schedule.

PART TWO - PRODUCTS

2.01 LEVEL TRANSMITTER - ULTRASONIC TYPE

- A. Type: Non-contact system using transducer to convert electrical pulses from the transmitter into sonic pulses directed towards the metered surface and receives the reflected sonic pulses and converts them back into electrical pulses for reception by the transmitter. Transmitter shall generate and time the electrical pulses, and count and convert the pulse travel times into an analog output signal linearly proportional to level.
- B. System Performance Requirements:
 - 1. Accuracy: Not less than ± 1 percent of full-scale range.
 - 2. Linearity and Repeatability: Not less than ± 1 percent of full scale.
 - 3. Minimum Operating Distance from Transducer (Deadband): 18 inches
 - 4. Beam Pattern: 7 degree conical.
 - 5. Transmitter Outputs: Provide each of the following:
 - a. 4-20 mdc. Direct acting and isolated, into 0-1 000 ohms.
 - b. Minimum of 1 independently adjustable alarm set-point relay with SPDT contact output rated at 5 amps, 120 vdc resistive.
 - c. Loss of echo relay, which energizes when measured level falls beyond signal range or signal, is interrupted for any other reason. Relay output shall be a SPDT contact rated 5 amps 125 vdc resistive.
 - 6. Environmental Conditions: Suitable for use under very humid environmental conditions, such as covered wet wells.
 - 7. Power Consumption: 25 watts maximum
- C. Required Features:
 - 1. Transducer:
 - a. Encapsulated by a corrosion resistant and submergence resistant material: PVC, Kynar or Halan.
 - b. Designed for suspended rigid conduit mounting.
 - c. 3/4-inch external NPT conduit connection.
 - 2. Transmitter:
 - a. Solid state construction
 - b. Built-in digital filtering for EMI protection and external acoustical noise rejection.
 - c. Built-in automatic compensation for variations in temperature, pressure and density of the sonic signal medium.

- d. Range changeable in the field by use of plug-in range modules, eliminating the necessity for rewiring or recalibration.
 - e. Integral LED or backlit LCD indicator scaled in engineering units for the range required.
 - f. Potentiometers for zero and span adjustment over 0-100 percent of the calibrated range.
 - g. Distance or Height Mode of operation selectable via internal switch.
 - h. Lost Echo and Power on Lights.
 - i. Housed in NEMA 4 enclosure and suitable wall mounting. Provide with a transparent window to permit viewing indicating meter and lights. Internally mounted diagnostic LED's to allow isolation of faults in terms of major components.
 - j. Designed for operation on 120 vac \pm 1.0 percent, 60 Hz power supply.
 - k. The instruments shall be factory calibrated to height of the liquid levels as specified in the special provisions.
3. Accessories: Special PVC jacketed coaxial cable, of the actual length required, for connection between the transducer and transmitter. Cable to be sized by the Electrical Contractor.
- D. Product Manufacturer: Provide ultrasonic level transmitters of one of the following:
- 1. Militronics
 - 2. Bailey/Fischer & Porter
 - 3. Sigma
 - 4. Or equal

2.02 ULTRASONIC FLOW SWITCH

- A. General: A clamp-on type, non-invasive ultrasonic device that detects and alarms low liquid velocities from outside of carbon steel and /or ductile iron pipe.
- B. Performance Requirements:
- 1. Alarm Range: 0.25 to 5/10/20 FPS switch selectable ranges.
 - 2. Output: 2 SPDT hermetically sealed relays rated at 3 amps. minimum.
 - 3. Transducer: Twin crystal, dual head with 10 ft. of flexible cable.
 - 4. Power Supply: 120 vac, 60 Hz
 - 5. Adjustments: Signal damping with time delay.
 - 6. Accuracy: \pm 5 percent of full scale.
 - 7. NEMA 4 transmitter housing.
- C. Product and Manufacturer Provide of one of the following:
- 1. Model SFDA, as manufactured by Polysonics.
 - 2. Or equal.

2.03 LEVEL TRANSMITTER - SUBMERSIBLE PRESSURE TRANSDUCER

- A. General: Specifically designed to meet the rigorous environments encountered in slurry or highly viscous applications. The transducer shall sense the liquid level or pressure variation and convert these variations into a linear 4-20 mA dc signal.
- B. Required Features:
1. Electrical connection will be 1/2"-14 NPT male conduit connection
 2. The transducer shall be solid state with no mechanical linkages or moving parts.
 3. Pressure Range: 0-5 through 0-100 psi
 4. Static Accuracy: ± 0.25 percent (includes the combined errors due to nonlinearity, hysteresis and non-repeatability on a Best Fit Straight Line basis at 25°C per ISA S51.1).
 5. The pressure-sensing element shall incorporate a four active arm Wheatstone Bridge strain gage diffused directly into a silicon diaphragm.
 6. The sensing element shall exhibit no measurable hysteresis, withstand overpressures up to 200 percent and have a life expectancy of 20 million cycles.
 7. The transducer shall operate from a DC supply, between 9 and 30 VDC, unregulated.
 8. The transducer shall have on-board signal conditioning and include over voltage and reverse polarity protection.
 9. Wetted materials: Type 316 stainless, fluorocarbon, and PTFE.
 10. Transducer Sensing Diameter: 2 3/4-inch
 11. Factory-attached polyurethane or Tefzel jacketed water block cable with non-stretch Kevlar stiffeners, cable shield wrap and vent tube for atmospheric reference with moisture barrier. Water tight cable seal shall be via compression type fitting.
 12. An aneroid bellows assembly complete with DIN rail mounting assembly shall be provided to prevent condensation from forming in the vent tubing. Order Series 815.
 13. Surge/lightning option provides over voltage protection at both sensor and electrical connection points. Option 009 for 4-20mA output.
- C. Product and Manufacturer: The well level monitoring system shall be KPSI Series 750 as manufactured by Pressure Systems, Inc.

2.04 LEVEL SENSOR UNIT -TRANSMITTER - CAPACITANCE TYPE PROBE

- A. Type: Four-wire, continuous capacitance type level transmitter system producing an output signal linear to level. System shall consist of sensing probe, electronic transmitter, interconnecting cable and other components as necessary for proper operation of the system.
- B. Performance Requirements:
1. System Performance: Suitable for use with conductive liquids (water or waste water).
 2. System Accuracy: ± 1 percent of span, or better.
 3. Linearity: ± 1 percent of span, or better.
 4. Repeatability: ± 1 percent of span, or better.
 5. Ambient Temperature Range: -40 F to 160 F.

6. Transmitter Output: 4-20 mdc, isolated, and direct reading into 0-600 ohms, minimum.

C. Construction Features:

1. Sensing Probe and Interconnecting Cable:

- a. Type: Provide the following type of sensing probe:
 - 1) Teflon coated solid rod (20 and 22 feet lengths). Contractor to field verify the probe lengths for each wet well before purchasing.
- b. Sensing Probe Materials:
 - 1) Insulated Rods: Type 316 Stainless Steel.
 - 2) Insulation: Teflon
- c. Probe Holder: Watertight conduit and fittings with corrosion resistant coating (NEMA 6 rating) for supporting the sensing probe and housing the connections to the transmitter.
- d. Probe and Holder Mounting: Threaded NPT fitting, 3/4 or 1 inch depending on probe OD provided. Provide auxiliary Type 316 stainless steel or Teflon-faced CS mounting flange and/or support bracket and fasteners for installation in wet wells.
- e. Interconnecting Cable: Three-conductor coaxial cable driven shield type, length as required to connect to transmitters. The cable lengths to be determined by the Contractor.

2. Transmitter:

- a. Solid state electronics designed to measure both resistance and capacitance between the sensing probe and ground reference probe with circuitry designed to ignore errors generated by coating build-ups on the sensing probe.
- b. Field adjustable zero and span adjustments.
- c. Housing: NEMA 4 enclosure with viewing window for indicator.
- d. Indicator: Integral 3-1/2 digit LCD meter, visible through transparent window on enclosure. Meter shall be capable of being field adjusted to indicate transmitter output in actual engineering units or 0-100 percent full scale.
- e. Mounting: Suitable for wall, handrail, surface or frame mounting. Provide Type 316 stainless steel fasteners and hardware as required.
- f. Power Supply: Suitable for operation on 120 vac, 60 Hz and single-phase power.
- g. RFI Protection: Provide RFI filters on sensing element input and signal output.
- h. Surge Protection: Provide surge protection suppressors for power supply, input, and signal connections.
- i. Damping: Field adjustable 0 to 30 second time delay.
- j. Zero offset: Field adjustable by means of additional zero capacitors installed across probe signal input terminals.
- k. Fail Safe Action: Field reversible Low Level or High Level (Low Level Fail Safe Standard).
- l. Relays: Provide 4 relays with Form C contacts, rated for 120 vac, 5 amps continuous duty. Terminal strips shall be available for field wiring. The drawings shall show the relay contacts for the following: low-level pump shutdown, first pump ON request, second pump ON request, and high level alarm. The set points for each relay shall be field adjustable.

3. Ground Reference: Provide reference ground as required for proper operation of the system.

D. Product shall be Universalevel Systems, as manufactured by Drexelbrook Engineering Company, Milltronics, or approved equal.

2.05 LEVEL SENSOR UNIT - TRANSMITTER – SUBMERSIBLE PRESSURE PROBE TYPE

A. Type: Submersible pressure probe type system measuring hydrostatic pressure continuously and producing an output signal linear to level. System shall consist of sensing probe and cable, electronic transmitter, interconnecting cable and other components as necessary for proper operation of the system.

B. Performance Requirements:

1. System Performance: Suitable for use with wastewater.
2. System Accuracy: ± 0.5 percent of span, or better.
3. Linearity: ± 1 percent of span, or better.
4. Repeatability: ± 1 percent of span, or better.
5. Ambient Temperature Range: -40 F to 160 F.
6. Transmitter Output: 4-20 mdc, isolated, and direct reading into 0-600 ohms, minimum.

C. Construction Features:

1. Sensing Probe and Interconnecting Cable:

a. Type: Provide the following type of sensing probe:

- 1) Snub-nosed sensing probe made of 316 Stainless Steel. Contractor shall field-verify the required lengths before purchasing.

b. Sensing Probe Materials:

- 1) Diaphragm: Type 316 Stainless Steel with silicone oil fill.
- 2) Housing Type: 316 Stainless Steel
- 3) Nut/washer Type: 316 stainless steel
- 4) Cable Grommet: Viton
- 5) Cable Jacket: Polyurethane
- 6) Snub Nose: Nylon 6/6, removable (1/2-inch NPT threads)

c. Probe and Holder Mounting: Use 2-inch diameter schedule PVC with 1/4-inch diameter holes drilled as shown on drawing. Provide auxiliary Type 316 stainless steel mounting flange and/or support bracket and fasteners for installation in wet wells.

d. Interconnecting Cable: Four wire polyurethane shield type, length as required to connect to transmitters. The cable lengths to be determined by the Contractor.

2. Transmitter:

a. Solid state electronics designed to measure the hydrostatic pressure continuously and provide direct readout and 4-20 ma analog outputs.

b. Field adjustable zero and span adjustments.

c. Housing: Fiberglass reinforced polyester with indicator viewing window.

d. Indicator: Integral 3-1/2 digit LCD meter, visible through transparent window on enclosure. Meter shall be capable of being field adjusted to indicate transmitter output in actual engineering units or 0-

100 percent of full scale.

- e. Mounting: Suitable for wall, within another panel, handrail, surface or frame mounting. Provide Type 316 stainless steel fasteners and hardware as required.
- f. Power Supply: Suitable for operation on 120 vac, 60 Hz and single-phase power. This unit will provide a DC current semi-regulated output to the probe.
- g. RFI Protection: Provide RFI filters on sensing element input and signal output.
- h. Surge Protection: Provide surge protection suppressors for power supply, input, and signal connections.
- i. Damping: Field adjustable 0 to 30 second time delay.
- j. Electrical Connector: Capable of receiving the #20 AWG polypropylene insulated and shielded conductors from the probe.
- k. Fail Safe Action: Field reversible Low Level or High Level (Low Level Fail Safe Standard).
- l. Relays: Provide 4 relays with Form C contacts, rated for 120 vac, 5 amps continuous duty. Terminal strips shall be available for field wiring. The drawings shall show the relay contacts for the following: low-level pump shutdown, first pump ON request, second pump ON request, and high level alarm. The set points for each relay shall be field adjustable

3. Ground Reference: Provide reference ground as required for proper operation of the system.

D. Product shall be Level Mate II as manufactured by Ametek, Devar, Inc., or approved equal.

PART THREE - INSTALLATION

3.01 SENSOR INSTALLATION

- A. The sensor installation shall be isolated from vibration in and physical damage. It shall not be mounted in the direct stream of the fluid. If required, use a deflecting baffle in front of the sensor in the direction of the flow. The sensor shall be easily removable for cleaning or maintenance.
- B. The sensor shall be wired using manufacturers recommended wiring practices to a junction box close to the probe to facilitate withdrawal of sensor for maintenance. The wiring from the junction box to the transmitter shall be done using conduits and wire sizes as shown on the drawings

3.02 MANUFACTURER'S SERVICES

- A. The Contractor shall provide the services of a qualified service engineer to supervise and inspect the equipment installation to insure for each type of level sensing instrument that it is installed in accordance with manufacturer's recommendations.
- B. The manufacturers service engineer shall field calibrate all equipment specified under this section. This service shall be performed at the request of the Project Engineer at the time of complete plant start-up at the end of the construction contract. A calibration certificate shall be submitted to the Project Engineer for each piece of equipment. The service engineer shall also make all adjustments necessary to place the equipment in trouble-free operation. In addition, the equipment manufacturer shall provide a qualified manufacturers service engineer to train the plant operating personnel in the proper care, repair, calibration and operation of the equipment. This service shall be provided at the location and time requested by the owner.
- C. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the level sensing equipment manufacturer's field service technician certifying that:
 - 1. The equipment has been properly installed, in accordance with manufacturers' recommendations.
 - 2. The equipment check out and initial start-up activities have been completed in accordance with manufacturer's recommendations and under the technician's supervision.

3. The equipment is in accurate alignment, if applicable.
4. The equipment is free from any undue stress imposed by connecting piping or anchor bolts.
5. The equipment has been operated under full load and that it operates satisfactorily and in compliance with the requirements of this Section.

3.03 OPERATION AND MAINTENANCE MANUALS

- A. Prior to or with the delivery of equipment, the contractor shall provide copies of an operation and maintenance manual including storage, installation, start-up, operation and maintenance instructions, and a complete parts list and recommended spare parts list. The O & M manuals shall be in compliance with Section 1048.

3.04 SPECIAL TOOLS AND EQUIPMENT

- A. The spare parts shall be provided as recommended by the Instrument manufacturer.

PART FOUR - SPECIAL PROVISIONS

- 4.01 Sanitary Pump Station Controls- Ultrasonic level Sensor (4-20mA) to control pump start and stop with Float backup

END OF SECTION

AUTOMATIC TELEPHONE DIALER

PART ONE - GENERAL

- A. Under this contract the Contractor shall furnish, install, and place in successful operation and furnish field services for the warranty period, the specified Telephone Dialer as shown on the drawings and specified herein. The phone line for the dialer shall be provided by the Owner.

Drawings and general provisions of Contract, including special and supplementary conditions and Division -1 Specification sections, apply to work of this section.

1.01 DESCRIPTION

- A. This section includes furnishing, installing and programming the telephone dialer to alarm the process signals to various phone numbers.
- B. It is the intent of this contract that the final installation shall be complete in all respects and the Contractor shall be responsible for minor details and any necessary special construction not specifically included in the Drawings or specifications.
- C. All systems shall be factory integrated, tested and should be ready for installation. The only field connections required shall be power, phone line and alarm signals.

1.02 STANDARDIZATION

- A. All equipment shall be of the latest and most modern design. All equipment of the same type shall be of the same manufacture and general model type.

1.03 SUBMITTALS

- A. Eight copies of detailed drawings and cut sheets shall be submitted for approval to the Engineer prior to manufacture. Eight bound copies of the Operation and Maintenance manuals including start-up, installation, storage, and spare parts list shall be supplied for each telephone dialer specified herein.

1.04 QUALIFIED MANUFACTURERS

- A. The proposed telephone dialer shall be manufactured by Raco Manufacturing & Engineering Company, Series Verbatim/VSS or approved equal by the Engineer.
- B. It is not the intention of this specification to restrict competition, but it is intended that a reliably performing system with quality equipment and documentation will be furnished and that "one of a kind" or experimental equipment by vendors not having a proven performance record is strictly disallowed.

1.05 TAGS

- A. The Dialer shall have an identifying tag (white plastic with black letters engraved on it) mounted on each piece of equipment with the following information:
 - 1. Manufacturer's name
 - 2. Part number
 - 3. Serial number
 - 4. Tag number

1.06 RESPONSIBILITY AND COORDINATION

- A. Under this Contract, the Contractor shall be responsible for the purchase, storage and installation of all equipment, as shown on the drawings. Each Dialer specified herein shall be completely wired, tested and be suitable for operation. Conduit, wiring and signal termination for each device, from the control panels to the specified Dialer, shall be the responsibility of the Electrical Contractor. The drawings and specifications are intended to illustrate and define the equipment installation, however, the Contractor shall be responsible for all the

details which may be necessary to properly install, adjust and place in operation the complete installation. The Contractor shall assume full responsibility for additional costs which may result from unauthorized deviations from the specifications.

- B. The telephone dialer provided under this Contract shall conform to the following specifications unless otherwise noted on the drawings.

PART TWO - PRODUCTS

2.01 TELEPHONE DIALER

- A. The telephone dialer shall be voice messages, unattended equipment alarm system, which shall report 8 discrete alarms conditions or equipment status via a standard dial-up voice grade (pulse or tone) telephone line. When an alarm is detected by the dialer, it shall automatically dial up to 16 phone numbers, and then use the user pre-recorded messages to tell the person on the other end of the phone line in plain English the exact nature of the alarm call. The messages shall be stored in the dialer's non-volatile memory. If the phone is busy or not answered within the specified number of rings, the dialer shall dial the next number in sequence.
- B. The dialer's front panel shall be with the following LED indicators:
 - 1. Power ON
 - 2. Low Battery
 - 3. Outgoing phone call indication
 - 4. Normal Operation
 - 5. Check Status
 - 6. Program Mode indication
 - 7. Unacknowledged Alarm indication
 - 8. Acknowledged alarm indication
 - 9. Discharging battery/recharging battery indication lights.
- C. The dialer shall have the following selector switches, minimum:
 - 1. Power On
 - 2. Speaker/ Mike selector
 - 3. Alarm ready /Disable switch
- D. The dialer shall be provided with real-time clock. It shall be capable of remote supervisory control, and printer output, when desired at a later date. It shall have the capability of 4 contacts outputs.
- E. A front panel keyboard shall be provided to enter phone numbers for storage in the non-volatile memory. All switches on the front of the panel shall be sealed to prevent contamination. User recorded messages shall be stored for a period of 10 years. External memories shall not be acceptable.
- F. The dialer shall be supplied with solid-state message recording (separate message for each channel) and playback features. There shall be no limit to the length of messages. The unit shall provide automatic setting of optimum speech recording rate for the total set of messages recorded, in order to achieve optimum sound quality. Switches and jumpers straps are not acceptable means of manipulating message lengths. The time of message recording shall vary up to 635 seconds, depending on the recording rate.
- G. The unit shall be equipped with screw-type terminal block for customer power and signal interface.
- H. The dialer shall operate on 120 vac, 60 Hz, 1 phase voltage source. If dc power is required for sensing alarms (dry contacts) the appropriate, power supplies shall be provided internal to the dialer. External power supplies are not

acceptable. In the event of power failure, the dialer shall be provided with a battery which shall provide 20 hours of continuous operation. An integral battery charger shall maintain batteries to its maximum charge.

- I. Equipment shall operate over a temperature range of -30 to +60 degrees centigrade and up to 95% Relative Humidity, non-condensing.
- J. All integrated circuit logic chips shall be equipped with plug-in sockets to facilitate maintenance and repair of the units.
- K. The telephone dialer shall be provided with surge protection (power, phone line, each dry contact input), IEEE Standard 587, Category B. Gas tubes shall be followed by solid-state protection devices which shall be integral to the circuit board for each line.
- L. The dialer's enclosure shall be NEMA 4X and shall be suitable for wall mounting.

2.02 WIRING AND RELAYS

- A. All wiring shall have less than 600-volt insulation and all power wiring and shall be in complete with the National Electric Code and State and Local and NEMA Electric Standards. Control wiring shall be colored coded. All job connections required to conveniently replace control components shall be made an approved type terminal blocks with engraved bakelite maker strips or similar approved means. Underground wiring shall be adequately protected with conduit.
- B. All interposing relays, where required, shall be supplied under this item. All power supplies shall be supplied with the equipment. All relays shall be SPDT and contacts shall be rated for 120 vac, 5 amps continuous duty and shall be of plug-in type.

PART THREE – EXECUTION

3.01 INSTALLATION

- A. The dialer's shall be wall mounted. When approved by the Engineer, it shall be mounted in strict accordance with the manufacturer's recommendations.

3.02 OPERATION AND MAINTENANCE MANUALS

- A. Prior to or with the delivery of equipment, the contractor shall provide copies of an operation and maintenance manual including storage, installation, start-up, operation and maintenance instructions, and a complete parts list and recommended spare parts list. The O & M manuals shall be in compliance with the General Requirements.

3.03 MANUFACTURER'S SERVICES

- A. The Contractor shall provide the services of a manufacturer's qualified service engineer to supervise and inspect the equipment installation for each dialer to insure that it is installed in accordance with manufacturer's recommendations.
- B. The manufacturer's service engineer shall field checkout all equipment specified under this section. This service shall be performed at the request of the Project Engineer at the time of complete plant start-up at the end of the construction contract. A system checkout certificate shall be submitted to the Project Engineer for each piece of equipment. The service engineer shall also make all adjustments necessary to place the equipment in trouble-free operation. In addition, the equipment manufacturer shall provide a qualified manufacturer's service engineer to train the plant operating personnel in the proper care, repair, calibration and operation of the equipment. This service shall be provided at the location and time requested by the owner.
- C. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared to show that the dialer is working per specifications.
 - 1. The equipment has been properly installed, in accordance with manufacturer's recommendations.
 - 2. The equipment check out and initial start-up activities have been completed in accordance with manufacturer's recommendations and under the technician's supervision.

PART FOUR – SPECIAL PROVISIONS

END OF SECTION

DIVISION 16
ELECTRICAL

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PART ONE - GENERAL

1.01 DESCRIPTION OF SYSTEM & SITE

- A. Provide a 250 kW standby power system to supply electrical power at 277/480 Volts, 60 Hertz, Three Phase. The generator shall consist of a liquid cooled spark-ignited engine, a synchronous AC alternator, and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.
- B. The site is an NEC ordinary location with no specific harsh environment requirements.
- C. The on-site gas pressure is 11 to 14 inches of water column.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. An electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.
- B. The generator set must conform to applicable NFPA requirements.
- C. The generator set must be available with the Underwriters Laboratories listing (UL2200) for a stationary engine generator assembly.
- D. The generator set must be pre-certified to meet EPA federal emission requirements for stationary standby. On-site emission testing & certification will not be acceptable for standby applications.

1.03 MANUFACTURER QUALIFICATIONS

- A. This system shall be supplied by an original equipment manufacturer (OEM) who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 25 years, thereby identifying one source of supply and responsibility. Approved suppliers are Generac Industrial Power, Cat Olympian or Cummins. Dealer produced generator sets are not acceptable.
- B. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.
- C. Manufacturer's authorized service representative shall meet the following criteria:
 - a. Certified, factory trained, industrial generator technicians
 - b. Service support 24/7
 - c. Service location within 200 miles
 - d. Response time of 4 hours
 - e. Service & repair parts in-stock at performance level of 95%
 - f. Offer optional remote monitoring and diagnostic capabilities

1.04 SUBMITTALS

- A. Engine Generator specification sheet
- B. Controls specification sheet(s)
- C. Installation / Layout dimensional drawing
- D. Wiring schematic
- E. Sound data
- F. Emission certification
- G. Warranty statement

PART TWO - PRODUCTS

2.01 ENGINE RATING AND PERFORMANCE

- A. The prime mover shall be a liquid cooled, spark-ignited, 4-cycle engine. It will have adequate horsepower to achieve rated kW output.
- B. The engine shall support a 100% load step.
- C. The generator system shall support generator start-up and load transfer within 10 seconds.
- D. The generator shall accept a load step of 100% of rated kW with a maximum frequency dip of 12 Hz.
- E. The engine shall be factory EPA certified. Field certification is not acceptable.

2.02 ENGINE OIL SYSTEM

- A. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).
- B. The engine shall operate on mineral based oil. Synthetic oils shall not be required.

2.03 ENGINE COOLING SYSTEM

- A. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system. The coolant system shall include a coolant fill box which will provide visual means to determine if the system has adequate coolant level. The radiator shall be designed for operation in 122 degrees F, (50 degrees C) ambient temperature.
- B. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer.
- C. Engine coolant and oil drain extensions, equipped with pipe plugs and shut-off valves, must be provided to the outside of the mounting base for cleaner and more convenient engine servicing.

2.04 ENGINE STARTING SYSTEM

- A. Starting shall be by a solenoid shift, DC starting system.
- B. The engine's cranking batteries shall be lead acid. The batteries shall be sized per the manufacturer's recommendations. The batteries supplied shall meet NFPA 110 cranking requirements of 90 seconds of total crank time. Battery specifications (type, amp-hour rating, cold cranking amps) to be provided in the submittal.
- C. The genset shall have an engine driven, battery charging alternator with integrated voltage regulation.
- D. The genset shall have an automatic dual rate, float equalize, 10 amp battery charger. The charger must be protected against a reverse polarity connection. The chargers charging current shall be monitored within the generator controller to support remote monitoring and diagnostics. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

2.05 ENGINE FUEL SYSTEM

- A. The engine shall be configured to operate on pipe line grade natural gas.
- B. The engine shall utilize a fuel system inclusive of carburetor, gas regulator, , low gas pressure switch, and fuel shut-off solenoid. Generators larger than 80 kW are to include air-fuel-ratio control.
- C. The engines internal fuel connections shall be terminated to the generator frame via an NPT fitting for easy installation.

2.06 ENGINE CONTROLS

- A. Engine speed shall be controlled with an integrated isochronous governor function with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.
- B. To support EPA emission requirements, gensets larger than 80 kW will incorporate an active air-fuel-ratio controller. The air-fuel-ratio controller shall be integrated into the generator controller to ensure security of settings and to support monitoring and remote diagnostics. External air-fuel-ratio controllers are not acceptable.
- C. Engine sensors used for monitoring and control are to be conditioned to a 4-20ma signal level to enhance noise immunity.
- D. All engine sensor connections shall be sealed to prevent corrosion and improve reliability.

2.07 ENGINE EXHAUST & INTAKE

- A. The engine exhaust emissions shall meet the EPA emission requirements for standby power generation.
- B. For generators larger than 80 kW, the engine will incorporate a 3-way catalytic convertor to meet EPA emission requirements.
- C. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system. All components must be properly sized to assure operation without excessive back pressure when installed.
- D. The manufacturer shall supply a critical grade exhaust silencer as standard.
- E. The engine intake air is to be filtered with engine mounted, replaceable, dry element filters.

2.08 ALTERNATOR

- A. The alternator shall be the voltage and phase configuration as specified in section 1.1.1.
- B. The alternator shall be a 4-pole, revolving field, stationary armature, synchronous machine. The excitation system shall utilize a brushless exciter with a three phase full wave rectifier assembly protected against abnormal transient conditions by a surge protector. Photo-sensitive components will not be permitted in the rotating exciter.
- C. The alternator shall include a permanent magnet generator (PMG) for excitation support. The system shall supply a minimum short circuit support current of 300% of the rating (250% for 50Hz operation) for 10 seconds.
- D. The alternator shall support 922 skVA with a maximum voltage dip of 35 %.
- E. Three phase alternators shall be 12 lead, broad range capable of supporting voltage reconnection.
- F. The alternator shall use a single, sealed bearing design. The rotor shall be connected to the engine flywheel using flexible drive disks. The stator shall be direct connected to the engine to ensure permanent alignment.
- G. The alternator shall meet temperature rise standards of UL2200 (120 degrees C). The insulation system material shall be class "H" capable of withstanding 150 degrees C temperature rise.
- H. The alternator shall be protected against overloads and short circuit conditions by advanced control panel protective functions. The control panel is to provide a time current algorithm that protects the alternator against short circuits. To ensure precision protection and repeatable trip characteristics, these functions must be implemented electronically in the generator control panel -- thermal magnetic breaker implementation are not acceptable.
- I. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings. A tropical coating shall also be applied to the alternator windings to provide additional protection against the entrance of moisture.

2.09 CONTROLS

- A. The generator control system shall be a fully integrated microprocessor based control system for standby emergency engine generators meeting all requirements of NFPA 110 level 1.
- B. The generator control system shall be a fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions including: engine protection, alternator protection, speed governing, voltage regulation, air-fuel-ratio control (as required) and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped. Generator controller's that utilize separate voltage regulators and speed governors or do not provide seamless integration with the engine management system are considered less desirable.
- C. Communications shall be supported with building automation via the Modbus protocol without network cards. Optional internet and intranet connectivity shall be available.
- D. The control system shall provide an environmentally sealed design including encapsulated circuit boards and sealed automotive style plugs for all sensors and circuit board connections. The use of non-encapsulated boards, edge cards, and pc ribbon cable connections are considered unacceptable.
- E. Circuit boards shall utilize surface mount technology to provide vibration durability. Circuit boards that utilize large capacitors or heat sinks must utilize encapsulation methods to securely support these components.
- F. A predictive maintenance algorithm that alarms when maintenance is required. The controller shall have the capability to call out to the local servicing dealer when maintenance is required.
- G. Diagnostic capabilities should include time-stamped event and alarm logs, ability to capture operational parameters during events, simultaneous monitoring of all input or output parameters, callout capabilities, support for multi-channel digital strip chart functionality and .2 msec data logging capabilities.
- H. In addition to standard NFPA 110 alarms, the application loads should also be protected through instantaneous and steady state protective settings on system voltage, frequency, and power levels.
- I. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option.
- J. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. In addition, custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.
- K. The control panel will display all user pertinent unit parameters including: engine and alternator operating conditions; oil pressure and optional oil temperature; coolant temperature and level alarm; fuel level (where applicable); engine speed; DC battery voltage; run time hours; generator voltages, amps, frequency, kilowatts, and power factor; alarm status and current alarm(s) condition per NFPA 110 level 1.

2.10 ENGINE / ALTERNATOR PACKAGING

- A. The engine/alternator shall be mounted with internal vibration isolation onto a welded steel base. These units shall not need external vibration isolation for normal pad mounted applications.
- B. A mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The breaker shall rated between 100 to 125% of the rated ampacity of the genset. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections. A second mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The breaker shall be rated 400 amps. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections.
- C. The generator shall include a unit mounted 120 volt convenience outlet.

2.11 LOOSE ITEMS

- A. Supplier to itemize loose parts that require site mounting and installation. Preference will be shown for gensets that factory mount items like mufflers, battery chargers, etc.
- B. Flexible fuel hose for use in gas piping installation.
- C. Spare Parts:
 - a. Fuses: One spare set
 - b. Filters One spare set (air, fuel, oil)
- D. The generator package shall include an exhaust kit including catalyst muffler, oxygen sensor, exhaust flex pipe and O2 sensor pipe. These components shall be loose for field mounting by the mechanical contractor. Installation contractor must consult with generator supplier for specific location of each component.

PART THREE – EXECUTION

3.01 FACTORY TESTING

- A. Before shipment of the equipment, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:
 - a. Verify voltage & frequency stability.
 - b. Verify transient voltage & frequency dip response.
 - c. Load test the generator for 30 minutes.

3.02 OWNER'S MANUALS

- A. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

3.03 INSTALLATION

- A. Contractor shall install the complete electrical generating system including all external fuel connections in accordance with requirements of NEC, NFPA, and the manufacturer's recommendations as reviewed by the Engineer.

3.04 SERVICE

- A. Supplier of the genset and associated items shall have permanent service facilities in this trade area. These facilities shall comprise a permanent force of factory trained service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

3.05 WARRANTY

- A. The standby electric generating system components, complete genset and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel.
- B. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

3.06 STARTUP AND CHECKOUT

- A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:
 - a. Ensuring the engine starts (both hot and cold) within the specified time.
 - b. Verification of engine parameters within specification.
 - c. Verify no load frequency and voltage, adjusting if required.
 - d. Test all automatic shutdowns of the engine-generator.
 - e. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.

3.07 TRAINING

- A. Training is to be supplied by the start-up technician for the end-user during commissioning. The training should cover basic generator operation and common generator issues that can be managed by the end-user.

PART FOUR - SPECIAL PROVISIONS

END OF SECTION