PROJECT MANUAL FOR

4 STAR INDUSTRIAL PARK

WESTERN KENTUCKY REGIONAL INDUSTRIAL DEVELOPMENT AUTHORITY

HENDERSON-WEBSTER COUNTIES, KENTUCKY

CONTRACT 6: SANITARY SEWER EXTENSION TO BUILD READY SITE

FEBRUARY, 2015

Project Manual

for

Western Kentucky Regional Industrial Development Authority

Henderson and Webster Counties, Kentucky

Contract 6: Sanitary Sewer Extension to Build Ready Site

MSE of Kentucky, Inc.

624 Wellington Way

Lexington, Kentucky 40503

(859) 223-5694

February, 2015

WESTERN KENTUCKY REGIONAL INDUSTRIAL DEVELOPMENT AUTHORITY

HENDERSON AND WEBSTER COUNTIES, KENTUCKY

CONTRACT 6: SANITARY SEWER EXTENSION TO BUILD READY SITE

TABLE OF CONTENTS

SECTION 00020 - ADVERTISEMENT FOR BIDS

Separate sealed bids for the construction of Contract 6: Sanitary Sewer Extension to Build Ready Site, for the Western Kentucky Regional Industrial Development Authority, will be received by Doug Bell, Chairman of the Northwest Regional Development Authority, until 2:00 PM local time on July 7, 2015 at the Kyndle Office, 145 N. Main Street, Suite 500, Henderson, Kentucky, 42420 (entrance is on 2nd Street) and will be publicly opened and read aloud.

Contract 6 consists of approximately 1,620 feet of eight inch diameter gravity sewer to be constructed at the Fourstar Regional Industrial Park.

The Contract Documents may be reviewed at the following locations:

Western Kentucky Regional Industrial Development Authority (Kyndle Office) 145 North Main Street, Henderson, Kentucky

MSE of Kentucky, Inc., 624 Wellington Way, Lexington, Kentucky

ABC, 1865 Old calhoun Road, Owensboro, Kentucky

Copies of the Contract Documents may be obtained at the office of Lynn Imaging, 328 Old Vine Street, Lexington, Kentucky 40507 (859) 226-5850 upon receipt of a nonrefundable printing and shipping charge of $125.

The plans are also available for viewing/download at the MSE of Kentucky web site. Call 859-223-5694 for instructions.

The Owner reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form, and subject to the conditions provided in the Information for Bidders.

No Bidder may withdraw his bid for a period of sixty days after the actual date of the opening thereof.

Award will be made to the lowest responsive, responsible bidder.

Bidder will make positive efforts to use small, minority and/or women owned and disadvantaged businesses.

"EQUAL EMPLOYMENT OPPORTUNITY"

End of Section

SECTION 00200 - INFORMATION FOR BIDDERS

Bids will be received by the Western Kentucky Regional Industrial Development Authority (herein called the "Owner") at the time and place described in the invitation to bid and then at said office publicly opened and read aloud.

Each Bid must be submitted in a sealed envelope, addressed to Western Kentucky Regional Industrial Development Authority, c/o Kyndle, 145 N. Main Street, Suite 500, Henderson, Kentucky 42420. Each sealed envelope containing a Bid must be plainly marked on the outside as Bid for Contract 6: Sanitary Sewer Extension to Build Ready Site, and the envelope should bear on the outside the BIDDER'S name, address and license number if applicable. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to the OWNER at the above address.

All Bids must be made on the required Bid Form. All blank spaces for Bid prices must be filled, in, in ink or typewritten, and the Bid Form must be fully completed and executed when submitted. Only one copy of the Bid Form is required.

The OWNER may waive any informalities or minor defects or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No BIDDER may withdraw a Bid within sixty (60) days after the actual date of the opening thereof. 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.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the Bid Schedule by examination of the site and a review of the drawings and specifications including Addenda. After Bids have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of Work or of the nature of the Work to be done.

The OWNER shall provide to BIDDERS prior to bidding, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The Contract Documents contain the provisions required for the construction of the project. 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 CONTRACTOR or relieve the CONTRACTOR from fulfilling any of the conditions of the contract.

Each Bid must be accompanied by a Bid bond payable to the OWNER for five percent of the total amount of the Bid. As soon as the Bid prices have been compared, the OWNER will return the bonds of all except the three lowest responsible BIDDERS. When the Agreement is executed the bonds of the two remaining unsuccessful BIDDERS will be returned. The Bid Bond of the successful BIDDER will be retained until the Payment Bond and Performance Bond have been executed and approved, after which it will be returned. A certified check may be used in lieu of a Bid Bond.

A Performance Bond and a Payment Bond each in the amount of 100 percent of the Contract Price, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign Bid Bonds or Payment Bonds and Performance Bonds must file with each Bond a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the Performance Bond and Payment Bond within ten (10) calendar days from the date when Notice of Award is delivered to the BIDDER. The Notice of Award shall be accompanied by the necessary Agreement and Bond forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may consider the

BIDDER in default, in which case the Bid Bond accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable Performance Bond, Payment Bond and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by written notice withdraw the signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The Notice to Proceed shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the Notice to Proceed has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the Work, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified Bid will not be accepted.

Award will be made to the lowest responsible BIDDER.

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.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the Contract Documents. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to its Bid.

The low BIDDER shall supply the names and addresses of major material suppliers and subcontractors when required to do so by the OWNER.

End of Section

SECTION 00310 - BID FORM

WESTERN KENTUCKY REGIONAL INDUSTRIAL DEVELOPMENT AUTHORITY
CONTRACT 6: SANITARY SEWER EXTENSION TO FOURSTAR PAD READY SITE

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____, doing business as _____ (insert "a corporation", "a partnership", or "an individual" as applicable) to the Western Kentucky Regional Industrial Development Authority (hereinafter "OWNER").

In compliance with your Invitation to Bid, BIDDER hereby proposes to furnish all equipment, materials, and labor for the work required to construct Contract 6: Sanitary Sewer Extension to Build Ready Site, in strict accordance with the Contract Documents, within the time set forth therein, and at the prices stated below.

BID SCHEDULE

ITEM & DESCRIPTION	ESTIMATED QUANTITY		UNIT PRICE	TOTAL
1. Erosion Control. Contractor will be responsible for developing and Implementing a Best Management Practices Plan for erosion control, sending Notice of Intent to the Kentucky Division of Water, inspecting and maintaining erosion control measures, and removing erosion control measures and sending Notice of Termination to the Kentucky Division of Water upon completion of work.				
Erosion Control	L.S.			$_____
2. Sanitary Sewer. Furnish all labor, equipment and materials and install 8" PVC SDR 35 sanitary sewer main, including all trenching, bedding, backfill, testing and related work. Unclassified excavation.				
A. Sanitary Sewer 0-6.0' Deep	828	L.F.	$_____	$_____
B. Sanitary Sewer 6.1-8.0' Deep	792	L.F.	$_____	$_____
3. Standard Manhole. Furnish all labor, equipment and materials and install four foot diameter standard manholes, up to six feet in depth.				
Standard Manhole	7	Ea.	$_____	$_____
4. Locate, excavate and uncover ends of existing casing pipe under Southernstar Way. Determine casing elevation and suitability for use.				
Excavate Existing Casing	1	L.S.	$_____	$_____
5. Vertical Extension for Manhole. Furnish all labor, equipment and materials and extend standard four foot diameter manhole, greater than six feet in depth.				
Vertical Extension	4	V.F.	$_____	$_____
6. Casing Pipe for Gravity Sewer Installed by Boring and Jacking. Furnish all labor, equipment and materials and install steel casing pipe for sanitary sewers by boring and jacking.				
12" Casing Pipe for Sewer Line	70	L.F.	$_____	$_____

7. Sewer Installed In Casing Pipe. Furnish all labor, equipment and materials and install PVC SDR 35 sewer line in casing pipe, including insulators. Note if the existing casing pipe is determined to be suitable, then this bid item will be adjusted and used to pay for installation of sewer in existing casing; similarly bid item 6 will be deleted and bid item 2 will be adjusted to pay for actual length not installed in casing.

A. 8” Sewer Installed in Casing Pipe	70	L.F.	$_____	$_____

8. Connection to Existing Manhole. Furnish all labor, equipment and materials and connect to existing manhole. Includes coring, reshaping invert, installing PSX or A-Lok gaskets and grouting.

Connection to Existing Manhole	1	Ea.	$_____	$_____

9. Service Connection. Furnish all labor, equipment and materials and install service wye, including plug and protective bar.

6" Service Wye	1	Ea.	$_____	$_____

10. Grass Surface Restoration. Includes furnishing all labor, equipment and materials and fertilizing, seeding and mulching disturbed lawns and other grassed areas.

Grass Surface Restoration		L.S.	$_____

11. Other Costs. Mobilization, demobilization, sewer line testing, manhole testing, repairs to property damaged by construction and other costs.

Other Costs		L.S.	$_____

Total Bid $_____

The bid prices shall include all labor, materials, overhead, profit, insurance, and other costs necessary to install the finished work of the several items called for. Changes shall be processed in accordance with the General Conditions.

By submission of this Bid, the BIDDER certifies, and 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.

BIDDER hereby agrees to commence Work under this contract on or before a date to be specified in the Notice to Proceed and to complete the work within one hundred twenty (120) days. BIDDER further agrees to pay as liquidated damages, the sum of $500 for each consecutive calendar day thereafter as provided in the General Conditions and the Special Conditions.

Accompanying this Proposal is a certified check or standard Bid Bond in the sum of _____ _____ Dollars ($_____), in accordance with the Information for Bidders. The BIDDER, by submittal of this Bid, agrees with the OWNER that the amount of the bid security deposited with this Bid fairly and reasonably represents the amount of damages the OWNER will suffer due to the failure of the BIDDER to fulfill his agreements as provided in this Proposal.

BIDDER acknowledges receipt of the following Addenda:

No. _____	Date: _____	No. _____	Date: _____	No. _____	Date: _____
No. _____	Date: _____	No. _____	Date: _____	No. _____	Date: _____

BIDDER understands that the OWNER reserves the right to reject any or all Bids and to waive any informalities in the Bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the actual date of bid opening.

Within ten (10) calendar days after receiving written notice of the acceptance of this Bid by the OWNER, the Bidder will execute and deliver to the OWNER four (4) copies of the Agreement and such other required Contract Documents.

BIDDER: _____
(Name of Company or Partnership)

By: _____
(Signature) (Date)

_____
(Print Name)

_____
(Title)

_____
(Address)

_____
(Phone Number)

Attested By: _____
(Signature) (Date)

Seal (If bid is by a corporation)

End of Section

SECTION 00320 - BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal, hereinafter called the Principal, and _____ as Surety, hereinafter called the Surety, are held and firmly bound unto _____, as Obligee, hereinafter called the Obligee, in the sum of _____ Dollars for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents. The Condition of the above obligation is such that whereas the Principal has submitted to _____, a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the construction of _____.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or contract documents with good and sufficient surety for the faithful performance of said contract, and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____ 20___.

_____
Principal

_____
Witness

By: _____

_____
Surety

_____
Witness

By: _____
Attorney-in-fact

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

End of Section

SECTION 00490 - NOTICE OF AWARD

TO: _____

_____

_____

_____

Project Description: Contract 6: Sanitary sewer extension to the Fourstar Build Ready site in the Fourstar Regional Industrial Park.

The OWNER has considered the BID submitted by you for the above described WORK in response to its Invitation to Bid dated _____, 2015 and Information for Bidders.

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

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

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

Dated this _____ day of _____, 2015.

_____
Owner

By: _____

_____
(Name, Title)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____,

this the _____ day of _____, 20 _____.

By: _____

_____
(Name, Title)

SECTION 00500 - **AGREEMENT**

THIS AGREEMENT, made this _____ day of _____, 2015, by and between Northwest Kentucky Regional Industrial Authority, hereinafter called "OWNER" and _____, doing business as _____ (insert "a corporation", "a partnership", or "an individual" as applicable) hereinafter called "CONTRACTOR".

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

1. The CONTRACTOR will commence and complete all work as specified or indicated in the Contract Documents for the construction of Contract 6, sanitary sewer extension to the Fourstar Build Ready site in the Fourstar Regional Industrial Park.

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

3. The CONTRACTOR will commence the work required by the contract documents within 10 calendar days after the date of the Notice To Proceed and will complete the same within 120 calendar days unless the period for completion is extended otherwise by the Contract Documents. The CONTRACTOR further agrees to pay as liquidated damages, the sum of $600. per day for each consecutive calendar day thereafter as provided in the Specifications.

4. The CONTRACTOR agrees to perform all of the work described in the Contract Documents and comply with the terms therein for the sum of $_____, or as shown in the Bid Schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:
   - A. Invitation to Bid
   - B. Information for Bidders
   - C. Bid Form
   - D. Bid Bond
   - E. Agreement
   - F. Performance Bond
   - G. Payment Bond
   - H. Notice of Award
   - I. Notice to Proceed
   - J. General Conditions
   - K. Administrative Provisions
   - L. Labor Regulations and Wage Rates (If Applicable)
   - M. Technical Specifications
   - N. Drawings and Plan Sheets
   - O. Addenda

6. The project has been designed by MSE of Kentucky, Inc. who will act as ENGINEER in connection with completion of the project in accordance with the Contract Documents.

7. CONTRACTOR shall submit Applications for Payment in accordance with the General Conditions. Applications for Payment will be reviewed by the ENGINEER as provided in the General Conditions.

8. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR'S Application for Payment as approved by the ENGINEER, on or about the _____ of each month during construction as provided in the General Conditions. All progress payments will be on the basis of the progress of work measured by the schedule of values provided for in the General Conditions. Progress Payments, retainage, and withheld payments

shall all be done in compliance with the General Conditions. Upon final completion of the work and settlement of all claims, OWNER shall pay the remainder of the Contract Price.

9. Neither OWNER nor CONTRACTOR shall, without the prior written consent of the other, assign or sublet in whole or in part his interest under any of the Contract Documents; and, specifically, CONTRACTOR shall not assign any moneys due or to become due without the prior written consent of the OWNER.

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

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, the Agreement in four (4) copies, each of which shall be deemed an original on the date first above written.

_____ (Owner)	_____ (Contractor)
By: _____ (Signature) (Date)	By: _____ (Signature) (Date)
_____ (Name, Title)	_____ (Name, Title)
Attest:	Attest:
By:_____ (Signature) (Date)	By: _____ (Signature) (Date)
_____ (Name, Title)	_____ (Name, Title)

End of Section

SECTION 00600 - PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
_
(Name of Contractor)

_____
_
(Address of Contractor)

a _____, hereinafter called Principal, and
(Corporation, Partnership or Individual)

_____, hereinafter called Surety, are held and firmly bound unto
(Name of Surety)

_____
_
(Name of Owner)

_____
_
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____ Dollars,
($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

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

_____
_

_____
_

_____
_

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

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

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

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original , this the _____ day of _____, 20_____.

ATTEST:

_____
Principal

_____ By: _____
(Principal) Secretary

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____ _____
(Surety)

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____ _____
(Witness as to Surety) Attorney-in-fact

_____ _____
(Address) (Address)

_____ _____

Note: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

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

End of Section

SECTION 00602 - PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
_
(Name of Contractor)

_____
_
(Address of Contractor)

a _____, hereinafter called Principal, and
(Corporation, Partnership or Individual)

_____, hereinafter called Surety, are held and firmly bound unto
(Name of Surety)

_____
_
(Name of Owner)

_____
_
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____ Dollars,
($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

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

_____
_

_____
_

_____
_

NOW, THEREFORE, if the Principal shall promptly make payments to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment, and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

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

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

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____
Principal

_____
(Principal) Secretary

By: _____

(SEAL)

_____
(Witness as to Principal)

_____
(Address)

_____
(Address)

_____
(Address)

_____
(Surety)

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____
(Witness as to Surety)

_____
Attorney-in-fact

_____
(Address)

_____
(Address)

_____

_____

Note: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

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

End of Section

SECTION 00670 - CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

_____
Signature

_____
Date

End of Section

SECTION 00680 - NOTICE TO PROCEED

TO: _____ Date: _____

_____ Project: _____

_____ _____

_____ _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20___, on or before _____, 20____, and you are to complete the WORK within _____ consecutive calendar days thereafter.

The date of completion of all work is therefore _____, 20_____.

_____
Owner

By: _____

_____
Name

_____
Title

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____, this the _____ day of _____, 20_____.

By: _____

_____
Name

_____
Title

End of Section

SECTION 00700 - GENERAL CONDITIONS

1. Definitions
2. Execution, Correlation and Intent of Documents
3. Starting the Project
4. Contract Documents
5. Contractor's Pre-Start Representations
6. Indemnity
7. Insurance
8. Guaranty Bond
9. Additional Bonds and Insurance
10. Availability of Lands
11. Unforeseen Physical Conditions
12. Reference Points
13. Superintendence - Supervision
14. Materials, Appliances, Employees
15. Substitute Materials or Equipment
16. Subcontracts
17. Patent Fees and Royalties
18. Permits, Laws and Regulations
19. Taxes
20. Safety and Protection
21. Shop Drawings and Samples
22. Record Drawings
23. Use of Premises
24. Cleaning
25. Work By Others
26. Engineer's Status During Construction
27. Engineer's Decision on Disagreements
28. Status of Engineer's Project Representative
29. Changes in the Work
30. Changes of Contract Price
31. Cash Allowance
32. Delays and Extension of Time
33. Warranty and Guarantee
34. Tests and Inspections
35. Access to Work
36. Uncovering Work
37. Stopping the Work
38. Correction of Work Before Final Payment
39. One Year Correction Period
40. Acceptance of Defective Work
41. Neglected Work By Contractor
42. Application for Payment
43. Approval of Payments
44. Substantial Completion
45. Partial Utilization
46. Final Payment
47. Owner's Right to Suspend Work
48. Owner's Right to Terminate Contract
49. Contractor's Right to Stop Work or Terminate
50. Arbitration by Mutual Consent
51. Computation of Time
52. Assignments
53. Ownership of Drawings
54. Compliance With Prevailing Wage Law (Where Applicable)
55. Measurement and Computation of Quantities
56. Project Signs

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:

Addendum - Written or graphic instrument issued to the execution of the agreement which modifies or interprets the Contract Documents, drawings and specifications.

Agreement - The written agreement between Owner and Contractor covering the work to be performed; other Contract Documents are attached to the Agreement.

Application for Payment - the form furnished by Engineer which is to be used by Contractor in requesting progress payments and which is to include the schedule of values required by Article 42.

Engineer - The person, firm or corporation named as such in the Agreement.

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

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

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

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

Contract Documents - The Advertisement for Bids, Agreement, Addenda (whether issued prior to the opening of Bids or the execution of the Agreement), Instructions to Bidders, Contractor's Bid, the Bonds, the Notice of Award, these General Conditions, the Supplementary Conditions, the Specifications, Drawings and Modifications.

Contract Price - The total moneys payable to Contractor under the Contract Documents.

Contract Time - The number of days stated in the Agreement for the completion of the work.

Contractor - The person, firm or corporation with whom Owner has executed the Agreement.

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

Drawings - The drawings which show the character and scope of work to be performed and which have been prepared or approved by Engineer and are referred to in the Contract Documents.

Field Order - A written order issued by Engineer to the Contractor which clarifies or interprets the Contract Documents or orders minor changes in the work without involving a change in the contract price or time.

Modification - (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, (c) a written clarification or interpretation issued by Engineer, or (d) a written order for a minor change or alteration in the work issued by Engineer. A Modification may only be issued after execution of the Agreement.

Notice of Award - The written notice by Owner to the apparent successful bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified, Owner will execute the Agreement with him.

Notice to Proceed - A written notice given by Owner to Contractor (with a copy to Engineer) fixing the date on which the contract time will commence to run and on which Contractor shall start to perform his obligations under the Contract Documents.

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

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

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

Shop Drawings - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by Contractor, a Subcontractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the work.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the work.

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

Substantial Completion - The date as certified by Engineer when the construction of the project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the project or specified part can be utilized for the purposes for which it was intended.

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

Written Notice - A notice in writing to any party of the Agreement and considered delivered and the service thereof completed, when posted by certified or registered mail to said party at his last given address or delivered in person to said party or his authorized representative.

2. Execution, Correlation and Intent of Documents

At least six copies of the Agreement and such other Contract Documents as practicable will be executed and delivered to the Owner by the Contractor within ten days of the Notice of Award. Owner shall execute and deliver one counterpart to Contractor within ten days after receipt of the executed Agreement from Contractor. Engineer will identify those portions of the Contract Document not signed and such identification will be binding on all parties.

Contractor shall also deliver to Owner such Bonds as he may be required to furnish when he delivers the executed agreement to Owner.

It is the intent of the Specifications and Drawings to describe a complete project to be constructed in accordance with the Contract Documents. The Contract Documents comprise the entire Agreement between Owner and Contractor. They may be altered only by a modification.

The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If Contractor finds a conflict, error or discrepancy in the Contract Documents, he shall call it to Engineer's attention in writing at once and before proceeding with the work affected thereby; however, he shall not

be liable to Owner or Engineer for his failure to discover any conflict, error or discrepancy in the Specifications or Drawings. In resolving such conflicts, errors and discrepancies, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Special Conditions, Instructions to Bidders, General Conditions, Specifications and Drawings. Figure dimensions on Drawings shall govern over general Drawings. Any work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

3. Starting the Project

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

Within ten days after delivery of the executed Agreement by Owner to Contractor, Contractor shall submit to Engineer for approval, an estimated progress schedule indicating the starting and completion dates to the various stages of the Work, and a preliminary schedule of Shop Drawing submissions.

Before starting the Work at the site, Contractor shall furnish Owner and Engineer certificates of insurance as required by Article 7. Within twenty days after delivery of the executed Agreement by Owner to Contractor, but before starting the work at the site, a conference will be held to review the above schedules to establish procedures for handling Shop Drawings and other submissions and for processing Applications for Payment, and to establish a working understanding between the parties as to the Project. Present at the conference will be Owner or his representative, Engineer, Resident Project Representative, Contractor and his Superintendent.

Contractor shall start to perform his obligations under the Contract Documents on the date when the Contract Time commences to run. No Work shall be done at the site prior to the date on which the contract time commences to run.

4. Contract Documents

Unless otherwise provided in the Special Conditions, the Owner or his representative will furnish the Contractor, free of charge, up to six copies of drawings and specifications and other Contract Documents. Additional copies shall be provided for the cost of reproduction.

5. Contractor's Pre-Start Representations

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

6. Indemnity

The Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising

out of or resulting from the performance of the work, providing that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, diseases or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor and Subcontractor, anyone directly or indirectly employed by any of them or any one for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

In any and all claims against the Owner or the Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, any one directly or indirectly employed by any of them or any one for whose acts any of them may be liable, the indemnification obligation under these General Conditions shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

The obligations of the Contractor under these General Conditions shall not extend to the liability of the Engineer, his agents or employees arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications or (b) the giving of or the failure to give instructions or directions by the Engineer, his agents or employees provided such giving or failure to give is the primary cause of injury or damage.

7. Insurance

Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation laws, disability benefit laws or other similar employee benefit laws; from claims for damages because of bodily injury, occupational sickness or disease, or death of his employees, and claims insured by usual personal injury liability coverage; from claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees including claims insured by usual personal injury liability coverage; and from claims for injury to or destruction of tangible property, including loss of use resulting therefrom -- any or all of which arise out of or result from Contractor's operations under the Contract Documents, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be legally liable. This insurance shall include the specific coverages and be written for not less than any limits of liability and maximum deductibles specified in the Special Conditions or required by law, whichever is greater, shall include contractual liability insurance and shall include Owner and Engineer as additional insured parties. Before starting the Work, Contractor shall file with Owner and Engineer certificates of such insurance, acceptable to Owner; these certificates shall contain a provision that the coverage afforded under the policies will not be canceled or materially changed until at least fifteen days' prior written notice has been given to Owner and Engineer.

The Contractor shall procure and maintain, at his own expense, during the contract time, liability insurance as hereinafter specified; and in the amounts listed in the Special Conditions.

a. Compensation Insurance - The Contractor shall take out and maintain during the life of this contract Workmen's Compensation Insurance for all of his employees employed at the site of the project, and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor.

b. Public Liability and Property Damage Insurance - The Contractor shall take out and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect him and any subcontractor performing work covered by this contract, from claims for damages for personal injury, including accidental death, as well as for claims for property damages which may arise from operations under this contract, whether such operations be by himself or by any subcontractor or by anyone directly or indirectly employed by either of them. The insurance will include as additional named insured: the Owner and Engineer and his Consultants; and each of their officers, agents and employees.

c. Contingent Public Liability and Property Damage Insurance - If any subcontracts are awarded, subparagraph "b" above shall be interpreted to require that the General Contractor shall take out and maintain Contractor's contingent public liability and property damage insurance in the amounts required under the "Special Conditions".

d. Builder's Risk Insurance or Installation Floater - The Contractor shall provide "All Risk" type Builder's Risk Insurance including coverage for fire, lightning, explosion, wind, hail, riot, aircraft, smoke, collapse, extended coverage, vandalism and malicious mischief. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than the contract price totaled in the bid. Deductible amount shall not exceed $250.

In case of pipeline contracts, this coverage shall be provided by an installation floater for the full cash value of materials and accessories on hand to be used in conjunction with the project. Coverage shall include insuring against transportation loss or damage. The policy shall name as the insured the Contractor, the Engineer and the Owner.

e. Railroad Protective Liability Insurance - Where work on railroad rights-of-way is involved, the Contractor shall also be covered by Railroad Protective Liability Insurance with limits of liability as required by the railroad company on whose property the work is being performed.

f. Flood Hazard Insurance - The Contractor will be required to acquire and maintain during the life of the Contract any flood insurance made available under the National Flood Insurance Act of 1968, as amended. The insurance shall be in an amount at least equal to the contract amount costs excluding cost of uninsurable improvements, or to the maximum limit of coverage made available under the National Flood Insurance Act of 1968, as amended, whichever is less.

8. Guaranty Bond

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

If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its rights to do business is terminated in any state where any part of the Project is located is revoked, Contractor shall within five days thereafter substitute another Bond and Surety, both of which shall be acceptable to Owner.

9. Additional Bonds and Insurance

Prior to delivery of the executed Agreement by Owner to Contractor, Owner may require Contractor to furnish such other Bonds and such additional insurance, in such form and with such sureties or insurers as Owner may require. If such other Bonds or such other insurance are specified by written instructions given prior to opening of bids, the premiums shall be paid by Contractor: if subsequent thereto, they shall be paid by Owner (except as otherwise provided in Article 15.)

10. Availability of Lands

Prior to issuance of Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

The Owner shall provide the Contractor information which delineates and describes the land owned and rights-of-way acquired.

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

11. Unforeseen Physical Conditions

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

12. Reference Points

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

13. Superintendence - Supervision

The Contractor shall keep on his work, during its progress, a competent Superintendent and any necessary assistants, all satisfactory to the Engineer. The Superintendent shall not be changed without written notice to the Owner and Engineer except under extraordinary circumstances. The Superintendent shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor.

The Contractor shall give efficient supervision to the Work, using his best skill and attention. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but he shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

The Contractor shall see that for his own Work and for the Work of each subcontractor, proper templates and patterns necessary for the coordination of the various parts of the Work are prepared, and shall furnish, or require subcontractors to fit together and execute fully their respective portions of the Work.

14. Materials, Appliances, Employees

The Contractor shall provide and pay for all materials, labor, water tools, appliances, fuel, heat, sanitary facilities, equipment, light, power, telephone, transportation and other facilities necessary for the execution, testing, initial operation and completion of the Work.

Approval of manufacturer's Shop Drawings of materials and equipment shall not mean final acceptance, but they shall be subject to inspection and test or delivery and installation. The Contractor shall repair,

replace, or adjust any materials or equipment found defective or not operating properly, due to improper materials, workmanship, and adjustment on his part, during the correction period.

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

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

The Contractor shall provide competent, suitably qualified personnel to survey and lay out the work and perform construction as required by the Contract Documents. The Contractor shall at all times enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him.

15. Substitute Materials or Equipment

Wherever the words "or equal", appear in the Specifications or on the Drawings, they shall be interpreted to mean an item of material or equipment equal in quality to that named and which is suited to the same use and capable of performing the same function as that named.

The burden of proof of equal quality or service shall be on the Contractor. Proof of inequality is not implied by the Specifications and is not a burden of the Engineer. His duty shall be to properly weigh the proven facts of equality in fairness to all parties involved.

Inclusion of a certain make or type of materials or equipment in Contractor's bid or estimate shall not obligate the Owner to accept such material or equipment if it does not meet the requirements of the Plans and Specifications.

If the Contract, Specifications, law, ordinance or applicable rules or regulations permit Contractor to furnish or use a substitute that is equal to any material or equipment specified, and if Contractor wishes to furnish or use a proposed substitute, he shall prior to 30 days before such substitute is required make written application to Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified; stating whether or not its incorporation in or use in connection with the project is subject to the payment of any license fee or royalty; and identifying all variations of the proposed substitute from that specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of Engineer who will be the judge of equality and may require Contractor to furnish such other data about the proposed substitute as he considers pertinent. No substitute shall be ordered or installed without such performance guarantee and bonds as Owner may require which shall be furnished at Contractor's expense.

In case where one or more specified brands, makes or manufacturers are named and these names are not qualified by the "or equal" clause, it is intended that the Contractor be restricted to one of those named unless otherwise set out.

16. Subcontracts

Contractor shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection.

The Contractor will not be permitted to sublet any portion of his contract to any individual, copartnership or corporation without the prior written consent of the Owner and the approval of the Engineer.

The Contractor shall not sublet more than fifty percent (50%) of the work without the written consent of the Owner and approval of the Engineer prior to the receipt of bids.

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

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

Contractor agrees to bind specifically every Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of Owner.

All work performed for Contractor by a Subcontractor shall be pursuant to an appropriate agreement between Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with Article 7, except such rights as they may have to the proceeds of such insurance held by Owner as trustee.

17. Patent Fees and Royalties

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

18. Permits, Laws and Regulations

Contractor shall obtain and pay for all construction permits and licenses and shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of his bid. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall also pay all public utility charges.

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

19. Taxes

Contractor shall pay all sales, consumer use and other similar taxes required to be paid by him in accordance with the law of the place where the Work is to be performed.

20. Safety and Protection

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

a. All employees on the Work and other persons who may be affected thereby.

b. All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

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

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

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

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

21. Shop Drawings and Samples

After checking and verifying all field measurements, the Contractor shall submit with such promptness as to cause no delay in the Work two (2) copies of all Shop Drawings and schedules required for the Work, and the Engineer will pass upon them with reasonable promptness, making necessary corrections. The Contractor shall then revise the drawings as required by the Engineer and file with him five (5) corrected copies for final approval (or one (1) reproducible copy).

Drawings shall have been checked by and stamped with the approval of Contractor and identified as Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable Engineer to review the information as required.

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

At the time of each submission, Contractor shall in writing call Engineer's attention to any deviations that the Shop Drawings or sample may have from the requirement of the Contract Documents.

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

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

The following items of Work and other such items as required shall have Shop Drawings submitted:

a. All concrete reinforcement, water stops, pre cast concrete and location of construction joints.

b. Structural steel, miscellaneous metal and fencing.

c. Windows and doors.

d. Piping layouts, including small piping layouts.

e. Mechanical equipment.

f. Pumps and related equipment, including pump control equipment.

g. Building service equipment.

h. Control and instrumentation, metering equipment.

i. Electrical equipment and wiring diagrams.

j. Plumbing, heating, ventilating and air conditioning equipment.

No fabrication, erection, installation or construction shall commence until drawings and details have been approved by the Engineer.

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

22. Record Drawings

The Contractor shall keep an accurate record of the location, size, and material for all piping, both interior and exterior, concealed and exposed; size and routing of conduits, size and location of pull boxes and number and size of conductors installed therein; and changes in equipment dimensions, structural openings, foundations and any other variations between the Work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practices and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the as-built construction. Upon completion, the Contractor shall have these drawings and records certified as to their completeness and correctness by the Resident Inspector and deliver them to the Engineer for incorporation into the tracings. Final As-Built alignment, invert elevations and locations including the location of service connections for water and sewer lines are to be supplied by the Contractor.

As-Built information shall be provided monthly to the Engineer and submitted with the partial pay request.

23. Use of Premises

The Contractor shall confine his apparatus, the storage of materials and the operation of his workmen to limits indicated by law, ordinances, permits or direction of the resident Engineer and shall not unreasonably encumber the premises with his materials.

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

The Contractor shall enforce all applicable regulations and any additional requirements of the Owner regarding signs, advertisements, fires and smoking.

24. Cleaning

Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work, and at the completion of the Work he shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by Owner. Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

25. Work By Others

The Owner reserves the right to perform additional work related to the project by himself or to let other contracts in connection with the Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall property connect and coordinate his work with theirs.

If any part of the Contractor's Work depends on proper execution or results upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results. His failure to inspect and report shall constitute an acceptance of the other Contractor's Work as fit and proper for the reception of his Work, except as to defect which may develop in the other Contractor's Work after the execution of his Work.

To insure the proper execution of this subsequent Work, the Contractor shall measure Work already in place and shall at once report to the Engineer any discrepancy between the executed Work and the Drawings.

Whenever Work being done by the Owner's forces or by other Contractors is contiguous to Work covered by this Contract, the respective rights of the various interest involved shall be established by the Engineer, to secure the completion of the various portion of the Work in general harmony.

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

If the performance of additional Work by other Contractors or Owner is not noted in the Contract Documents prior to the execution of the contract, written notice thereof shall be given to Contractor prior to starting any such additional Work. If Contractor believes that the performance of such additional Work by Owner or others involves him in additional expense or entitles him to an extension of the Contract Time, he may make a claim thereof as provided in these Specifications.

26. Engineer's Status During Construction

The Engineer will be the Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of the Engineer as Owner's representative during construction as defined in these General Conditions shall not be extended without written consent of the Owner and the Engineer.

The Engineer will make periodic visits to the site to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. He will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. His efforts will be directed toward providing assurance for Owner that the completed project will conform to the requirements as an experienced and qualified design professional, he will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work of Contractors.

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

The Engineer will have authority to disapprove or reject Work which is "defective" (which term is hereinafter used to describe Work that is unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in these Specifications or has been damaged prior to approval of final payment.) He will also have authority to require special inspection or testing of the Work as provided in these specifications whether or not the Work is fabricated, installed or completed.

The Engineer is responsible for review and approval of Shop Drawings and samples in accordance with Article 21 of these General Conditions.

The Engineer has responsibilities for preparation of Change Orders for execution by the Owner in accordance with Article 29 of these General Conditions.

In accordance with Article 27 of these General Conditions, the Engineer shall decide claims of the Owner or Contractors and interpret the Contract Documents.

The Engineer shall faithfully discharge his responsibilities with regard to Applications for Payment as described in Articles 42, 43, 44 and 46 of these General Conditions.

If Owner and Engineer agree, the Engineer will furnish a Resident Project Representative and/or inspector to assist the Engineer in carrying out his responsibilities at the site. The duties, responsibilities and authority of any such representative shall be as set forth in Article 28 of these General Conditions.

Neither Engineer's authority to act under this Article 26 or elsewhere in the Contract Documents nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Engineer to Contractor, any Subcontractor, any material man, fabricator, supplier, or any of their agents or employees or any other person performing any of the work.

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

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

27. Engineer's Decision on Disagreements

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

Either Owner or Contractor may request arbitration with respect to any such claim, dispute or other matter that has been referred to Engineer, except any which have been waived by the making or acceptance of final payment as provided in Article 46, such arbitration to be in accordance with Article 50. However, no request for arbitration of any such claim, dispute or other matter shall be made until the earlier of (a) the date on which Engineer has rendered his decision, or (b) the tenth day after parties have presented their evidence to Engineer if he has not rendered his written decision before that date. No request for arbitration shall be made later than thirty days after the date on which Engineer rendered his written decision in respect of the claim, dispute or other matter as to which arbitration is sought; and the failure to request arbitration within said thirty days' period shall 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 shall not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

28. Status of Engineer's Project Representative

Resident Project Representative is Engineer's Agent and shall act as directed by and under the supervision of Engineer. He shall confer with Engineer regarding his actions. His dealings in matters pertaining to the on-site work will in general be only with Engineer and Contractor. His dealings with Subcontractors will only be through or with the full knowledge of Contractor or his Superintendent. He shall generally communicate with Owner only through or as directed by Engineer.

Resident Project Representative shall:

a. Schedules: Review the progress schedule, schedule of Shop Drawing submissions, schedule of values and other schedules prepared by Contractor and consult with Engineer concerning their acceptability.

b. Conferences: Attend pre construction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with Engineer and notify in advance those expected to attend. Attend meetings, and maintain and circulate copies of minutes thereof.

c. Liaison:

1. 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.

2. 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.

3. In the interest of preserving the proper channels of communication, advise Engineer of any direct communication between Owner and Contractor.

d. Shop Drawings and Samples:

1. Receive and record date of receipt of Shop Drawings and samples which have been approved by Engineer.

2. Receive samples which are furnished at the site by Contractor for Engineer's approval, and notify Engineer of their availability for examination.

3. Advise Engineer and Contractor or his Superintendent immediately of the commencement of any Work requiring a Shop Drawing or sample submission if the submission has not been approved by Engineer.

e. Review of Work, Rejection of Defective Work, Inspections and Tests:

1. Conduct on-site observations of the Work in progress to assist Engineer in determining that the project is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.

2. Report to Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspections, tests or approvals required to be made; and advise Engineer when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing or inspection.

3. Verify that tests, equipment and system's 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.

4. Accompany Owner and visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to Engineer.

f. Interpretation of Contract Documents: Transmit to Contractor clarification and interpretation of the Contract Documents as issued by Engineer.

g. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report them with recommendations to Engineer.

h. Records:

1. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample 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.

2. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list of principal visitors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send Copies to Engineer.

3. Record names, address and telephone numbers of all Contractors, Subcontractors and major suppliers of equipment and materials.

4. Advise Engineer whenever Contractor is not currently maintaining an up-to-date copy of Record Drawings at the site.

i. Reports:

1. Furnish Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the approved progress schedule, schedule of Shop Drawing submissions and other schedules.

2. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work.

j. 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.

k. Guarantees, Certificates, Maintenance and Operation Manuals: During the course of the Work verify that guarantees, 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 these data to Engineer for his review and forwarding to Owner prior to final acceptance of the Project.

l. Completion:

1. Before Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring correction.

2. Conduct final inspection in the company of Engineer, Owner and Contractor and prepare a final list of items to be corrected.

3. Verify that all items on final list have been corrected and make recommendations to Engineer concerning acceptance.

Except upon written instructions of Engineer, Resident Project Representative:

a. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.

b. Shall not undertake any of the responsibilities of Contractor, Subcontractor or Contractor's Superintendent.

c. Shall not expedite Work for the Contractor.

d. 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.

e. Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.

f. Shall not authorize Owner to occupy the Project in whole or in part.

g. Shall not participate in specialized field or laboratory tests or inspections conducted by others.

h. Shall not assist Contractor in maintaining up-to-date copy of Record Drawings.

29. Changes in the Work

Without invalidating the Agreement, Owner may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. Upon receipt of a Change Order, Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 30 on the basis of a claim made by either party.

Engineer may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. If Contractor believes that any minor change or alteration authorized by Engineer entitles him to an increase in the Contract Price, he may make a claim therefore, as provided in Article 30.

Additional work performed by Contractor without authorization of a Change Order will not entitle him to an increase in the Contract Sum or an extension of the Contract Time, except in the case of an emergency as provided in Article 20.

Owner shall execute appropriate Change Orders prepared by Engineer covering changes in the Work to be performed, work performed in an emergency and any other claim of the Contractor for a change in the Contract Time or the Contract Sum which is approved by the Engineer.

It is the Contractor's responsibility to notify his surety of any changes affecting the general scope of the Work or change in the Contract Sum and the amount of the applicable bonds shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to Owner.

30. Changes of Contract Price

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

The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to Owner and Engineer within fifteen days of the occurrence of the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-seven days of such occurrence unless Engineer allows an additional period of time to ascertain accurate cost data. All claims for adjustment in the Contract Price shall be determined by Engineer if Owner and Contractor cannot otherwise agree on the amount involved. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

The value of any Work covered by a Change Order shall be determined in one or more of the following ways:

a. By estimate and mutual acceptance in a lump sum.

b. By unit prices named in the Contract or subsequently agreed upon.

c. On the basis of the cost of the Work plus a Contractor's fee for overhead and profit as provided in this Article.

In Case "c", the Contractor shall keep and present in such form as the Engineer may direct, a correct account of all items comprising the net cost of such work, together with vouchers. The determination of the Engineer shall be final upon all questions of the amount and cost of extra work and changes in the work.

The term Cost of the Work means the sum of all costs necessarily incurred and paid by the Contractor in the proper performance of the Work. Except as 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 30.6.

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

30.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturer's field service required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to Owner and Contractor shall make provisions so that they may be obtained.

30.3 Payments made by Contractor to the Subcontractors for work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from Subcontractors acceptable to him and shall deliver such bids to Owner who will then determine with the advice of Engineer, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work, plus a Fee, the Cost of the Work shall be determined in accordance with paragraphs 30.4 and 30.5. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

30.4 Cost of special consultants (including, but not limited to, Engineers, architects, testing laboratories, surveyors, lawyers and accountants) employed for services specifically related to the Work.

30.5 Supplemental costs including the following:

The proportions of necessary transportation, traveling and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

Costs, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the work, and cost less market value of such items used but not consumed which remain the property of Contractor.

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 (shall not exceed 100 miles), loading, unloading, installation, dismantling and removing thereof ; all in accordance with 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.

Sales, use or similar taxes related to the Work, and for which Contractor is liable, imposed by any governmental authority.

Deposits lost for causes other than Contractor's negligence, royalty payments and fees for permits and licenses.

Losses, damages and expenses, not compensated by insurance or otherwise, sustained by Contractor in connection with the execution of, and to, the Work, provided they have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's Fee. If, however, any such loss or damage requires reconstruction and Contractor is placed in charge thereof, he shall be paid for his services a fee proportionate to that stated in paragraph 30.6.

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

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.

Cost of premiums for bonds and insurance which Owner is required to pay.

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

Payroll costs and other compensation of Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by Contractor whether at the site or in his principal or a branch office for general administration of the work and not specifically included in the schedule referred to in subparagraph 30.1 -- all of which are to be considered administrative costs covered by the Contractor's Fee.

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

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

Cost of premiums for all bonds and for all insurance policies whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except as otherwise provided in subparagraph 30.5).

Cost 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 paragraphs 30.1 - 30.5.

30.7 The Contractor's Fee which shall be allowed to Contractor for his overhead and profit shall be determined as follows:

A mutually acceptable fixed fee; or if none can be agreed upon,

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

a. For costs incurred under paragraph 30.1 and 30.2, the Contractor's Fee shall be ten (10%) percent.

b. For costs incurred under paragraph 30.3, the Contractor's Fee shall be five (5%) percent; and if a subcontract is on the basis of Cost Plus a Fee, the maximum allowable to the subcontractor as a fee for overhead and profit shall be ten (10%) percent.

c. No fee shall be payable on the basis of costs itemized under paragraph 30.4, 30.5 and 30.6.

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

Whenever the cost of any work is to be determined pursuant to Article 30, Contractor will submit in form prescribed by the Engineer an itemized cost breakdown together with supporting data.

In all cases where Extra Work or Changes are covered by unit prices set forth in the Contract, the value of such Extra Work or Changes shall be determined only upon the basis of such unit prices.

Pending final determination of value, payments on accounts of Extra Work or Changes shall be made only upon the estimate of the Engineer.

30.8 All Change Orders to the construction contract (if required) must be negotiated pursuant to 40 CFR 35.938.5.

31. Cash Allowance

The Contractor shall include in the contract sum all allowances named in the Contract Documents and shall cause the Work so covered to be done by such Contractors and for such sums as the Engineer may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for expenses and profit on account of cash allowance as he deems proper. No demand for expense or profit other than those included in the contract sum shall be allowed.

32. Delays and Extension of Time

The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to Owner and Engineer within fifteen (15) days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five (45) days of such occurrence unless Engineer allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by Engineer if Owner and Contractor cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

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

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

33. Warranty and Guarantee

Contractor warrants and guarantees to Owner and Engineer that all materials and equipment will be new unless otherwise specified and that all work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents and of any inspections, tests or approval referred to in Article 34. All unsatisfactory Work, all faculty or defective Work, and all Work not conforming to the requirements of the Contract Documents at the time of acceptance thereof or of such inspection, tests or approvals, shall be considered defective. Prompt notice of all defects shall be given to Contractor. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in these Contract Documents.

34. Tests and Inspections

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

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

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

35. Access to Work

Engineer and his representatives and other representatives of Owner will at reasonable times have access to the work. Contractor shall provide proper and safe facilities for such access and observation of the Work and also for any inspection or testing thereof by others.

36. Uncovering Work

If any Work should be covered contrary to the written request of the Engineer, it must, if required by the Engineer be uncovered for examination and replace at the Contractor's expense.

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

37. Stopping the Work

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

38. Correction of Work Before Final Payment

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

39. One Year Correction Period

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

40. Acceptance of Defective Work

If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to approval of final payment, also Engineer) prefers to accept it, he may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary

revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance amount shall be approval of final payment, an appropriate amount shall be paid by Contractor to Owner.

41. Neglected Work By Contractor

If Contractor should fail to prosecute the work in accordance with the Contract Documents, including any requirements of the progress schedule, Owner, after seven (7) days' written notice to Contractor may, without prejudice to any other remedy he may have, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against Contractor if Engineer approved such action, in which case a Change Order shall be issued incorporating an appropriate reduction in the Contract Price. If the payments then or thereafter due Contractor are not sufficient to cover such amount, Contractor shall pay the difference to Owner.

42. Application for Payment

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

At least ten days before each progress payment falls due (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such data and schedules as Engineer may reasonably require. If payment is requested on the basis of 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 such data, satisfactory to Owner, as will establish Owner's title to the material and equipment and protect his interest therein, including applicable insurance. Each subsequent Application for Payment shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied to discharge in full all of Contractor's obligations reflected in prior Applications for Payment.

Retainage shall be an amount equal to 10% of the Work completed until 50% of the Work has been completed. At 50% completion, further partial payments shall be made in full to the Contractor and no additional amounts may be retained unless the Engineer certifies that the job is not proceeding satisfactorily, but amounts previously retained shall not be paid to the Contractor. At 50% completion or any time thereafter when the progress of the Work is not satisfactory, additional amounts may be retained but in no event shall the total retainage be more than 10% of the value of the work completed. Upon substantial completion of the work, any amount retained may be paid to the Contractor. When the Work has been substantially completed except for Work which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgment of the Owner are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed.

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

43. Approval of Payments

Engineer will, within ten days after receipt of each Application for Payment, either indicate in writing his approval of payment and present the Application to Owner, or return the Application to Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application. Owner shall, within thirty days of presentation to him of an approved Application for Payment, pay Contractor the amount approved by Engineer.

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

Engineer's approval of final payment will constitute an additional representation by him to Owner that the conditions precedent to Contractor's being entitled to final payment as set forth in Article 46 has been fulfilled.

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

a. The Work is defective, or completed Work has been damaged requiring correction or replacement.

b. Claims or Liens have been filed or there is reasonable cause to believe such may be filed.

c. The Contract Price has been reduced because of Modifications.

d. Owner has been required to correct defective Work or complete the Work in accordance with Article 41.

e. Unsatisfactory prosecution of the Work, including failure to furnish acceptable submittals or to clean up.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

44. Substantial Completion

Prior to final payment, Contractor may, in writing to Owner and Engineer, certify that the entire Project is substantially complete and request that the Engineer issue a certificate of Substantial Completion. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of the Project to determine the status of completion. If Engineer does not consider the Project substantially complete, he will notify Contractor in writing giving his reasons therefore. If Engineer considers the Project

substantially complete, he will prepare and deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion and the responsibilities between Owner and Contractor for maintenance, heat and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within the Contract Time. Owner shall have seven (7) days after receipt of the tentative certificate during which he may make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the project is not substantially complete, he will within fourteen days (14) days after submission of the tentative certificate to Owner notify Contractor in writing, stating his reasons therefore. If, after consideration of Owner's objections, Engineer considers the project substantially complete, he will within said fourteen days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as he believes justified after consideration of the objections from Owner. The Owner may reduce the retainage to five (5%) percent of the total Contract Price after substantial completion. Owner shall have the right to exclude Contractor from the Project after the date of Substantial Completion, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

45. Partial Utilization

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

Insurance carrier shall be informed by the Contractor of occupancy and adjustments made so that coverage of construction will not be invalidated.

46. Final Payment

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

After Contractor has completed all such corrections to the satisfaction of Engineer and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection and other documents -- all as required by the Contract Documents, he may make Application for final Payment following the procedure for progress payments. The final Application for Payment shall be accompanied by such date and scheduling as Engineer may reasonably require, together with complete and legally effective releases or waivers (satisfactory to Owner) of all Liens arising out of the Contract Documents and the labor and services performed and the material and equipment furnished hereunder. In lieu thereof and as approved by Owner, Contractor may furnish receipts or releases in full, an affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filled, and that all payrolls, material and equipment bills, and other indebtedness connected with the work for which Owner or his property might in any way be responsible, have been

paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor, material man, fabricator or supplier fails to furnish a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify him against any Lien.

If, on the basis of his observation and review of the Work during construction, his final inspection and his review of the final Application for Payment -- all required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor has fulfilled all of his obligations under the Contract Documents, he will, within ten (10) days after receipt of the final Application for Payment, indicate in writing his approval of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable. Otherwise, he will return the Application to Contractor, indicating in writing his reasons for refusing to approve final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Owner shall, within ten (10) days of presentation to him of an approved final Application for Payment, pay Contractor the amount approved by Engineer.

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

The making and acceptance of final payment shall constitute:

a. a waiver of all claims by Owner against Contractor other than those arising from unsettled Liens, from defective Work appearing after final inspection or from failure to comply with the requirements of the Contract Documents or the terms of any special guarantees specified therein, and

b. a waiver of all claims by Contractor against Owner other than those previously made in writing and still unsettled.

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

47. Owner's Right to Suspend Work

Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by notice in writing to Contractor and Engineer which shall fix the date on which Work shall be resumed. Contractor shall resume the Work on the date so fixed. Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if he makes a claim therefore as provided in these Contract Documents.

48. Owner's Right to Terminate Contract

If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper material, or if he should fail to make prompt payment

to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instruction of the Engineer, or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon the certificate of the Engineer that sufficient cause exists to justify such action, may without prejudice to any other right or remedy and after giving the Contractor and his Surety a minimum of seven (7) days from delivery of a written notice, take possession of the premises and of all materials, tools and appliances thereof and finish the Work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price shall exceed the expense of finishing the Work including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If any such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be certified by the Engineer and incorporated in a Change Order.

Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys by the Owner due the Contractor will not release the Contractor from compliance with the Contract Documents.

After ten (10) days from delivery of a written notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Contract. In such case, the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.

49. Contractor's Right to Stop Work or Terminate

If, through no act or fault of Contractor the Work is suspended for a period of more than ninety (90) 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 (30) days after it is submitted, or Owner fails to pay Contractor any sum approved by Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then Contractor may, upon fifteen (15) days' written notice to Owner and Engineer, terminate the Agreement and recover from Owner payment for all Work executed and any expense sustained plus a reasonable profit. In addition and in lieu of terminating the Agreement, if Engineer has failed to act on an Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fifteen (15) days' notice to Owner and Engineer stop the Work until he has been paid all amounts then due.

50. Arbitration by Mutual Consent

All claims, disputes and other matters in question arising out of, or relating to, this Agreement or the breach thereof except for claims which have been waived by the making or acceptance of final payment, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate 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 any court having jurisdiction thereof.

Notice of the request for arbitration shall be filed in writing with the other party to the Agreement and a copy shall be filed with Engineer. Request for arbitration shall in no event be made on any claim, dispute or other matter in question which would be barred by the applicable statute of limitations.

The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

51. Computation of Time

When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a

Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

52. Assignments

Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title of interest herein, or his obligations thereunder, without written consent of the other party.

53. Ownership of Drawings

All Drawings, Specifications and copies thereof furnished by the Engineer are the property of the Engineer. They are not to be used on other work and, with the exception of the signed Contract set, are to be returned to the Engineer or his representative upon request, at the completion of the Work.

54. Compliance With Prevailing Wage Law (Where Applicable)

Full compliance by the Contractor and any Subcontractor as to their duties prescribed by the applicable State or Federal Minimum Wage Laws is required in the performance of Work under this Contract.

The Contractor will be required to accept liability for payment of all payroll taxes or deductions required by local and federal law, including old age pension, social security or annuities. Workmen's Compensation Insurance shall be carried to the full amounts as required by local statutes.

Incorporated within the Labor Regulations and Wage Rates is a classified list of labor positions used in this work. Opposite the positions are shown the general prevailing hourly rates of wages as ascertained for this contract.

In case it shall become necessary for the Contractor or any Subcontractor to employ on the work under this contract any person in a trade or occupation (except executive, administrative or supervisory workers) for which no wage rates are specified herein, the Contractor shall immediately notify the Engineer who will promptly thereafter furnish the Contractor with the general prevailing rates. The rates thus furnished shall be applicable for such trade or occupation from the time of initial employment of the person or persons affected and during the continuance of such employment.

The Contractor and any Subcontractor shall post and keep posted in a conspicuous place at the site of the Work a copy of the prevailing rates of wages and work hours for each classification of laborers employed in the performance of this Contract.

55. Measurement and Computation of Quantities

Computation of quantities that will be the basis for payment estimates, both monthly and final, will be made by the Engineer. In general, all payment-estimates will be checked and approved by a representative of the funding agency before payment.

No extra measurements of any kind, unless specially noted shall be allowed in measuring the Work under these Specifications; but the length, area solid contents or number only shall be considered as the basis for payment as hereinafter specified.

Where the computation of areas or volumes by exact geometric methods is unduly laborious or refined, the planimeter shall be held an instrument of precision and may be used in the determination of quantities upon which payments are based.

The measurements of the Engineer as to the amount of Work done shall be final and conclusive. Payments shall be made upon the Work done within the lines prescribed by the Drawings or Specifications and in accordance with the unit prices for the items under which the Work is done.

56. Project Signs

The Contractor shall erect a project sign at a prominent location on the Project. The sign shall be four feet by eight feet, two color and shall contain the name of the Project, the Owner, the Engineer, and the Contractor. The lettering shall be approved by the Engineer prior to making the signs.

End of Section

SECTION 00800 - SPECIAL CONDITIONS

1. Description of the Work and Designation of the Owner
2. Available Funds
3. Time of Completion and Liquidated Damages
4. Insurance
5. Performance and Payment Bond
6. Additional Bonds and Insurance
7. Sequence of Work
8. Site Dimensions
9. Damage to Equipment Stored and/or In Place Prior to Initial Operations
10. Equipment Rental - Charges for Extra Work
11. Salvaged Materials and Equipment
12. Sanitary Facilities
13. Utilities
14. Cash Allowances
15. Nondiscrimination in Employment
16. Minimum Wage Rates
17. Property Protection
18. Rock Excavation
19. Extra Fill Material
20. Layout of the Work
21. Conflict With or Damage to Existing Utilities and Facilities
22. Personal Liability of Public Officials
23. Blasting
24. Control of Erosion
25. Occupational Safety and Health
26. Construction Warning Signs
27. Pipeline Right-of-way
28. Responsibility for Trench Settlement
29. Permission to Use Property Other Than That Provided by Owner
30. Resolving Conflicts in Contract Documents
31. Access to the Work
32. Lubrication
33. Labor Regulations
34. Pre construction Conference
35. Record Drawings

1. Description of the Work and Designation of the Owner

These specifications and accompanying plans describe the work to be done and the materials to be furnished for the construction of sanitary sewer extension for the Western Kentucky Regional Industrial Development Authority.

All references to the Owner in these specifications, Contract Documents and plans shall mean the Western Kentucky Regional Industrial Development Authority.

2. Available Funds

The attention of all bidders is directed to the fact that the funds for the project are being provided by the Western Kentucky Regional Industrial Development Authority.

3. Time of Completion and Liquidated Damages

The time allowed for completion of the contract is one hundred twenty (120) calendar days. The time allowed for completion shall begin at midnight, local time, on the date which the Owner shall instruct the Contractor, in writing, to start work, but not later than 10 days after Notice to Proceed.

The Contract completion time stipulated above includes an allowance for an average number of inclement weather days as follows:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Precip.	7	7	9	8	8	8	8	7	6	5	6	7
Freeze	10	6	1								1	5

When number of days (including Saturdays, Sundays and Holidays) of precipitation in excess of 0.1" per day or maximum daily temperatures of 32 degrees F exceed those shown above in any month, the Contractor shall be entitled to an equal number of additional days for Contract Completion.

It is understood that time is the essence of this contract and that the Owner will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

Therefore, if the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as part consideration for the awarding of this contract, to pay the Owner the amount specified in the contract, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the extreme difficulty in fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

Liquidated damages are fixed at $600 per day for each calendar day of overrun beyond the date set for completion or authorized extension thereof for the contract.

4. Insurance

Insurance is to be furnished by the Contractor for the benefit of the Owner, Contractor and subcontractors as their interests may appear. The minimum amounts of insurance coverage to be furnished under these contracts, in accordance with the applicable provisions of the General Conditions are:

(a) Workmen's Compensation ---------- Statutory

(b) Comprehensive General Liability - Including coverage for the explosion, collapse, and underground hazards where applicable; also including contractual liability and also products and/or completed operations liability coverage (no deductible clauses are acceptable for these coverages):

Bodily Injury Liability	$1,000,000 Each Person $3,000,000 Each Occurrence $500,000 Aggregate Products
Property Damage Liability	$1,000,000 Each Occurrence $2,000,000 General Aggregate $1,000,000 Aggregate Products $1,000,000 Aggregate Contractual $3,000,000 Excess/Umbrella Property Insurance

(c) Comprehensive Automobile Liability - Including hired car and employers' non-ownership liability coverage:

Bodily Injury Liability	$1,000,000 Each Person $3,000,000 Each Occurrence $3,000,000 Excess/Umbrella Property Insurance
Property Damage Liability	$1,000,000 Each Occurrence

(d) Builder's Risk (Building Construction) - Including coverage for fire, extended coverages, vandalism, and malicious mischief: 100% of insurable values.

(e) Installation Floater (Non-Building Construction): 100% of insurable values.

(f) Flood Hazard Insurance - In accordance with General Conditions.

All policies shall provide for a minimum of fifteen (15) days written cancellation notice with notice to be given both to the Owner and the Engineer. The Owner and Engineer shall be included as additional insured parties.

5. Performance and Payment Bond

The Contractor shall furnish separate performance and payment bonds issued by an approved bonding company (in accordance with the General Conditions) in an amount at least equal to one hundred (100%) percent of the contract price, as security for the faithful performance of this contract and for the payment of persons performing labor and furnishing materials in connection with this contract. These bonds shall be executed by a company authorized to do business in the State of Kentucky and shall be signed or countersigned by a Kentucky resident agent. Bonds shall remain in effect for one year after date of final acceptance of the work.

6. Additional Bonds and Insurance

Prior to delivery of the executed Agreement by the Owner to the Contractor, the Owner may require the Contractor to furnish such other Bonds and such additional insurance, in such forms and with such sureties or insurers as the Owner may require. If such other Bonds or such other insurance are specified by written instructions given prior to opening of the bids, the premium shall be paid by the Contractor; if subsequent thereto, they shall be paid by the Owner (except as otherwise provided for bonding of substitute materials or equipment).

7. Sequence of Work

Contractor shall apply their forces as necessary to complete the project within the allowed time.

8. Site Dimensions

All Contractors furnishing materials and equipment for this contract shall obtain exact dimensions at the site. Scale or figure dimensions on the drawings and details show the correct size under ideal conditions and shall not, under any circumstances, be so construed as to relieve the Contractor from responsibility for taking measurements at the site and furnishing materials or equipment of the correct size.

9. Damage to Equipment Stored and/or In Place Prior to Initial Operations

Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of a project, shall be replaced with new equipment, or with the approval of the Engineer, be returned to the manufacturer of the equipment, or his authorized repair agency, for inspection and repair; provided, however, that such repair after inspection will place the equipment in new condition and restore the manufacturer's guarantee the same as for new equipment.

10. Equipment Rental - Charges for Extra Work

Equipment rental charges by the Contractor for rented equipment units used on "Extra Work" or "Changes in Work" as may be ordered and authorized by the Owner shall not exceed those charges listed in the latest edition of the "Green Book," compiled and distributed by Associated Equipment Distributors, 615 West 22nd Street, Oak Brook, Illinois 60523.

11. Salvaged Materials and Equipment

All materials and/or equipment to be removed from existing structures and not specifically specified to be reused shall remain the property of the Owner. Such materials and/or equipment shall be stored on site by the Contractor as directed by the Owner.

12. Sanitary Facilities

Each Contractor shall construct and maintain, in a sanitary condition, sanitary facilities for his employees and also employees of his subcontractors. At completion of the contract work, these sanitary facilities shall be properly disposed of.

13. Utilities

The obtaining of all utilities for construction, including power and water, shall be the responsibility of the Contractor and he shall bear the cost of all utilities used for construction. Cost of all connections and facilities for use of utilities shall be borne by the Contractor.

14. Cash Allowances

No cash allowances are included in this project. However, the Contractor is required to make labor and material allowances for unforeseen repairs, to the existing improvements as described in these specifications.

15. Nondiscrimination in Employment

During the performance of this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color or national origin.

16. Minimum Wage Rates

If available, the prevailing minimum wage rates are contained in these specifications. However, applicable wage rates may be provided at any time before bids are received. In that event the wage rates will be provided by addendum to these specifications.

The Contractor will be required to pay not less than the higher of the State or Federal minimum wage rate for each job classification as and if set forth in these specification or in an addendum to the specifications. The stipulated wage rates represent prevailing minimum rates of pay allowable as determined by the appropriate governing agency and shall not be construed to mean that the Contractor may not have to pay higher rates to secure labor. No contract adjustment is permissible should this condition become applicable.

17. Property Protection

Care is to be exercised by the Contractor in all phases of construction to prevent damage and injury to the Owner's or other property.
In connection with work performed on "private property" (property other than that belonging to the Owner), the Contractor shall confine his equipment and stored materials to lands and rights-of-way provided for the project by the Owner and shall take every precaution to avoid damage to the private property owner's buildings, grounds and facilities.

Fences, hedges, shrubs, etc., within the construction limits shall be carefully removed, preserved and replaced when the back filling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the Contractor's expense. Grassed areas, other than lawns, shall be graded, fertilized and seeded when construction is completed. When construction is completed the private property owner's facilities and grounds shall be restored to as good or better condition than found as quickly as possible at the Contractor's expense.

When directed by the Engineer, large trees or other facilities that cannot be replaced or preserved shall be removed by the Contractor. The Owner will assume responsibility for settling with the property owner for such loss. The Contractor shall be solely and entirely responsible for any damage to all other trees or facilities.

The Contractor, in the use of easements and rights-of-way, will comply with any and all agreements between the Owner and the property owner.

Carelessness on the part of the Contractor or his employees in leaving gates open, parking cars, trucks or vehicles in such a way as to interfere with farming operations will not be tolerated. Contractor shall use existing roads to transport pipe, materials and workmen to and from the job.

Foundations, adjacent to where an excavation is to be made below the bottom of the foundation, shall be supported by shoring, bracing and underpinning as long as the excavation shall remain open and the Contractor shall be held strictly responsible for any damage to said foundation.

Highway rights-of-way, railroad rights-of-way, public parks, school yards and other such properties shall be considered "private properties" for the purpose of this section.

18. Rock Excavation

It is specifically noted that separate payment for solid rock excavation will not be made under this contract, all excavation being considered "unclassified."

19. Extra Fill Material

Extra fill material required to complete the finished grading to the line and grade shown on the plans shall be obtained by the Contractor at no extra cost to the Owner above that included in the unit price bid.

20. Layout of the Work

The layout of the work shall be the responsibility of the Contractor and shall be subject to checking by the Engineer. All instruments, stakes, batter boards, barricades, traffic signs, flags and other materials necessary and personnel needed for establishing and marking lines, grades and structure location during construction, shall be furnished and paid for by the Contractor. The Contractor's personnel engaged in the layout work described herein and any aides used shall be fully capable of performing the duties set out herein.

21. Conflict With or Damage to Existing Utilities and Facilities

Insofar as location data is available to the Engineers, existing underground utilities (such as water lines, sewer lines, gas lines, telephone conduits, etc.) are accurately located on the drawings. Due, however, to the approximate nature of much of this data, the location of any particular facility can not be certified to be correct. In general, locations and elevations shown are approximate only.

Repair to existing utilities and facilities damaged by the Contractor's construction forces shall be considered as a part of the Contract covered only by the price bid for the new construction. The only exceptions to this provision, wherein extra compensation will be authorized, are relocation of an existing facility due to direct conflict with the new pipeline, and relocation (outside of limits of maximum allowable trench widths) of an existing facility presently located within the bounds of maximum allowable trench width, where necessitated for assurance against future damage due to settlement or to permit reasonable access to the new work.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, or departments that own and operate utilities in the vicinity of the construction work to verify the location of and possible interference with, the existing utilities that are shown on the Plans, arrange for necessary suspension of service and make arrangements to locate and avoid interference with all utilities (including house connections) that are not shown on the Plans.

Where the existing utilities must be disturbed during construction under this contract, their operation and function shall be maintained by the Contractor to such a degree that service to customers will be interrupted for minimum time periods only. Such disturbances and any maintenance use of these lines shall constitute no cost to the Owner. The Owner shall be notified of interruptions in sufficient time to prepare for them and shall agree to the hour, date and duration of them before they are undertaken.

Should shutdowns in service be in excess of the time of duration agreed upon and such excessive shutdown time be due to the Contractor's negligence, faulty work and/or inability to perform, then and in that event, the Contractor shall be held liable to the Owner, by reason of such excessive shutdown periods.

When existing utilities or appurtenant structures, either underground or above ground, are encountered, they shall not be displaced or disturbed unless necessary and in such case shall be replaced in as good or better condition that found, as quickly as possible. Temporary relocation and replacement of all utilities and appurtenant structures to accommodate the construction work shall be at the Contractor's expense and permanent relocation of such facilities as described herein to accommodate the construction work

shall be at the Owner's expense, unless such temporary or permanent relocation and replacement is by statute or agreement the responsibility of the Owner. It is expected that the Contractor will be diligent in his efforts and use every possible means to locate existing utilities.

Payment for necessary disconnection and reconnection of utility services shall be included as a part of the Contractor's bid and no extra compensation will be made for same.

The Contractor shall at all times maintain on hand an adequate supply of repair materials and tools with which to make repair to damaged water, gas and sewer lines. Should the Contractor inadvertently damage existing utilities, he shall make immediate repair thereto and in no event shall he leave the site before such repair has been made and proven to be successful. Repair to damaged utilities must meet the requirements of the agency in charge of that particular utility.

The intent of this article is to assure compensation to the Contractor for changes in existing utilities reasonably necessary and at the same time, to protect the Owner against excessive damage due to carelessness of the Contractor's construction force.

22. Personal Liability of Public Officials

In carrying out any of the provisions of the Contract or in exercising any power or authority granted to them thereby, there shall be no personal liability upon the Engineer, or its authorized agents or employees, or upon any other officer or employee of the Owner, it being understood that in such matters they act as the agent and representative of that Owner.

23. Blasting

All blasting operations shall be conducted in strict accordance with Kentucky Revised Statutes 351.320 to 351.340 and the rules and regulations promulgated under KRS 351.320 to 351.340, effective October 6, l972, which shall be deemed to be included in these Specifications the same as though herein written out in full. The Contractor shall also comply with applicable municipal ordinances, Federal safety regulations and Section 9 of the Manual of Accident Prevention in Construction published by the Associated General Contractor's of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

To implement these requirements and unless otherwise required by ordinance or law, each excavation crew shall be provided with two metal boxes equipped with suitable locks. One of these boxes shall be for storing explosives and one for caps. The boxes shall always be locked except when in actual use. They shall be painted a bright color and stenciled with appropriate warning signs. At night explosives and caps shall be stored in separate magazines.

All shots shall be covered with heavy timber, steel or rope blasting mats to prevent flying material. Unless otherwise specified or directed, delay caps shall be used to reduce earth vibration and noise. In sparsely populated areas, the Engineer may permit the Contractor to use regular type caps.

The Contractor shall keep a blasting log and, for each blast, shall record the date, time of blast, number of holes, type of explosive, number of delays, amount of charge per delay, stemming and number and type of caps. An inventory of all explosives handled and stored shall also be kept. Blasting operations shall be covered by comprehensive general liability insurance or separate public liability insurance to cover blasting as set forth in the General Conditions.

24. Control of Erosion

The Contractor shall be responsible for control of siltation and erosion from the project work. Control shall include all necessary ditching, check dams, mulching, etc. to prevent deposition of materials in roadside ditches. The Owner shall incur no extra costs from such work.

25. Occupational Safety and Health

It shall be the Contractor's responsibility to be informed of and comply with all Kentucky Department of Labor, Division of Occupational Safety and Health requirements for this type of construction. He shall also comply with all reporting requirements of the Occupational Safety and Health Law. The Contractor shall provide adequate protection against accidents due to special hazards caused by blasting, deep trenches, excavations, heavy equipment or vehicle operation, electrical work, work in dangerous atmospheres, work above the ground, traffic control, work with augering and drilling equipment and any other construction work which he might undertake as a part of this project.

The Contractor shall provide safety controls for protection of the life and health of employees. He will utilize precautionary methods for the prevention of damage to property, materials, supplies and equipment and for avoidance of work interruptions in the performance of this contract. In order to provide such safety controls aforesaid, the Contractor shall comply with all pertinent provisions of the Kentucky Safety Standards of the Division of Occupational Safety, Department of Labor, that are in effect at the time this contract is entered into and during the period in which the contract is to be performed. The Contractor shall also take or cause to be taken such additional measures as the Division of Occupational Safety may determine to be reasonably necessary for the purpose.

The Contractor shall maintain an accurate record of, and shall report to the Division of Occupational Safety in the manner and on the forms prescribed by the Division; exposure date and all accidents resulting in death, traumatic injury, occupational disease and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

The Division of Occupational Safety will notify the Contractor through the Owner of any noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately correct conditions. Such notice when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient for the purpose.

If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory or corrective action has been taken. Failure or refusal to comply with the order will be grounds for stopping all payments due under the contract to the Contractor. No part of the time lost due to any such stop order shall be made the subject of claim or extension of time or for excess cost or damages to the Contractor.

Compliance with the provisions of the foregoing sections by subcontractors will be the responsibility of the prime Contractor.

The Contractor shall provide necessary first aid facilities and employees trained to provide first aid as required by the Occupational Safety and Health Law. In addition to the reporting requirements of other agencies, the Contractor must report promptly in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on or adjacent to the site, which caused death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, such shall be reported to both the Engineer and the Owner.

26. Construction Warning Signs

The Contractor shall provide construction warning signs for each location where he is working in the highway right-of-way. Safety rules, including size, type and placement of construction signs, shall be equal to those required by the Kentucky Department of Highways.

27. Pipeline Right-of-way

The Owner will attempt to obtain all pipeline right-of-way before construction is begun. However, the Contractor must be prepared to work in right-of-way which have been acquired and shall not be entitled to a time extension due to delay over lack of particular right-of-way unless he has been provided no other place to work.

28. Responsibility for Trench Settlement

Where the pipelines installed under this contract are located within existing or proposed street right-of-way the Contractor shall be responsible for any settlement of the street surfacing, curbs, or sidewalks caused by the pipeline construction, that occurs within one year after the final acceptance of this contract. Repair of any damage caused by settlement shall meet the approval of the Owner.

29. Permission to Use Property Other Than That Provided by Owner

Should the Contractor desire or elect to use, pass over and/or encroach on private property title or right-of-way for a specific purpose, he shall obtain such rights and permission at his own expense and risk.

30. Resolving Conflicts in Contract Documents

Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications shall be included in the Contractor's work, the same as if included in both. Where the details and general drawings do not agree, the Contractor shall notify the Engineer at least five (5) days before the date of the receipt of bids and the Engineer will have the Owner issue an addendum to all Contractors as to which of the two methods of construction shall be followed. Failure to make this determination shall make the Contractor subject to furnishing either method as may be later called for by the Engineer. In case of discrepancies between the various parts of the plans and the specifications, the detailed drawings shall take precedence over the general layouts or elevations and the written specifications shall take precedence over all other documents.

Figure dimensions on the drawings shall govern over scale dimensions. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

In resolving conflicts, errors and discrepancies in the Contract Documents, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Funding Agency Specifications or Contract Documents, Special Conditions, Special Provisions, Supplementary General Conditions, Information for Bidders, General Conditions, Technical Specifications and Drawings.

31. Access to the Work

The Engineer and the Owner shall have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection.

32. Lubrication

The Contractor shall make suitable provision for the proper lubrication of all equipment furnished under this Contract. Accessible grease fittings shall be provided where required. A supply of oil, grease and other lubricants of proper quality, as recommended by the manufacturer of the equipment, shall be furnished. Lubricants shall be furnished in their original, unopened containers, in sufficient quantity for initial fillings and for at least one (1) year of operation.

33. Labor Regulations

All public works projects bid and constructed in the State of Kentucky are subject to the provisions of Chapter 337 of the Kentucky Revised Statutes entitled Wages and Hours. In addition, if the project to which these specifications apply is funded in whole or in part by a Federal grant program whereby the U.S. Department of Labor is required to prescribe predetermined prevailing minimum wages, compliance with the applicable Federal labor regulations is also required.

All Contractors and subcontractors on the work will be required to comply with all applicable provisions of State and Federal regulations as outlined in the Supplemental General Conditions.

34. Pre construction Conference

A pre construction conference shall be held prior to issuance of notice to proceed. The Contractor shall be represented by at least one (1) principal of the firm and the job superintendent. The Contractor shall at that time present the construction schedule, progress payment format and estimates, any available subcontractor approval requirements, required insurance and any other documents deemed necessary.

35. Record Drawings

The Contractor shall keep an accurate record of the location, size and material for all piping and changes in dimensions, and any other variations between the work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the construction. This requirement shall not be deleted regardless of the record keeping practices of the Engineer or the Owner.

End of Section

SECTION 01200 - PROJECT MEETINGS

PART 1. GENERAL

1.1 Requirements Included

A. Contractor participation in pre-construction conferences, progress meetings, pre-final inspection and final inspection.

B. Contractor administration of pre-installation conferences and pre-final inspection.

1.2 Related Requirements

A. Section 01300 - Submittals: Progress Schedules.

B. Section 01300 - Submittals: Shop drawings, product data, and samples.

C. Section 01400 - Quality Control.

D. Section 01700 - Contract Close-out: Project record documents.

E. Section 01700 - Contract Close-out: Operation and maintenance data.

1.3 Pre-construction Conferences

A. Engineer will administer pre-construction conference for execution of Owner-Contractor Agreement and exchange of preliminary submittals.

1.4 Progress Meetings

A. Attend progress meetings.

B. Review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of Work.

1.5 Pre-installation Conferences

A. When required in individual specification Section, convene a pre-installation conference prior to commencing work of the Section.

B. Require attendance of entities directly affecting, or affected by, work of the Section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.6 Pre-final Inspection

A. When work is substantially complete, convene a pre-final inspection.

B. Require attendance of Owner, Engineer and funding agency officals.

C. Review installation, clean-up and operation of work.

D. Review record drawings, operation and maintenance materials, and other close-out documents.

1.7 Final Inspection

A. When punch list work is complete, attend a final inspection.

B. Review completion of punch list items.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

Not Used

End of Section

SECTION 01300 - SUBMITTALS

PART 1. GENERAL

1.1 Requirements Included

A. Procedures.

B. Construction Progress Schedules.

C. Shop Drawings.

D. Product Data.

E. Manufacturer's Instructions.

F. Manufacturer's Certificates.

G. Record Drawings.

1.2 Related Requirements

A. Section 01005 - Administrative Provisions: Applications for Payment.

B. Section 01400 - Quality Control: Testing laboratory reports.

C. Section 01400 - Quality Control: Manufacturers' field service reports.

D. Section 01700 - Contract Close-out: Close-out submittals.

1.3 Procedures

A. Deliver submittals to Engineer at address listed on cover of Project Manual.

B. Identify Project, Contractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification Section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Engineer review stamps.

C. Submit initial progress schedule in duplicate within 15 days after date established in Notice to Proceed. After review by Engineer revise and resubmit as required. Submit revised schedule with each second Application for Payment, reflecting changes since previous submittal.

D. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

E. After Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

F. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.4 Construction Progress Schedules

A. Submit horizontal bar chart or network analysis system using the critical path method, showing complete sequence of construction by activity, identifying work of separate stages and other logically

grouped activities. Show projected percentage of completion for each item of Work as of time of each Application for Progress Payment.

B. Show submittal dates required for shop drawings, product data, and samples, and product delivery dates.

1.5 Shop Drawings

A. Submit the number of copies which Contractor requires, plus two copies which will be retained by Engineer.

1.6 Product Data

A. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.

B. Submit the number of copies which Contractor requires, plus two copies which will be retained by Engineer.

1.7 Manufacturer's Instruction

A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, operation, maintenance, adjusting, and finishing, in quantities specified for product data.

1.8 Record Drawings

A. Maintain accurate records of any variations between the work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the construction.

B. Submit one copy of all such records to the Engineer.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

Not Used

End of Section

SECTION 01400 - QUALITY CONTROL

PART 1. GENERAL

1.1 Requirements Included

A. General Quality Control.

B. Workmanship.

C. Manufacturer's Instructions.

D. Manufacturer's Certificates.

E. Manufacturers' Field Services.

1.2 Related Requirements

A. Document 00700 - General Conditions: Inspection and testing required by governing authorities.

B. Section 01005 - Administrative Provisions: Applicability of specified reference standards.

C. Section 01300 - Submittals: Submittal of Manufacturer's Instructions.

1.3 Quality Control, General

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

1.4 Workmanship

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 Manufacturer's Instructions

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.6 Manufacturer's Certificates

A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.7 Manufacturer's Field Services

A. When specified in respective Specification Sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to Engineer listing observations and recommendations.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

Not Used

End of Section

SECTION 01420 - INSPECTION OF THE WORK

PART 1. GENERAL

1.1 The Engineer's Duties

It is not the Engineer's function to supervise or direct the manner in which the work under this Contract is carried on or conducted.

The Engineer is not responsible for construction means, methods, techniques, sequences, or procedures, nor for safety precautions and programs in connection with the work.

The Engineer will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents.

1.2 The Contractor's Duties

The Contractor shall perform no work in the absence of the Engineer or his assistants, without prior approval.

The Contractor shall use no material of any kind until it has been inspected and accepted by the Engineer.

The Contractor agrees that any method or procedure, which in the opinion of the Engineer does not achieve the required results or quality of the work specified, shall be discontinued immediately upon the order of the Engineer.

The Contractor shall remedy all materials or workmanship found at any time to be defective or not of the quality required by the Plans and Specifications, regardless of previous inspection of the materials and workmanship.

The Engineer's inspection does not relieve the Contractor from any obligation to perform the work specified, strictly in accordance with the Drawings and Specifications. Any work not so constructed shall be removed and made good by the Contractor free of all expense to the Owner.

Upon completion, the Contractor shall have Record Drawings and certified as to their completeness and correctness by the Resident Inspector and delivered to the Engineer for incorp-oration in the Drawings.

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

Accompany submittal with transmittal letter in duplicate, containing:

Date. Project title and number. Contractor's name and address. Title and number of each Record Document. Signature of the Contractor or his authorized representative.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

Not Used.

End of Section

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1. GENERAL

1.1 Requirements Included

A. Barriers

B. Protection of Installed Work.

C. Security.

D. Water Control.

E. Cleaning During Construction.

F. Project Identification.

1.2 Related Requirements

A. Section 01005 - Administrative Provisions: Work sequence. Contractor use of premises.

B. Section 01700 - Contract Close-out: Final cleaning.

1.3 Barriers

A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.

1.4 Protection of Installed Work

A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

1.5 Cleaning During Construction

A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

1.6 Project Identification

A. Provide Project identification sign of wood frame and exterior grade plywood construction, painted with required design and colors. List title of Project, names of Owner, Engineer, Contractor.

B. Erect on site at location established by Engineer.

1.7 Removal

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

Not Used

End of Section

SECTION 01700 - CONTRACT CLOSE-OUT

PART 1. GENERAL

1.1 Requirements Included

A. Close-out Procedures.

B. Project Record Documents.

C. Operation and Maintenance Data.

D. Warranties and Bonds.

E. Spare Parts and Maintenance Materials.

1.2 Related Requirements

A. Document 00700 - General Conditions: Fiscal provisions, legal submittals, and other administrative requirements.

B. Section 01500 - Construction Facilities and Temporary Controls: Cleaning during construction.

1.3 Close-out Procedures

A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

B. When Contractor considers Work has reached final completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

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

D. Engineer will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.4 Project Record Documents

A. Store documents separate from those used for construction.

B. Keep documents current; do not permanently conceal any work until required information has been recorded.

C. At Contract close-out, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.5 Operation and Maintenance Data

A. Provide data for pump stations.

B. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch (216 x 279 mm) three-ring side binders with durable plastic covers.

1.6 Warranties and Bonds

A. Provide duplicate, notarized copies. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Provide table of contents and assemble in binder with durable plastic cover.

B. Submit material prior to final application for payment. For equipment put into use with Owner's permission during construction, submit within 10 days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.7 Spare Parts and Maintenance Materials

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work. Coordinate with Owner, deliver to project site and obtain receipt prior to final payment.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

Not Used

End of Section

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1. GENERAL

1.1 Work Included

The Contractor shall maintain at the site for the Owner one record copy of:

A. Drawings.

B. Specifications.

C. Addenda.

D. Change orders and other modifications to the Contract.

E. Engineer field orders or written instructions.

F. Approved shop drawings, product data and samples.

G. Field test records.

1.2 Related Requirements

A. Section 01200 - Project Meetings

B. Section 01340 - Shop Drawings, Product Data and Samples

C. Section 01500 - Construction Facilities and Temporary Controls

1.3 Recording

A. Each document shall be labeled "PROJECT RECORD" in large printed letters.

B. Record information shall be kept current with construction progress.

1.4 Submittals

A. Sketches showing the "Record" information shall be provided monthly to the Engineer and submitted with the partial pay request.

B. Upon completion, the Contractor shall have Record Drawings and certified as to their completeness and correctness by the Resident Inspector and delivered to the Engineer for incorporation in the Drawings.

C. At Contract close-out, the Contractor shall deliver Record Documents to the Engineer for the Owner.

D. The Contractor shall accompany the submittal with a transmittal letter containing:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each Record Document.
5. Signature of the Contractor or his authorized representative.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

Not Used.

End of Section

SECTION 02100 - EROSION CONTROL

PART 1. GENERAL

1.1 Work Included

Submit KPDES Notice of Intent (NOI) and all follow-up information. Take responsibility for locating, furnishing, installing, and maintaining temporary sediment and erosion control best management practices for earth disturbing activity areas and developing a Best Management Practices (BMP) Plan using good engineering practices as required by the Kentucky Pollutant Discharge Eliminating System (KPDES) Permit. Make and record inspections of BMPs and areas as required by the KPDES Permit. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, State or Local agencies, adhere to the more restrictive laws, rules, or regulations.

1.2 Related Work

A. Section 02110 - Site Clearing
B. Section 02200 - Earth and Rock Work
C. Section 02936 - Seeding

PART 2. PRODUCTS

Not used

PART 3. EXECUTION

As the permittee, submit the KPDES Notice of Intent (NOI) form to the Division of Water. Additionally, delegate in writing to Manager, KPDES Branch, who will have signature authority for reports. Provide the Engineer a copy of the NOI and a BMP Plan to represent and warrant compliance with the Kentucky Division of Water (KDOW) KPDES Permit, related rules, and specifications prior to starting work.

Locate, furnish, install, and maintain temporary sediment and erosion control best management practices (BMP) to represent and warrant compliance with the Clean Water Act, (33 USC Section 1251 et seq.), the 404 permit, the 401 Water Quality Certification, local government agency requirements, and other related rules and permits until the project has a formal release issued.

Provide the Engineer a copy of all weekly and rainfall event inspections as they are completed. Ensure all reports are signed by the delegated authority. keep a current BMP Plan and all inspection records available for public inspection as required by the KPDES Permit.

These provisions survive the completion and/or termination of the contract. The following provisions must be followed:

1. Take full responsibility and make all corrections when a governmental agency or a local governmental authority finds a violation of the above noted requirements; that the BMPs are incomplete; that the BMP Plan is incomplete; or that the implementation of the BMP Plan is not being performed correctly or completely.

2. Make payment to the Owner for the full amount, within 10 Calendar Days of notification, when a governmental agency or a local governmental authority furnishes an assessment, damage judgment or finding, fine, penalty, or expense for a violation of the above noted requirements; the BMPs being incomplete; or the BMP Plan being incomplete or its implementation not being performed correctly or completely. The Owner may withhold the amount of money requested for the above from the next pay estimate and deliver that sum to the governmental agency or local governmental authority issuing the assessment, damage judgment or finding, fine, penalty or expense.

3. Indemnify and hold harmless the Department, and reimburse the Department for any assessments, damage judgment or finding, fine, penalty, or expense as a result of the failure of performing this portion of the Contract. The Owner may withhold the amount of any assessments, damage judgments or finding, fine, penalty or expense from the next pay estimate.

4. The Owner will find the Contract in default if a governmental agency or a local governmental authority furnishes a stop work order for any of the following: a violation of the above noted requirements, that the BMPs are incomplete, that the BMP Plan is incomplete, that the implementation of the BMP Plan is not being performed correctly or completely.

5. When the Owner or any government regulatory agency finds a violation of the above noted requirements, or that the BMPs are incomplete, or that the BMP Plan is incomplete or that the implementation of the BMP Plan is not being performed correctly or completely, correct and mitigate the conditions within 48 hours of notification by the Owner or regulatory agency. Failure to correct non-compliant site conditions will result in the Owner applying a penalty of $500 per day until corrective actions are completed.

Upon completion of the project, provide the Engineer with a copy of the submitted KPDES Notice of Termination (NOT) form. Retain all records for 3 years or provide them to the Engineer for retention.

End of Section

SECTION 02725 - BORING AND CASING FOR UTILITIES

PART 1. GENERAL

1.1 Work Included

The work to be performed hereunder shall consist of the installation of casing pipe for the purpose of installing utilities under streets, roads, highways or railroads. It shall include the excavation of a boring pit, auger boring, rock coring or jacking as and where required.

PART 2. PRODUCTS

2.1 Casing Pipe

The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have a minimum yield strength of 35,000 psi and shall have the minimum wall thickness shown in the following table:

Carrier Pipe	Casing Pipe	Nominal Thickness
4	8	0.250 inch
6	12	0.250 inch
8	16	0.312 inch
10	20	0.312 inch
12	24	0.312 inch
14	27	0.344 inch
16	30	0.375 inch
18	32	0.406 inch

When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inch greater than the thickness shown.

PART 3. EXECUTION

3.1 Installation of Casing Pipe

The steel casing pipe shall be bored or jacked in place at the locations as shown on the plans or as directed by the Engineer. All joints between lengths shall be solidly welded with a smooth non-obstructive joint inside. When the casing is required from right-of-way to right-of-way or ditch line to ditch line, the casing pipe may be extended beyond the boring limits by open trenching. Open trenching at jacked or bored locations will be allowed no closer than three feet from edge of pavement.

A suitable approach trench shall be opened adjacent to the slope of the embankment, or adjacent to point of bored and jacked section as shown on the plans. The approach trench shall be long enough to accommodate the selected working room. Guide timbers or rails for keeping the casing pipe on line and grade shall be accurately set and maintained in the bottom of the approach trench and with heavy timber backstop supports installed at the rear of the approach trench to adequately take thrust of the jacks without any movement or distortion. It is paramount to the securing of acceptable tolerance limits of workmanship in the boring and jacking operation that extreme care be taken in the setting of all guides, rails and jacks to the end that the casing pipe in final position be within the limits of acceptability for the placing and laying of the carrier pipe. The minimum cover of 36 inches under the roadway must be maintained. Greater depth may be required.

3.2 Installation of Carrier Pipe

Manufactured casing spacers of the required sizes shall be installed to maintain separation between the casing and carrier pipes. The Henderson Water Utility Technical Manual is incorporated as a part of the these technical specifications and describes acceptable materials. The HWU Technical Standards can be found at http://www.hkywater.org/governance/technical-manuals.

Should there be any discrepancy between these specifications and the Henderson Water Utility Technical Manual, then the provisions of the Technical Manual shall govern.

3.3 Closure of Casing

The casing ends shall be closed with rubber boot ends as required by the Henderson Water Utility Technical Manual.

End of Section

SECTION 02731 - GRAVITY SEWERS

PART 1. GENERAL

1.1 Work Included

The Contractor shall furnish all labor, materials and equipment required to install the gravity sewer system as shown on the plans and as specified herein. **The completed project will be turned over to the Henderson Water Utility (HWU) for operation and maintenance. All materials and construction procedures must comply with the HWU Technical Manual – Requirements and Specifications for Sanitary Sewer Facilities (current edition). A copy of the manual is included in these specifications. Should any conflicts or discrepancies between these specifications and the HMU Technical Manual be found, then the requirements of the HMU Technical manual shall govern the work and materials.**

1.2 Submittals

Submit manufacturer's specifications for materials and installation instructions. Include test reports showing compliance with project requirements where test method is indicated.

1.3 Delivery and Storage

Notify the Engineer when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading operations and examining the pipe materials.

PART 2. PRODUCTS

2.1 Polyvinyl Chloride Sanitary Sewer Pipe

Pipe and fittings shall meet or exceed all of the requirements of ASTM D-3034. All pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, and nominal diameter.

All fittings and accessories shall be the product of the same company as the pipe manufacturer. All in-line fittings shall be integral wye-tee combination with rubber ring joint. No saddle type fittings will be allowed.

2.2 Ductile Iron Sanitary Sewer Pipe

Pipe and fittings shall meet or exceed all of the requirements of ASTM A-746. All pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, and nominal diameter.

All fittings and accessories shall be the product of the same company as the pipe manufacturer. All in-line fittings shall be integral wye-tee combination with rubber ring joint. No saddle type fittings will be allowed.

2.3 Manholes

A. Manhole Sections. Manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section and a base section conforming with the manhole details shown on the drawings.

Manhole sections shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C-478.

The minimum compressive strength of the concrete for all sections shall be 4,000 psi.

Joints of manhole sections shall be of the tongue and groove type with performed plastic gasket meeting the requirements of Federal Specification SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints" Type 1, Rope Form. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope-form of suitable cross-section and of such sizes as to seal the joint space when the manhole sections are set. Joint shall be double-sealed (inside and outside). Con-Seal is an acceptable sealant.

Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.

B. Manhole Castings. Manhole rims, toe pockets and covers shall be cast iron conforming to ASTM A-48, Class 30 or 35 for gray iron castings. All castings shall be made accurately to the required dimensions, sound, smooth, clean and free from blisters and other defects.

Manhole frames and covers shall be heavy duty, with machined bearing surfaces. The words "Sanitary Sewer" shall be cast on the top in letters 2 inches high. They shall be as manufactured by the Neenah Foundry Co., East Jordan Iron Works, Inc., or equal.

C. Steps. Steps shall be built into the walls of all manholes. They shall be approximately twelve inches wide and shall be uniformly spaced at intervals of twelve to sixteen inches. Steps shall be cast aluminum, polypropylene coated #4 re-bar, or other approved material.

D. Line Connectors. All new manholes shall have rubber and/or neoprene line connectors for the installation of the line such as "A-Lok" or as recommended by the manufacturer. For connection to an existing manhole, a rubber boot type connector such as "Kor-n-seal" is required.

2.4 Waterproof Manhole Inserts

Manhole inserts, designed to prevent inflow of water through and around the manhole cover, shall be provided. Inserts shall be manufactured from a corrosion-resistant material able to withstand the environment of a sanitary sewer system, road salts, oils and fuels. Inserts shall be as manufactured by Southwestern Packing & Seals Co. or equal.

PART 3. EXECUTION

3.1 Lines and Grades

A. General. The Engineer will establish the locations of all manholes by reference to landmarks on the ground and will establish a system of bench levels to be used in the construction of the sewer lines.

B. Laser Beam Method of Laying Sewer. Laser beams shall be used for laying gravity sewer lines. The equipment shall be maintained in a good operating condition. The allowable error shall be plus or minus 0.02 feet.

3.2 Water and Sewer Separation

Wherever sewer lines and water lines cross, or are adjacent to each other, special precautions shall be taken.

Sewer lines which are parallel to a water line must, if possible, be located a minimum lateral distance of 10 feet from any water lines measured from outside diameters. Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no evidence of joint leakage is known in that vicinity. If any such evidence does

exist, the existing line shall be exposed by the Contractor at least 10 feet each side of the new pipe crossing, carefully examined, and any defects positively corrected. The Owner will arrange for examining and correcting any defects in the existing lines, but the Contractor shall cooperate in every way possible.

When sewer lines cross water lines, the sewer line shall be installed at least 24 inches below the water line. If this condition cannot be met, the Contractor shall expose the existing water line a distance of 5 feet each side of the new sewer line crossing, and shall encase the water line in concrete in accordance with the details shown on the drawings.

3.3 Installing Sanitary Sewer Pipe

A. Excavation. The Contractor shall not excavate trench beyond what is necessary for pipe installation to minimize risk of accident or trench collapse.

B. Bedding. Bedding shall be with No. 9, No. 67 or No. 78 crushed stone. Pipe shall be laid with bottom quadrant of barrel and bells of pipe underlain by at least a four inch depth of stone on earth subgrade and at least six inch depth of stone on rock subgrade. If trenches are dug too deep, they must be brought up to grade with crushed stone.

C. Pipe Installation. All pipe must be inspected for uniform diameter, straightness and defects. Rejected pipe must be removed from the project.

Pipe shall be laid to required lines and grades. The pipe lengths shall be fitted together and matched, so that they will form a sewer with a smooth and uniform invert. Laying will begin at the lowest point and proceed upstream with the bells of the pipe pointing upstream.

Tees and wyes shall be located at such points in the sewer so as to facilitate the service connection.

No backfilling (except for securing pipe in place) will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade. Such inspection shall not relieve the Contractor of further liability in case of defective joints.

D. Backfilling. Backfilling of excavated trenches shall be commenced as soon as possible after the sewer is installed and the jointing and alignment are approved.

Backfill in trenches within the limits of existing or proposed paved surfaces shall be compacted DGA up to the paved surface. Where open-cutting of a state maintained paved surface is allowed, the backfill shall be controlled density fill with a 28 day compressive strength of 50 pounds per square inch.

Backfill in trenches outside the limits of existing or proposed paved surfaces shall be either compacted DGA or No. 9 crushed stone, to twelve inches above the top of the pipe. The remaining backfill shall be compacted soil, capable of supporting growth of either seed or sod.

3.4 Manhole Installation

Manhole inverts shall of factory made concrete construction and smooth. Where manhole inverts must be constructed, they shall be of 1:2 grout mix, in accordance with details on drawings. Inverts shall have the same cross-section as the invert of the sewer which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.

The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement.

After backfilling has been completed, the excavated area, if located in a street, alley or sidewalk, shall be provided with a temporary surface.

3.5 Testing

A. Pipe Pressure Testing. The Contractor shall conduct low-pressure air tests of all pipe laid under this contract before putting the new sewers into service. The Contractor shall furnish all the necessary equipment and personnel required to conduct the tests, including pneumatic plugs, which shall have a sealing length equal to or greater than the diameter of the pipe to be tested.

The sewer line to be tested shall be flushed with water prior to the test. All pneumatic plugs shall be seal-tested before being used in the actual test installation.

Tests shall be made from manhole to manhole at an average pressure of 3.0 PSI greater than the average back pressure of any ground water present and shall be conducted in accordance with the test procedure outline below.

Plug all pipe outlets with suitable test plugs. Brace each plug assembly. If the sewer line to be tested is submerged in ground water, insert a pipe probe (by boring or jetting) into the backfill material adjacent to the center of the pipe, determine the pressure in the probe when air passes slowly through it. This is the back pressure due to ground water submergence over the end of the probe. All gauge pressures in the test shall be increased by this amount.

Add air slowly to the portion of the sewer line installation under test until the internal pressure is raised to 4.0 PSI. Allow at least two minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure.

When the pressure decreases to 3.5 PSI, start timing with a stop watch. Determine the time, in seconds, that is required for the internal air pressure to reach 2.5 PSI. Minimum permissible time for the 1.0 PSI drop (from 3.5 PSI to 2.5 PSI) shall not be less than 3 min. 57 sec.

The air test may be dangerous if a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Since an internal pressure of 5 PSI exerts a force of 250 pounds on an 8-inch plug, it should be realized that the sudden expulsion of a plug can be very dangerous. No one shall be allowed in the manholes of the section being tested until the lines have been depressurized.

Pressurizing equipment shall include a regulator set at 5 PSI to avoid over pressurizing and damaging an otherwise acceptable line.

B. Pipe Deflection Testing. After all backfill is in place, any pipe with stiffness (F/Y) of less than 100 psi shall be measured for vertical deflection. Maximum deflection of the installed pipe shall be limited to four percent of the internal pipe diameter. if the pipe is measured more than six months after all backfill has been placed, a deflection of five percent of the internal pipe diameter will be allowed. All pipe exceeding the allowable deflection shall be replaced or re-rounded by the Contractor.

C. Manhole Testing. Manholes shall be tested after installation with all connections in place. The test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings. Lift holes, if any, shall be plugged with an approved, non-shrink grout prior to testing.

Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe. The plug must be inflated at a location past the manhole/pipe gasket.

The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.

A vacuum of 10 inches of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.

The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.

The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time duration:

	Time (minutes)		
Manhole Depth	4' Dia.	5' Dia.	6' Dia.
20 feet or less	1	2	3
20.1 to 30 feet	2	3	4

No joints will be accepted that show leakage and if after backfilling and inspection any joints are found that are allowing ground water to enter the sewer, such joints must be dug up and corrected.

All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced.

End of Section

SECTION 02936 - SEEDING

PART 1. GENERAL

1.1 Work Included

The work described herein shall consist of application of seed, fertilizer and agricultural limestone to establish turf on all lawn areas shown on the drawings and disturbed by the construction work and not intended to receive other surfaces.

1.2 Submittals

Submit certificates of analysis and weight for all fertilizers to the Engineer. The tags from each package shall be delivered to the Engineer.

PART 2. PRODUCTS

2.1 Seed

Seed shall be certified seed to be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable.

Seed Mixture	Lbs./Acre PLS
For permanent cover:	
Kentucky 31 Tall Fescue	15
Birdsfoot Trefoil	8
For temporary cover during application period from February 15 to May 15 and August 1 to November 1:	
Either	
Annual Ryegrass	5
or	
Perennial Ryegrass	10
For temporary cover during application period from May 15 to August 1:	
Either	
Foxtail Millet	12
Pearl Millet	10
Japanese Millet	15
Weeping Lovegrass	2.5
or Bermuda Grass	4
For temporary cover for application period from November 1 to February 15:	
Winter Wheat	100

2.2 Agricultural Limestone

Agricultural limestone shall have a minimum calcium carbonate equivalent of not less than 85 percent and shall be ground to such a fineness that at least 90 percent will pass a 20-mesh sieve and at least 50 percent will pass a 100-mesh sieve.

2.3 Fertilizer

Fertilizer shall be commercial grade, free flowing, uniform in composition.

Fertilizer shall be 10-10-10.

2.4 Mulch

Mulch shall be clean straw.

PART 3. EXECUTION

3.1 General

Seed all areas disturbed by the construction work not scheduled for other surfaces.

3.2 Preparation for Planting Lawns

The finished surface shall be free of bumps, depressions or other irregularities or foreign materials. Spread topsoil evenly. Ground limestone shall be applied evenly at a rate of 50 pounds per 1,000 square feet. Fertilizer shall be applied evenly at a rate of 20 pounds per 1,000 square feet.

3.3 Seeding

A. Sowing of Seed. Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical drilling seeder at the rate of 6 pounds per 1,000 square feet of area, lightly raked, rolled with a 200 pound roller and watered with a fine spray.

B. Mulching. All seeded areas shall be mulched with a straw and asphalt mat or netting or with a spray mulch of an approved material. Straw and asphalt mat shall be applied at the rate of one hundred pounds of straw and 11 gallons of asphalt per one thousand square feet. Asphalt shall either be emulsified RS1 grade or cutback RC1 grade. The type and method of mulching may be varied at the discretion of the Contractor on his own responsibility to establish a uniform turf free of erosion.

3.4 Maintenance

Seeded areas shall be protected and maintained by watering and replanting as may be necessary to produce a uniform stand of grass. Maintenance shall continue until a dense, uniform turf is established composed of the grasses specified and until acceptance, and shall include repair of damage caused by erosion.

End of Section

Technical Manual

Requirements and Specifications
For
Sanitary Sewer Facilities

Henderson, Water Utility
Henderson, Kentucky

April 27, 2004

TABLE OF CONTENTS

CHAPTER 1 **PAGE**

Chapter 1

1.1 INTRODUCTION

This document is a technical guide for the construction of sanitary sewer facilities to serve existing and new development. It is one of the technical companion documents to the "Manual of Procedures and General Requirements for Design and Construction of Water, Wastewater and Stormwater Infrastructure." The information in the Procedures Manual and the information contained herein outline the policies, procedures, and technical requirements as approved by the Henderson Water and Sewer Commission. The intent is to establish uniform policies and procedures for the construction and acceptance of sanitary sewer facilities that will provide efficient, reliable service and are compatible with the existing sanitary system.

HWU and the Henderson Water and Sewer Commission reserve the right to add to these procedures as may be necessary in order to achieve the required service to its customers.

The HWU System Operations Superintendent is responsible for working with developers and others subject to the procedures and specifications contained herein and may be contacted by telephone at (270) 826-2824. The System Operations office is located at 230 N. Alvasia Street, Henderson, KY 42420.

Provision of Sanitary Sewer Facilities

HWU reserves the right to design and construct all improvements to the sanitary sewer system for existing and new developments. HWU realizes that in certain instances it may be in the best interest of all concerned for HWU to allow others to design and construct sanitary sewer facilities that are to become part of HWU's System. Before others are allowed to provide the construction of these facilities, the agreements specified herein must be properly executed.

Sanitary Sewer System Extensions

The procedures in this manual will apply to extensions to furnish general sewer service to a prospective customer or group of prospective customers including new developments. The customer(s) being served are expected to pay the cost of the extension unless prior agreement has been made with HWU to share the cost.

Any additions to the public sanitary sewer system made as a result of an agreement with HWU, shall become the property of HWU who reserves the right to further extend the lines or provide other facilities it deems necessary and the customer(s) would not qualify for any refund of the cost of the newly extended section.

If a line extension is to be built on general road frontage or farmland, the extension will generally stop at a point just past the last point of service. However, in order that the right of way be available for future use, HWU will generally require that the customer grant a right-of-way over the entire frontage.

HWU may require developers or others requesting line extensions to pay the full cost of off-site improvements necessary to serve a development when the development benefits from the improvement or constructing the improvement is necessary to serve the development. This includes over sizing of lines that may be prudent in HWU's judgment based on needs that may occur in the future.

1.2 PURPOSE

The regulated sanitary sewer in Henderson lies on both public and private property. Portions of the sanitary sewer infrastructure are constructed through the HWU capital improvements projects and portions are constructed through private residential, commercial, and industrial development. In many cases, the HWU may ultimately become the owner of the sanitary sewer infrastructure constructed by private development. To responsibly regulate the sanitary sewer infrastructure, a consistent quality of construction is necessary regardless of the entity financing and managing the construction.

The purpose of this manual is to provide standards to assure quality in the design and construction of sanitary sewer infrastructure that becomes a part of that owned or regulated by the HWU by providing standard design criteria to the engineers who design the infrastructure. The manual establishes uniformity in design assumptions and general methods of design. The manual also sets policy regarding design standards and specifications and provides for uniform interpretation of the specifications. Finally, the manual outlines the required calculations and design applicable to all sanitary sewer infrastructure.

This manual draws heavily on technical information and design criteria used in numerous city and state manuals and is thus similar in may instances to those manuals. However, this manual has been tailored to fit Henderson County and contains important provisions that are unique to this area.

1.3 GENERAL CRITERIA

The following is a list of procedures to be followed by a developer or others who wish to design, finance, and construct sewer system facilities line that will become a part of the HWU system. These procedures as well as those listed in HWU's Manual of Procedures and General Requirements for Design and Construction of Potable Water, Sanitary Sewer, and Stormwater Infrastructure must be followed in order for the proposed sewer system facilities to be considered for acceptance and connection to the HWU system.

Design Criteria

All designs shall comply with HWU's Technical Manual for Sanitary Sewer Facilities.

The following is a list of minimum design criteria required of any sewer facility to be approved to connect to the HWU system.

1. Pipe size and material shall be as determined by HWU consistent with state of the art engineering practices. All pipe shall be manufactured and installed in accordance with the specifications contained herein. Main sewer lines shall be a minimum of 8-inch diameter for gravity lines and 6-inch diameter for sewer taps and laterals. Gravity sewer lines are to be sized so that the ultimate design peak flow is no greater than 2/3 flow depth. Poly-wrap is required on all installations of ductile iron pipe or as required by HWU.

2. Sewer force mains shall be designed for a flow minimum of 2 feet per second, with a maximum of 15 feet per second. Force mains shall be sized for potential growth.

3. All pipe shall be installed on a level bottom with holes for the bells cut at each joint. Rock bedding shall be required as per the specifications contained herein.

4. Gravity sewer lines shall be laid true to lines and grades as shown on the HWU approved design plans and profiles. Minimum cover over the top of gravity sewers shall be 42" unless otherwise approved in writing by HWU. Force mains shall have 42"-48" cover.

5. The size, type, class and thickness or pressure rating of sewer line material shall be as shown on the utility plans and/or project special provisions.

6. PVC and ductile iron pipe shall have a gasketed joint used in conjunction with an integral bell, which shall be a homogenous part of the pipe. PVC and ductile iron pipe joints shall be assembled in accordance with recommendations of the manufacturer and in accordance with the specifications. HDPE pipe shall be fusion welded and installed as per manufacturer's specifications.

7. All pipe shall have its location marked by using a detectable marking tape, installed 18 to 24 inches above top of pipe. Such tape shall be approved by the Engineer.

8. A manhole shall be placed at every change in direction, grade change, end point, or every 400 feet maximum spacing (500 feet for 18-inch or larger sewer).

9. All new manholes shall be pre-cast reinforced concrete with pre-cast base with flow lines as per standard drawings.

10. Combination air and vacuum release valves shall be located at significant high points in the constructed facilities for force mains.

11. Sanitary Sewer lines shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. Where a separation of 10 feet is not feasible, the sewer shall be laid so that the top of the sewer pipe is no less than 18 inches below the bottom of the water main. Sewer lines crossing water mains shall have a vertical distance of 18 inches between the outside of the water main and the outside of the sewer. If a sewer line is to be laid above a

water main, the sewer main shall be constructed of ductile iron pipe with one full length of pipe centered on the water main. At all crossings, one full length of the water main pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

12. Sanitary sewers shall be designed and built so that they generally run adjacent to, but outside of the road rights-of-way in dedicated utility easements. Easements for sewer lines shall be a minimum of 12 feet in width. Easements for water and sewer lines running parallel shall be of sufficient width to maintain a minimum of 10 feet of separation between the adjacent edges of the water and sewer lines. Easements for sewer lines running parallel shall be of sufficient width to maintain a separation between the adjacent edges of the parallel sewer lines based on the formula (invert depth in feet/2) or 5 feet minimum. The outer edge of the easement for single and parallel lines shall be a distance from the outside edge of the pipe(s) based on the formula (invert depth in feet/2) or 5 feet minimum. Easements wider than those described herein may be required at HWU's discretion.

13. Sanitary sewer tap clean-outs and service connections shall be installed in accordance with the applicable utility provisions, by the resident plumber, as shown on the utility plans. Clean-outs shall be 6-inch minimum in diameter and have cast iron covers installed according to standard drawings. For location of tap, the developer shall place a cap on the end of the tap and use a metallic marker with PVC pipe and cap around it for protection. This marker should be even with the ground. The developer is not required to install the tee and cleanout.

14. During the progress of the work and until the completion and final acceptance, the pipelines and their appurtenances shall be kept clean throughout. Any obstructions or deposits shall be removed.

15. If, at any time before completion of the contract, any broken pipe or any defects are found in the lines or in any of their fittings or appurtenances, they shall be carefully examined for defects before placing, and any found defective shall not be used.

16. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that water, earth, or other foreign substances cannot enter.

17. The Contractor shall adjust manhole tops as required to provide access during all phases of construction. Final adjustment shall be 1-inch above finish grade unless specified otherwise.

18. Acceptable pipe materials for gravity sewers are: solid wall PVC pipe, ductile iron pipe, reinforced concrete pipe as specified in the Materials Checklist below. At depths of cover of 10 feet or less, any of these pipe materials may be used. At depths greater than 10 feet but no greater than 15 feet, SDR35 PVC shall not be used. At depths greater than 15 feet, no PVC pipe shall be used. If any portion of a sanitary sewer segment crosses one or more of the above threshold depths, the most stringent requirement shall apply; however, manholes may be strategically located to minimize

the lengths of deep sewers. Sewer force mains shall be HDPE fusion welded pipe DR-11 unless otherwise approved by HWU.

19. Each separate dwelling, commercial building or industrial building shall have a separate sewer connection, which extends to the sewer main.

20. All gravity sewer pipe in steel casing longer than 200 feet shall be ductile iron pipe with field-loc type gasketed joints.

21. All service connections shall be as per standard drawings.

22. Testing will be required as per technical specifications.

MATERIALS CHECKLIST

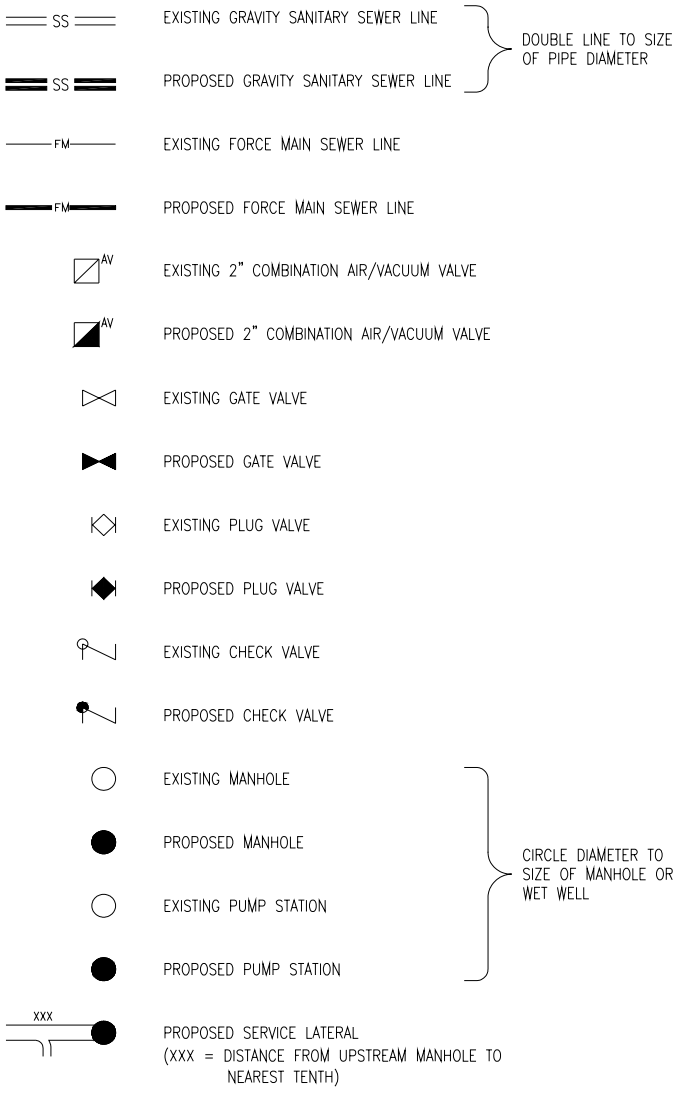
PIPE	PVC SDR-35 OR SDR-26 ASTM D-3034, F-679 J-M Manufacturing Co. or approved equal
PIPE	DI (DUCTILE IRON) Pressure Class 150-350 AWWA/ANSI C150/A21.5 Interior lined with Protecto 401 or approved equal
PIPE	HDPE ASTM D3350, ASTM F714, ASTM D3035 CSR Polypipe Greenview PE 3408 or approved equal
FITTINGS FOR GRAVITY	Same material and/or coating as pipe being used.
AIR VACUUM RELEASE VALVE	ANSI-AWWA C512 Made from Non-Corrodible Materials Bronze Saddle, Corp Stop, and Globe Valve Required APCO Model 445C or approved equal
CASING	Steel AWWA C-200 Minimum 0.250 Wall Thickness Neither Coated nor Wrapped
CLEANOUTS	Cast Iron East Jordan Iron Works or approved equal
FITTINGS FOR FORCE MAIN	Flanged fittings ductile iron with cement lining.
PIPE	RCP reinforced concrete pipe minimum Class III wall thickness KYTC 810.03 interior lined with Permite PCS-9043 Type II or approved equal.

1.4 GENERAL SPECIFICATIONS

General Notes, Legend, And Map Index

1. Name of development; name, address, and telephone number of developer in lower right-hand corner of plans.
2. Names of existing utilities and telephone numbers.
3. Vicinity map (highlighting proposed extension).
4. Sheet index.
5. Legend as follows:

LEGEND



6. General notes as follows:

   a. The contractor is prohibited from excavating by KRS Chapter 367 until existing underground utilities have been located by properly notified utility companies. Utility locations are approximate and based on information provided by others. Phone numbers for known utilities in the area are shown on this sheet, however other utility companies may also have facilities in the project area. Contractor shall identify and contact all utilities per legal requirements.

   b. Existing sewer line locations shown hereon are approximate and based on as built drawings provided by owner.

   c. Contractor shall be responsible for maintenance of traffic in accordance with KYDOT requirements. Contact Kentucky Transportation Cabinet District Office for traffic control manuals.

   d. All new temporary construction easements are 30' wide centered on pipeline as shown. All new permanent sewer line easements are 12' minimum as specified herein and noted.

Sewer Line Plan Sheet

1. Minimum 24" x 36" sheet.
2. Title block
3. Name, address, and telephone number of developer
4. Name, address and telephone number of engineer
5. Professional engineer seal and signature
6. Sheet number
7. North arrow
8. Scale (maximum 1" = 50')
9. Date
10. Right of way (designate city, county or state)
11. Easements
12. Property owners, deed book and page numbers of recorded plat
13. All existing utilities in project area
14. All new proposed utility lines
15. Locations of tie in to existing lines to be completed by HWU
16. Size of lines and class of pipe
17. All manholes and clean-outs
18. Gate all air/vacuum release valves
19. Match lines with station number reference
20. Length and size of steel casing pipe for road bores or open cut
21. Distance to sewer line form centerline of road or other visible permanent topography
22. Detail information for all road, creek, and railroad crossings

1.4.1 GENERAL

1.4.1.1 SCOPE

1.4.1.1.1 The work to be accomplished under this section of the Specifications consists of the furnishing of all labor, materials, equipment, and services necessary for the construction of sanitary sewer and appurtenances as shown on the Drawings and more fully described within the contract specifications and herein.

1.4.1.1.2 The purpose of this document is to provide information and guidance to developers, contractors, and design engineers in the construction of sanitary sewer facilities that shall be owned or connected to Henderson Water Utility (HWU). This document shall be adhered to in its entirety.

1.4.1.2 DESIGNATION OF PARTIES

1.4.1.2.1 The City of Henderson, Henderson Water Utility is the utility having jurisdiction and supplying water and/or sewer service and is referred to herein as Henderson Water Utility and abbreviated as HWU.

1.4.1.2.2 Contractor shall refer to the party or parties who have been retained by either HWU or others to perform the construction work.

1.4.1.2.3 Engineer refers collectively to the HWU General Manager, an Engineer in responsible charge working under contract to HWU or in the employ of HWU, or an Engineer in responsible charge working in the employ of a developer working under an Infrastructure Development Agreement.

1.4.1.2.4 Owner refers collectively to HWU or to a developer working under an Infrastructure Development Agreement.

1.4.1.3 SAFETY

All work shall be carried out in strict accordance with all applicable rules and regulations of the Kentucky Labor Cabinet, Division of Occupational Safety and Health, and, for projects contracted directly with HWU, the document titled HWU Safety Policies.

1.4.1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

1.4.1.4.1 Care shall be exercised in transporting and handling to avoid damage to pipe and fittings, and all appurtenances.

1.4.1.4.2 Materials shall be stored in an enclosure or under protective coverings if required by the engineer to prevent damage.

1.4.1.4.3 Materials shall not be stored directly on the ground.

1.4.1.4.4 The inside of pipes and fittings shall be kept free of dirt and debris.

1.4.1.4.5 Contractor shall be responsible for all materials furnished and shall replace at his own expense all materials found defective in handling after delivery. Contractor shall report to the Engineer immediately upon finding any material defective in manufacture. Contractor shall furnish all materials and labor required for replacement of installed materials discovered defective or damaged.

1.4.1.4.6 HWU reserves the right to reject any materials that do no comply with these standards.

1.4.1.5 COOPERATION

Cooperation with the Owner concerning construction activities is required.

1.4.1.6 NOTIFICATON

The Contractor shall give the Owner or Owner's representative a minimum of 48 hours notice before starting construction.

1.4.1.7 INSPECTION

The Owner's Engineer shall make sufficient periodic observations during construction to provide final certification that the improvements were installed in conformance with HWU standards and the approved construction drawings in accordance with the requirements of HWU's Infrastructure Development Agreement. In addition to observation by the Engineer, a final inspection will be made by HWU prior to putting the facilities in service. Final inspection will be made prior to acceptance of any facilities and only after all construction is complete. The Contractor shall provide the labor as required to complete the punch list developed during final inspection. Access to the construction site and construction records shall be provided at all times to inspectors. As part of the final inspection, HWU shall be provided a complete set of "As-Built" plans including two copies of full-size (24" x 36") bound print as-built drawings for the entire completed sanitary sewer facilities. Both plan and profiles of the sewer lines and facilities shall be included on the as-built drawings. In addition, one copy of the final as-built drawings including, plan and profile, in digital *.DWG or *.DXF format shall be provided. These digital files must be readable by HWU and the coordinates of the file shall be referenced to the Kentucky State Plan Coordinate System NAD83.

1.4.1.8 PERMITS, EASEMENTS, AND RIGHTS-OF-WAY

The Contractor shall make application for, obtain and pay fees for all licenses, permits, easements, and rights-of-way, including railroad permits (where applicable). The Contractor shall be required to comply with all State and municipal ordinances, laws, and/or codes, which may apply to same.

1.4.1.9 CONTRACTOR'S CERTIFICATION

The Contractor shall certify, upon completion of project construction, that all work was completed in accordance with drawings and specification bearing Owner's approval. The certification must be signed, and dated by the contractor.

1.5 MATERIAL SPECIFICATIONS

1.5.1 PRODUCTS

1.5.1.1 GRAVITY SEWER LINES – DUCTILE IRON PIPE

1.5.1.1.1 Ductile iron pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi surge allowance (if anticipated surge pressures are other than 100 psi, the actual anticipated pressure should be used); a 2 to 1 factor of safety on the sum of working pressure plus surge pressure.

1.5.1.1.2 Ductile iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

1.5.1.1.3 Pipe shall have standard asphaltic coating on the exterior. Pipe shall also have an interior lining or Protecto 401 Ceramic Epoxy or approved equal.

1.5.1.1.4 All areas of pipe and fittings including inside of bell and the outside of the plain end shall have Protecto 401 Ceramic Epoxy or approved equal.

1.5.1.1.5 The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or stamped on the pipe.

1.5.1.1.6 All pipe shall be furnished with Push-on Type Joints, such as Tyton® or Fastite®. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories.

1.5.1.1.7 Fittings shall be manufactured in the U.S.A. and be ductile iron. Fittings shall conform to the latest revision of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings shall have a standard asphaltic coating on the exterior. Fittings shall also have lining on the interior, which is H_2S corrosion resistant and pre-approved by HWU.

1.5.1.1.8 Fittings and accessories shall be furnished with either Push-on or Mechanical Type Joints in accordance with ANSIAWWA C111/A21.11, of latest revision.

1.5.1.2 GRAVITY SEWER LINES - PVC PIPE

1.5.1.2.1 All PVC pipe for gravity sewer lines shall conform to ASTM D-3034 and ASTM F-679.

1.5.1.2.2 All PVC pipe for gravity sewer lines shall be SDR-35 or greater wall thickness.

1.5.1.2.3 The chemical resistance of the pipe and fittings shall be tested in accordance with ASTM D-543.

1.5.1.2.4 All fittings shall be of the same material as the pipe and shall be consistent therewith in strength, dimensions and utility. Adaptors shall be provided for transitions to other pipe products.

1.5.1.2.5 Nominal laying lengths shall be 13’-0”.

1.5.1.2.6 Pipe joints are to be made by the use of an integral bell with elastometric gasket and according to manufacturer’s recommendations.

1.5.1.3 CASING PIPE FOR BORE

1.5.1.3.1 Casing pipe for gravity sewer lines installed by road boring where required on the drawings or bid documents shall be steel, plain end, uncoated and unwrapped, have a minimum yield point strength of 35,000psi and conform to ASTM A252 Grade 2 or ASTM A139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18-foot lengths. Pipe shall be straight along the centerline axis within 1/50 of the outside diameter. Pipe shall also be free from dents or humps having a depth greater than ¼ inch.

1.5.1.3.2 For highway and ditch crossings, the minimum wall thickness of the casing pipe shall be 0.250 inches for 16 inch and smaller casings; 0.312 inches for 18 inch, 20 inch, and 22 inch casings, 0.344 for 24 inch and larger casings. For railroad crossings casings shall have a minimum wall thickness of 0.344 inches.

1.5.1.3.3 All pipes inside casing shall be supported with manufactured PVC or polyethylene casing spacers installed according to the manufacturer's specifications. A minimum of two spacers shall be provided with each length of pipe. All materials shall be furnished and installed at the Contractor's expense.

1.5.1.3.4 At each end of the cover pipe, the pipeline shall be sealed with casing seals model "AM" by Advance Products & Systems, Inc., (www.advprod.com) or equal.

1.5.1.3.5 Field lock gaskets or retainer glands shall be installed within all encasement pipe and within one pipe length outside the casing on both ends. No joint restraint is required for PVC installations.

1.5.1.4 DITCH CROSSINGS

All piping at ditch crossings shall be ductile iron with retainer glands or as directed by the engineer.

1.5.1.5 SEWER FORCE MAINS

High Density Polyethylene Pipe (HDPE) - Unless otherwise specified on the project drawings, all HDPE pipe for force mains shall be 160 psi working pressure, dimensional ratio DR11, except that 4" and smaller shall be DR 9, and shall conform to ASTM D-1248 and ASTM D-3350. HDPE fittings shall be molded or fabricated from sections of pipe with outlet ends machined to match the system piping.

1.5.1.6 MATERIALS FOR MANHOLES

Reinforced concrete manholes shall conform to ASTM C-478. The minimum inside diameter, except for the eccentric cone, shall be 48". The joints shall consist of "O" ring type conforming to ASTM 443 or 1-1/2" wide strip of "Kent Seal" bituminous mastic strip with non- shrink grout in the inside. Precast manhole bases shall conform to ASTM C-478 with a steel finish flowline channel and ledge. A chemical resistant rubber compression diaphragm will be precast into the base for every pipe entering the manhole. The diaphragm shall meet ASTM C-923-79. Poured in place manholes will use 3,500 psi concrete. Precast manhole base bedding shall be No. 5 crushed stone or Dense Graded Aggregate conforming to KYTC Specifications.

Heavy duty manhole castings will be equal to an East Jordan 1040 with Type A solid cover or a Dewey MHR 247 with a 105 solid cover, all meeting ASTM A48 Class 35.

1.6 CONSTRUCTION SPECIFICATIONS

1.6.1 EXECUTION

1.6.1.1 TRENCH EXCAVATION

1.6.1.1.1 Trenching shall be accomplished as described hereinafter. All excavation on this project is "unclassified" and no additional payment will be made for rock excavation.

1.6.1.1.2 Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths shown on the plans, or as specified by the Engineer. Excavation in earth shall undercut the pipe to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. The bedding shall be as set out hereinafter.

1.6.1.1.3 Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2 feet 6 inches plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2 feet 6 inches at the level of or below the top of the pipe, special precautions may be necessary, such as providing compacted, granular fill up to top of the pipe or providing the pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

1.6.1.1.4 All excavated materials shall be placed a minimum of 2 feet back from the edge of the trench.

1.6.1.1.5 Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

1.6.1.1.6 Watchman or barricades, lanterns and other such signs and signals as may be necessary to warn the public of the dangers in connection with open trenches, excavation and other obstructions, shall be provided by and at the expense of the Contractor. Conformance to all state highway requirements shall be the responsibility of the Contractor when encroachment on highway right-of-way is necessary.

1.6.1.1.7 When so required or when directed by the Engineer, only one-half of street crossings and road crossing shall be excavated before placing temporary bridges over the side excavated for the convenience of the

traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and property owners abutting shall be taken into consideration. All public or private drives shall be taken into consideration and shall be promptly backfilled or bridged at the direction of the Engineer. Disposal of excavated materials shall cause as little interference with the work as possible, and in every case the disposition of materials shall be satisfactory to the Engineer. Trenches in which pipes are to be laid shall be excavated in open cut to the depths shown on the approved plans, cut sheets or as specified by the Engineer.

1.6.1.1.8 Where conditions exist that may be conductive to slides or cave-ins, proper and adequate sheeting, shoring and bracing shall be installed to provide safe working conditions and to prevent damage to work. Trenches shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. All excavation shall be in accordance with OSHA and/or KOSHA regulations.

1.6.1.1.9 Dewatering of trenches shall be considered a part of trenching, at no extra cost to the owner. Dewatering of trenches shall include ground water and storm or sanitary sewage. Suitable pumping and other dewatering equipment are to be provided by the CONTRACTOR, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.

1.6.1.1.10 Wherever pipelines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these right-of-ways within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be removed and/or replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Engineer, and the agency having jurisdiction over the roadway.

1.6.1.2 LAYING OF PIPE

1.6.1.2.1 Laying Requirements

1.6.1.2.1.1 All pipe shall be laid to lines, cover or grades shown on the Drawings.

1.6.1.2.1.2 All pipe shall be visually inspected for cleanliness and proper jointing.

1.6.1.2.1.3 The points insisted upon in the laying of pipe will be: Proper alignment, evenness of width and depth of joints, perfection in jointing, and care of the pipe in handling.

1.6.1.2.1.4 Precautions must be taken to prevent flotation of the pipe should water enter the trench prior to putting the pipeline into operation.

1.6.1.2.1.5 In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or alignment, or where the backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. If additional crushed rock fill beneath the pipe is necessary for stability, it will be paid for at the unit price bid per ton of such material in place except in cases where instability is caused by neglect of the CONTRACTOR.

1.6.1.2.1.6 A manhole will be required at the termination of any line installation.

1.6.1.2.1.7 No pipe shall be laid resting on solid rock, blocking or other unyielding objects. Jointing before placing in the trench and subsequent lowering of more than one section jointed together will not be allowed.

1.6.1.2.1.8 When locating near water lines, the horizontal separation between water and sewer lines should be at least 10 feet measured from inside edge to inside edge of the two pipes. Should location conditions prevent a horizontal separation of 10 feet, HWU may allow a deviation on a case-by-case basis, if supported by data from the engineer. Such deviation may be allowed if the sewer is laid in a separate trench or if it is laid in the same trench with the water main located at one side on a bench of undisturbed earth. In either case, the elevation of the crown of the sewer is at least 18 inches below the bottom of the water main.

1.6.1.2.1.9 Whenever sewer lines must pass below water mains, the sewer lines shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. Should location conditions prevent the sewer line from being buried to meet the above requirements, HWU may allow a deviation on a case-by-case basis, if supported by data from the engineer. Such deviation may be allowed if the sewer line is constructed with ductile iron pipe with protective internal coating of “Protecto-401” or equivalent epoxy coating with one full length of sewer pipe centered on the water main.

1.6.1.2.2 PIPE BEDDING

1.6.1.2.2.1 Standard Bedding – Sewer pipe shall, as a standard practice, be laid using bedding of No. 9 crushed limestone that shall be placed a minimum depth of four-inches (4") below the bottom of the pipe barrel.

1.6.1.2.2.2 In no case shall the pipe be supported directly on solid rock. When rock is encountered in the trench bottom, bedding shall consist of size #9 crushed limestone only.

1.6.1.2.3 SPECIAL PIPE BEDDING

1.6.1.2.3.1 UNSTABLE SOILS

Unstable soils shall be stabilized by over excavating to allow a bedding of #3 crushed stone below the 4" of #9 crushed stone bedding.

1.6.1.2.3.2 All bore pits and any over digging related to such will be stabilized with #3 stone and backfilled with #9 stone to sub-grade.

1.6.1.2.4 INSTALLATION AND JOINTING

1.6.1.2.4.1 Jointing of push-on type Ductile Iron Pipe and PVC pipe rubber gasket couplings shall be accomplished in accordance with the manufacturer's specifications.

1.6.1.2.4.2 Pipe shall not be laid in water or upon frozen sub grade at any time or condition when, in the opinion of the Engineer or HWU, or conditions are unsuitable.

1.6.1.2.5 BACKFILLING

1.6.1.2.5.1 Backfilling of pipeline trenches shall be accomplished in accordance with the details set forth hereinafter.

1.6.1.2.5.2 In all cases walking or working on the completed pipelines, except as may be necessary in tamping or backfilling, will not be permitted until the trench has been backfilled to a point one foot (1') above the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur. The methods of backfilling shall be as follows:

1.6.1.2.5.3 Method “A” - Backfilling in Open Terrain:

1.6.1.2.5.3.1 The lower portion of the trench, from the bottom of the trench to a point six (6) inches above the top outside surface of the pipe, shall be backfilled with #9 stone.

1.6.1.2.5.3.2 The upper portion of the trench above the #9 stone shall be backfilled with material, which is free from large rock. Incorporation of rock with any individual piece having a volume exceeding eight (8) cubic inches is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over the top of the trench or leveled as directed by the Engineer. Material for backfilling the upper portion of the trench is not a separate pay item.

1.6.1.2.5.4 Method “B” - Backfilling Under Sidewalks and Unpaved Driveways:

1.6.1.2.5.4.1 The entire trench shall be backfilled with No. 9 crushed stone.

1.6.1.2.5.5 Method “C” - Backfilling Under Streets, Roads and Paved Driveways:

1.6.1.2.5.5.1 The lower portion of the trench to a point six inches (6”) below the base of the pavement or concrete sub-slab shall be backfilled with No. 9 crushed stone or fine gravel. Backfill for the lower portion of the trench is not a separate pay item.

1.6.1.2.5.5.2 The upper portion of the trench, from the top of the #9 stone to the base of the pavement or concrete sub-slab, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

1.6.1.2.5.5.3 Material for backfilling the upper portion of the trench is not a separate pay item.

1.6.1.2.5.5.4 Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall, at his expense, also remove and legally dispose of all excess earth or other materials resulting from construction from roadways, right-of-ways and/or private property. Hazardous materials are to be handled and disposed of in accordance with all local, state and federal requirements.

1.6.1.2.5.5.5 In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. The Contractor shall be liable for any damage to persons or property resulting from the Contractor’s failure to maintain the trench surface.

1.6.1.2.6 CONCRETE CRADLE ANCHORS, THRUST BLOCKS OR ENCASEMENTS

Concrete cradle, anchors or encasement of sewer lines and/or fitting shall be placed where shown on the plans, required by the specifications, or as directed by the Engineer. Concrete shall be Class "B" and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

1.6.1.2.7 CONNECTIONS TO EXISTING LINES:

1.6.1.2.7.1 Connections to existing gravity sewer lines shall be made with new or existing manholes as indicated on plans.

1.6.1.2.7.2 Connections of new sewer collector pipes to existing sewer lines by tapping into the side of the existing sewer shall not be permitted unless specifically approved by the HWU.

1.6.1.2.7.3 Service line connections shall be factory built Y or T branches if not otherwise indicated

1.6.1.3 FIELD QUALITY CONTROL

1.6.1.3.1 After the collecting and/or outfall lines or system have been brought to completion, and prior to final inspection, the Contractor will be required to clean all dirt, debris and trash from lines and manholes.

1.6.1.3.2 During the final inspection, the Engineer will inspect each individual line, from manhole to manhole, either by use of lights or other means at his/her disposal to determine whether the completed lines are true to line and grade as laid out or as shown on the plans.

1.6.1.4 TESTING REQUIREMENTS

1.6.1.4.1 All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced.

1.6.1.4.2 Maximum allowable leakage rate shall be 200 gallons per inch of pipe diameter per mile of sewer per day. The length of the main sewers shall be used in making the foregoing computation even though the house connection (from the main sewer to the property line) should be in place and included as a part of the system when infiltration is measured. This requirement may be applied to a portion of the contract work, such as the sewers in a separate drainage area or to a single section of line between two (2) manholes.

1.6.1.4.3 All piping shall be tested for deflection thirty (30) days after installation by a mandrel test. The mandrel test shall be performed by the Contractor in the presence of the Owner's engineer (or HWU's inspector) using a rigid ball or mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The mandrel shall be pulled through the pipe by hand with no mechanical assistance. The section of sewer pipe fails if for any reason the mandrel cannot pass through the section of sewer pipe.

1.6.1.4.4 All parts of the system shall bear the load imposed by the backfill. For Reinforced Concrete Pipe, if cracks one-hundredth (1/100) of an inch develop in the pipe within one (1) year from the date of final acceptance of the work, the Contractor will replace the cracked pipe at his/her expense.

1.6.1.4.5 Prior to acceptance of the sewage system, all sewer will be tested for leakage. After laying, backfilling and compacting, the Contractor shall test the sewer in the presence of the Engineer.

1.6.1.4.6 House sewers will be considered part of the main to which they are connected and no adjustment of test time shall be allowed to compensate for the smaller diameter of house sewers.

1.6.1.4.7 The pressure gauge used shall be supplied by the Contractor, shall have minimum division of 0.25 psi, and shall have an accuracy of 0.10 psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals or when required by the Engineer. In addition, the Engineer may compare the Contractor's gauge with a municipally owned gauge at any time.

1.6.1.4.8 Leakage shall conform to ASTM C-828, which shall be as follows:

1.6.1.4.8.1 Preparation of the Line

1.6.1.4.8.1.2 Contractor shall flush and clean the line prior to testing to wet the pipe surface and clean out debris. A wetted interior surface will produce more consistent test results.

1.6.1.4.8.1.3 Contractor shall plug all pipe outlets, including stoppers in laterals, to resist the test pressure.

1.6.1.4.8.2 Procedure

1.6.1.4.8.2.1 Calculate the test time for the section using the applicable time in air test table below.

1.6.1.4.8.2.2 Plug and brace the plugs in all openings in test section.

1.6.1.4.8.2.3 Add air until the internal pressure of the line is raised to approximately 4.0 psi gage. After this pressure is obtained, allow the pressure to stabilize (usually five minutes). The pressure will normally drop as the air temperature in the test section stabilizes. Before starting the test, the pressure may be reduced to 3.5 psig.

1.6.1.4.8.2.4 When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, start the test. Record the drop in pressure for the test time. If the pressure drops more than 1.0 psi gage during the test time, the line is presumed to have failed. If a 1.0 psig drop does not occur within the test time, the test is successfully completed.

1.6.1.5 AIR TEST TABLE (TABLE 1)

Specification time (minutes) required for pressure drop from 3.5 to 2.5 psi when testing one pipe diameter only.

TABLE 1

LENGTH OF LINE IN FEET	4 inches diameter	6 inches diameter	8 inches diameter	10 inches diameter	12 inches diameter
25	0:04	0:10	0:18	0:28	0:40
50	0:09	0:20	0:35	0:55	1:19
75	0:13	0:30	0:53	1:23	1:59
100	0:18	0:40	1:10	1:50	2:38
125	0:22	0:50	1:28	2:18	3:18
150	0:26	0:59	1:46	2:45	3:58
175	0:31	1:09	2:03	3:13	4:37
200	0:345	1:19	2:21	3:40	5:17
225	0:40	1:29	2:38	4:08	5:40
250	0:44	1:39	2:56	4:35	
275	0:48	1:49	3:14	4:43	
300	0:53	1:59	3:31		
350	1:02	2:19	3:47		
400	1:10	2:38	4:05		6:03
450	1:19	2:50			6:48
500	1:28			5:14	7:34

1.6.1.5.1 If the prevailing ground water is above the sewer being tested, air pressure shall be increased 0.43 psi gage for each foot in the water table is above the crown of the sewer.

1.6.1.5.2 The Contractor shall repair any damage to the pipeline and its appurtenances or to any structure resulting from the testing at his expense. If the section tested fails the test, it shall be repaired and retested at the

Contractor's expense until the measure leakage is within the allowable limits as outlined in the air test table.

1.6.1.5.3 The test results of the air test shall be recorded by the Contractor defining the size of pipe, length of line, starting pressure, ending pressure, the time to drop 1.0 psig for each line. This test report shall be submitted to the Engineer.

1.6.1.6 FORCE MAIN TESTING

1.6.1.6.1 All force mains shall be given a hydrostatic test to 50 psi above the rated working pressure of the pipe, under which leakage shall not exceed 50 gallons per 24 hours per inch of diameter per mile of pipe. Loss of water pressure during testing shall not exceed 10 psi in a 24-hour period, 5 psi in a 10-hour period or 2 psi in a 4 hour period.

1.6.1.6.2 Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1,500 feet.

1.6.1.6.3 Pipelines shall be tested before backfilling at joints except where otherwise required by necessity, local ordinance, or public convenience.

1.6.1.6.4 The duration of the test shall not be less than two hours where joints are exposed and not less than 24 hours where joints are covered.

1.6.1.6.5 All pipe, fittings, and other materials found to be defective under test shall be removed and replaced at the contractor's expense.

1.6.1.6.6 Lines, which fail to meet the test requirements, shall be repaired and retested as necessary until test requirements are met.

1.6.1.6.7 HWU will provide initial water for testing for force mains. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

1.6.1.7 MANHOLE TESTING

1.6.1.7.1 All manholes shall be subjected to a vacuum test in accordance with ASTM C1244, except as specified otherwise herein. Other forms of testing of some manholes may be required, as deemed necessary by the OWNER.

1.6.1.7.2 Manholes shall be tested after installation with all connections in place and shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.

1.6.1.7.3 A vacuum of at least ten inches of mercury (10" Hg) shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.

1.6.1.7.4 The manhole shall be considered to pass the vacuum test if the vacuum reading does not drop more than 1" Hg (i.e. from 10" Hg to 9" Hg) during the following minimum test times.

Minimum Test Times for Various Manhole Diameters

MH Depth (feet)	**4' Diameter MH**	**5' Diameter MH**	**6' Diameter MH**
15 Feet or less	50 sec.	1 min. 5 sec.	1 min. 20 sec.
15.01 to 30 Feet	1 min. 20 sec.	1 min. 45 sec.	2 min. 10 sec.

TABLE OF CONTENTS

CHAPTER 2 – WASTEWATER PUMPING STATION **PAGE**

Chapter 2 - WASTEWATER PUMPING STATION

2.1 SCOPE

This specification applies to all labor, materials, equipment and services necessary for the construction of wastewater pumping station(s), equipment, and appurtenances of the size, or sizes as shown on the approved Project Drawings and in compliance with the requirements more fully described hereinafter.

2.2 DESCRIPTION

Submersible pump stations shall incorporate two or three solids-handling sewage pumps. Electrical control design shall alternate pump operation so all pumps get equal wear. Under extreme peak flow conditions all pumps shall come online overriding the alternation circuit.

The station shall at a minimum be a duplex configuration. In the duplex pump station, one pump shall be sized for peak flow conditions and the second pump designed for 100 percent backup. In three (3) pump stations, two (2) pumps shall be sized for peak flow conditions with one pump reserved for backup.

2.3 LIFT STATION WET WELL

The wet well shall be constructed of reinforced concrete conforming to ASTM C-478. The minimum inside diameter shall be 72" unless otherwise approved in writing by HWU. The joints shall consist of "O" ring type conforming to ASTM 443 or 1-1/2" wide strip of "Kent Seal" bituminous mastic strip with nonshrink grout in the inside. Precast bases shall conform to ASTM C-478 with a steel finish flowline channel and ledge. An access frame and cover made of heavy duty aluminum shall be precast into the concrete cover. The door size shall be large enough to allow removal of pumps by lifting vertically out of the wet well. The doors shall have locking hasps and retractable lifting handles. Minimum clear opening shall be 24” x 24”.

The wet well shall have a vent pipe, with a cross-sectional area of at least 60% of the cross-sectional area of the discharge force main. The vent pipe shall extend three feet above the top of the station and terminate with two 90-degree elbows to direct the open end back toward the top of the station. The vent pipe shall be steel with malleable iron screwed fittings or cast iron with cast iron flanged fittings.

2.4 OUTSIDE VALVE BOX

An outside precast concrete valve box shall be provided adjacent to the wet well and shall meet the same specifications for the wet wells with the following additions:

The reinforced concrete valve box shall be constructed within three feet (3') of the wet well. The valve box shall be a minimum 60 inches inside diameter. A four (4) inch drain pipe with a molded Tideflex® check valve shall be provided from the valve vault back to the wet well on the bottom of the valve vault sloped to the drain. The valve box shall have a precast concrete top with an aluminum hatch (min. 24" x 30") frame and cover cast into the top.

2.5 START-UP

The Contractor shall furnish the services of an engineer, representing the manufacturer or group of manufacturers for each equipment grouping or system within the Project, for checking the installation, making the necessary adjustments, placing the equipment in operation, and during acceptance tests. The representative shall be available for no less than one 8-hour day scheduled with the Owner to instruct operating personnel in the use, operation, and maintenance of the equipment during the initial on-line operating period. All components and equipment shall be installed in accordance with the recommendations of the manufacturer and these specifications.

Operating tests shall be made on all equipment in the presence of the Owner and the Engineer or their representatives in order to demonstrate the entire facility to be complete, functional, and ready to be placed in operation.

Operating instructions shall be given to the Owner's regular operating personnel by the equipment manufacturer's representative where complex equipment is provided and by the Contractor for other equipment in order to thoroughly familiarize the operators in the correct procedures and functions for operating and maintaining the facility.

2.6 VARIABLE SPEED PUMPS

Where a variable speed pump installation is provided, the pump manufacturer/supplier shall furnish the pumps and associated variable frequency controlling system as sole-source responsibility. The manufacturer/supplier shall provide a written guarantee for the pumps and controls as a single unit installation relative to materials quality and durability, system performance, and coordinated completeness of the overall system.

Performance curves for the variable speed pumps shall be submitted to show families of curves for the ranges of pressures, flows, and speeds anticipated at the specific location of the pumps within the hydraulic system. A manufacturer's certification shall be provided for the applicability of the pump and motor for the particular project conditions. The Vendor shall also furnish a listing of recommended spare parts for each particular item of equipment supplied under this requirement.

2.7 PERFORMANCE TEST

The Contractor shall perform field tests on all completed pump and control system assemblies to demonstrate their conformance to the Specification to the satisfaction of the Engineer. A test log shall be presented to the Engineer upon the completion of each test that records the following:

1. Flow, in gallons per minute.

2. Pump discharge pressures as measured by calibrated gauges, converted to feet, of the liquid pumped and corrected to pump datum as defined by Hydraulic Institute.

3. Calculated velocity heads at the discharge flanges and total head, all tabulated in feet.

4. Applied voltage and amperage measured for each phase.

5. Megger readings for all power cables.

2.8 ELECTRICAL

2.8.1 Standard Compliance

All electrical material and equipment provided by the Contractor shall be new and free of defects. All work performed under this Section of the Specifications shall be carried out by skilled workers regularly engaged in the performance of such duties. The entire electrical installation shall not be less than that required by the latest edition of the National Electrical Code, the Occupational Safety and Health Act, and all electrical codes locally enforced in the Project area. The Contractor shall obtain all permits required by local ordinances; and after completion of the Work, shall give the Engineer a certificate of final inspection and approval from the local Electrical Inspection Office. Any expenses connected with such inspection and certificate shall be borne by the Contractor.

Electrical material and equipment shall be designed in accordance with the latest requirements of applicable standards such as NEMA, ANSI, IEEE, and where listings are available for such items shall be approved by the Underwriters Laboratories, Inc. Equipment, components, material, etc., rated by other standards and agencies, including but not limited to IEC, VDE, and DIN, will not be considered equal to NEMA, ANSI, IEEE, and UL. Electrical items shall be standard cataloged products of manufacturers regularly engaged in the manufacture of such products, unless otherwise noted. Acceptable manufacturers for Motor Control Centers are: Cutler-Hammer, Square-D, Siemens and General Electric.

All devices, equipment, and materials not definitely specified or noted that are required for complete installations shall be manufactured for the purpose intended and shall be installed in conformance with good accepted practice for the conditions encountered. All hardware such as straps, supports, bolts and nuts shall be of rust or corrosion-resistant material unless otherwise noted.

2.8.2 **Electric Power Metering**

The Contractor shall provide all labor and materials required for a complete installation to meter electrical power usage in accordance with the power company's detailed requirements. Meter location shall be as shown on the Plans. Contractor shall contact the appropriate power company regarding new or revised installation. Power Company shall supply new meter socket free of charge. Contractor shall install meter socket and coordinate power hook-up by Power Company.

The Contractor, at his own expense, shall provide power and all necessary temporary wiring as required to perform his work. After completion of the permanent electrical connections, the Contractor shall be required as a part of this Work to secure all utility services from the respective utility companies and shall pay all monthly bills until such time as acceptance of the equipment is made by the Owner. Upon acceptance, the Contractor can have the respective utility companies transfer their billing to the Owner's name.

2.8.3 **Electrical Service**

When required and as instructed by the Owner, the Contractor shall request 3-phase power service from the utility company, and shall make arrangements for the utility company to bill the Owner directly for any installation charges, other than those associated with power metering, for the service.

2.8.4 **Grounding**

Non-Current Carrying Metal Parts of electrical items such as cabinets, enclosures, frames, etc., and the neutral conductor shall be grounded in accordance with the National Electrical Code unless additional grounding requirements are indicated. Grounding conductors shall be copper, sized as noted. Special grounding system features shall be provided as indicated.

All Conduit Runs installed for lighting and power loads shall contain a grounding conductor throughout the entire length of the run forming a part of the grounding system. The grounding system shall be electrically continuous throughout the electrical system and shall be connected to earth ground at the point of power service and as otherwise indicated.

Ground Rods shall be copperwelded steel type, ¾ inch diameter, 20'-0" total length, minimum. The top of the ground rods shall be driven to 1'-0" (minimum) below finished grade unless otherwise indicated and shall be electrically connected with suitable cast-type ground clamps or exothermic welding.

Resistance to Ground of each ground rod shall not exceed 25 ohms when measured during dry weather. In the event this value is not obtained, one additional rod or rod section equal to that tested shall be driven. Should the additional rod or section fail to achieve the required value, the Engineer shall be immediately notified. A written record of all resistance measurements and test dates shall be submitted to the Engineer prior to completion of the Project.

2.8.5 **Lightning and Surge Protection**

Lightning Protector Units shall be provided for power circuit protection at the main service connection point and elsewhere as noted on the Plans. Lightning protectors shall be Surge Suppression Inc. for three and single-phase circuits, respectively.

2.8.6 **Insulation Test**

Circuit insulation tests shall be performed to prove each circuit free of faults after all wiring is completed prior to equipment and fixture connections, and again after the installation is complete and ready for use.

Tests shall be made at the main electrical service connection between all conductors and between line conductors and ground. Tests shall be made with a 500 Vdc instrument capable of accurately measuring the resistance involved. Readings shall be taken in the presence of the Engineer or his representative for each test and the written results of each test shall be submitted to the Engineer.

2.8.7 **Main Service and Disconnect**

A main electrical service complete with service pole shall be provided near the station. The service and disconnect shall be housed in a NEMA3 weatherproof enclosure with a locking hasp on the outside door. A main fusible type, NEMA 4, multiple pole disconnect switch shall be provided and mounted on the service pole. The disconnect switch shall be capable of being locked in either position. The service shall be sized to allow all pumps to run simultaneously and continuously. The wiring between the main service to the station main control panel shall be run underground through galvanized rigid steel conduit. The service shall be grounded via a rigid conduit encased wire attached to a 5/8 inch x 10 feet long copper ground rod.

2.8.8 **Emergency Power Receptacle**

On the side of the main electrical service panel, an all weather 600 volt, 200 AMP rated four prong twist lock male receptacle shall be furnished and wired into the center feed of the main power transfer switch supplying the station.

2.8.9 **Electrical Control Panel**

The control panel shall be duplex type and shall have a NEMA 4 all aluminum weatherproof enclosure. A locking hasp shall be provided on the outside door. A circuit breaker and a magnetic motor starter with overload protection and separate temperature sensitive motor thermal overload protection system shall be supplied for each pump motor. In addition to overload protection, anti-single phase protection shall be provided for each motor starter in stations served by the three-phase power. Starters for motors 30 HP and larger shall be autotransformer type. Transformer shall be closed transition 2-coil construction with taps for 50, 65, and 80% starting voltage, and be designed for medium duty per NEMA Standard IC-1-14.21. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. Starters shall have auxiliary contacts to operate both pumps on override condition. An interlock relay shall be provided to automatically reconnect the control circuit in case of circuit breaker trip on one pump. H-O-A switches, run lights, and elapsed time four digit hour meters shall be supplied for each pump. A terminal strip or block shall be provided for connecting the pumps and control wires. Additional terminals shall be provided to connect high water alarm, heat sensors, ultrasonic level measurement instruments and seal failure alarm. If the station is fed by a three phase electrical service, a 5 KVA minimum dry type transformer shall be supplied to provide 120 volt single phase power for the control circuits and for a 30 AMP convenience outlet circuit.

A 120-volt duplex grounded convenience outlet shall be mounted inside the panel and wired into the 30 AMP convenience outlet circuit.

A high water alarm circuit shall be provided to a terminal block inside of the panel.

A pump seal failure alarm panel with one light per pump shall be mounted on the inside of the control panel. The seal failure alarm shall be wired in parallel with the high water alarm circuit.

The alarm circuit and seal failure alarm shall be wired to light a red all weather lens obstruction light mounted on the exterior of the panel. The light shall be mounted such as to be visible from the access road to the station. The alarm seal failure, and pump control circuit shall be wired into a terminal strip and appropriately labeled for incorporation into HWU SCADA system.

2.8.10 **Conductors**

Single Conductors Installed in Raceways shall be copper with AWG sizes as noted, and shall have 600 volt rated, type THW, THHN/THWN or XHHW, 75 degrees C (minimum) insulation. Conductors requiring special consideration shall have insulation material and ratings noted on the Plans and as required by the National Electrical Code. Type TW insulation shall not be used for any purpose in this Contract except ground wire identification only.

Lighting and Power Conductors shall be minimum size No. 12 AWG, with AWG No. 8 and larger to be stranded, and AWG No. 10 and smaller to be solid unless otherwise noted. Conductors shall be stranded where movement, vibration, or other flexing occurs in order to prevent conductor fatigue. Control conductors may be AWG No. 14 stranded, and inputs to remote telemetry units (RTU) may be 16 gauge, unless otherwise noted.

Insulation Colors shall be: Green for ground; white for neutral; and black for single phase line conductor. "Stinger" phase conductor of 120/240 V systems shall be orange as per NEC 215.8. Unless otherwise noted, a uniform insulation color scheme for all new three-phase systems shall be established as black for phase A, red for phase B, and blue for phase C. Control circuit insulation shall be yellow. Conductors size AWG 10 and larger may be black with entire exposed ends taped with "Scotch #35", or equal by Plymouth, in accordance with color schemes mentioned herein.

Direct Buried Grounding System Conductors shall be bare copper, sized as noted.

2.8.11 **Splices and Terminations**

600 Volt System conductors shall be spliced with "Ideal Wire-Nuts", or equal by T & B, for AWG Number 10 and smaller for dry areas, and machine crimped or bolted connectors with "Scotch 88," or equal by Plymouth, full coverage tape for all other splices. Soldered and taped splices will not be acceptable. Terminations shall be made with mechanical lugs or other acceptable termination features of the equipment supplied.

Control Conductors and RTU Inputs shall terminate on box clamp, binding post screw, or set screws only. Soldered, taped, and free-standing connections will not be acceptable.

2.8.12 **Conduits**

All Conduit shall be heavy-wall, rigid galvanized type bearing the Underwriters Laboratories, Inc., label of approval, with the exception of buried conduits, which may be Schedule 80 PVC. Conduit minimum size shall be ½ inch. Steel conduit and fittings installed through concrete shall be manufactured with an exterior 40 mil thick

polyvinyl chloride bonded jacket “Plasti-Bond” by Robroy, or approved equal. Fittings for rigid steel conduit shall be threaded types made up with conductive waterproof compound. Poured liquid sealed fittings shall be provided as required by the National Electrical Code.

All Conduit shall be clean and free from dents, scars, or other deformities. Connections shall be made up watertight, and bushings shall be provided where smooth hubs are not encountered. Changes in directions shall be made with symmetrical bends or conduit boxes. Field-made bends shall be made with an approved hickey or conduit bending apparatus. Conduit runs shall be installed parallel or perpendicular to structural members. Conduit hangers and supports shall be provided at intervals recommended by the manufacturer and the National Electrical Code.

Underground conduit runs shall be installed at least 1’-6” below finished grade unless other depths are indicated. Plain earth used for backfill shall be free from objectionable material such as rocks, glass, metal, wood, etc., and shall be tamped to surrounding earth density.

All Conduit routed from the Pump Control Panel and SCADA Panel to the pump pit shall include an expansion proof seal at the control panels. Seals shall be poured with flexible sealant as per the National Electrical Code. Control Panel or SCADA Panel conduit shall include an expansion proof seal at the pump pit exit junction box to prevent the migration of wetwell vapors and moisture from the wetwell to the panels. Each conduit entering the pump control panel or SCADA panel from the wetwell shall be equipped with a conduit body immediately adjacent to the pump or SCADA control panel. Where power or control cables exit conduits, conduit bells and strain relief devices shall be provided. Electrical and Control wiring shall exit the pump pit via conduit and terminate on terminal block within an appropriately sized NEMA 4X Stainless Steel Junction Box Enclosure either mounted on the side of the pump pit or on the top of the wetwell slab, as shown on the drawings. If the top of pump pit is not sufficiently above grade for side mounting of junction box, it may be mounted on the top and to one side of the hatch. Electrical and control wiring shall continue through the junction box and exit via conduit to appropriate control panels.

All conduits shall be installed with smooth bends. Splices, in junction boxes below grade shall not be acceptable. Conduits shall be cleaned of all dirt, debris and moisture before wire and/or cable is pulled. Suitable mounting frames required for controllers, disconnects, etc., shall be provided.

2.8.13 **Cable Connectors and Supports**

Conduit runs into the wet-well for cable protection shall be positioned to suit field conditions to achieve an unobstructed passage for removal and installation of

pumping units and shall provide close accessibility to allow removal of the cable connector by maintenance personnel from outside and above the wet-well.

Cables entering conduit protection and as otherwise noted shall be fitted with connectors sized to suit the cable and conduit actually installed. Connectors shall be plastic body and threaded cap type with neoprene or equal internal gas-tight compression gland.

Cable grips shall be provided as strain relief for cables and shall be wire mesh offset eye, closed mesh type, all fabricated with 304 stainless steel and shall be sized to suit the cable actually installed.

2.8.14 **Receptacles**

Duplex Convenience Receptacles shall be rated 15 amps, 125 volts, 2 pole, 3 wire, grounding type, specification grade, NEMA configuration 5-15R, ground fault interrupting type, unless otherwise noted. Receptacles shall be brown for unfinished areas and ivory for finished walls. Where installed in damp locations, receptacles shall be installed in weatherproof enclosures.

Special Receptacles shall be provided as noted and shall have electrical ratings, pole configuration, and number of poles as shown or required. Enclosures, receptacle types, and other special features shall be suitable for the duty and conditions encountered.

2.8.15 **Switches**

Safety Switches shall be provided where indicated and elsewhere as required by the National Electrical Code. Safety switches shall be heavy-duty type, with voltage, current, fuses, number of poles, and enclosure types as noted. All switches requiring security including main power service, transfer, and switches installed out-of-doors, shall be provided with padlocks. NEMA 3R switches installed out-of-doors, in corrosive areas, or in wet or damp areas shall be thoroughly cleaned of surface films after installation and given one coat of Indurall rapid dry epoxy primer H-1175 and two final coats of Indurall two-part epoxy paint “Perma-Clean”, or approved equal, in color approved by the Engineer.

2.8.16 **Fuses**

Unless otherwise noted, fuses provided for motor protection and other general purpose loads shall be dual-element type, “Buss Fusetron”, or equal by Shawmut, with voltage and current ratings as required.

Control circuit fuses shall be “Buss FNM” for 120-volt circuits and “Buss KTK” for 480-volt circuits, or equal by Shawmut. Unless otherwise noted, control circuit fuses

shall be installed in terminal strip mounted switch action fuse blocks rated for 15 amps at 600 volts.

2.8.17 **Circuit Breakers**

Branch and feeder circuit breakers shall be thermal-magnetic, molded case, industrial type, unless otherwise noted, and shall be listed by the Underwriters Laboratories, Inc. for not less than 14,000 amps symmetrical interrupting at 480 volts. Voltage, trip and frame current ratings, and number of poles shall be as indicated or required. Circuit breakers shall have trip-free operating handles with trip current rating permanently molded therein.

Circuit breakers provided as an integral part of combination motor starters may be as specified herein or may be magnetic only type manufactured specifically for motor protection duty and set for the actual motor nameplate data.

Circuit breakers provided to serve 120 volt lighting, receptacles, and other small loads shall be rated by Underwriters Laboratories, Inc. for not less than 10,000 amps symmetrical interrupting, and otherwise shall be as specified herein. Multiple circuit breakers shall be factory assembled and sealed. Tandem-type breakers and bailed-tied handles of single-unit breakers are not acceptable for this work.

2.8.18 **Motor Starters**

Starters shall be sized in whole increment NEMA designation with voltage rating poles and enclosure as noted or otherwise required. Starters shall be approved by the Underwriters Laboratories, Inc. Ambient temperature compensated overcurrent protection shall be provided in each ungrounded phase of the circuit and shall be sized to suit the motor provided. Auxiliary equipment including contacts, selector switches, pushbuttons, lights, control power transformer, fuses, etc. shall be provided as noted or otherwise required.

Starters shall be designed and rated in accordance with NEMA Table 2-321-1. Ratings by IEC, VDE, DIN, etc., will not be considered for this work. Terminal temperature rise rating shall not exceed 50 degrees C. Operating coils and overcurrent sensors shall be readily and independently replaceable in the field without requiring complete starter exchange.

Starters indicated as being combination type shall be circuit breaker type motor circuit protector combination type set to suit the motor provided.

Starters shall be magnetic type, full voltage, non-reversing, NEMA Size 1 minimum with wiping style contacts, unless otherwise noted.

2.8.19 **Variable Speed Controls**

Pumping stations designed for variable speed pumping shall be two-pump, pump-down, continuous near linear transition flow type unless otherwise noted herein or on associated Plans. A wet-well mounted analog level sensor shall be provided to produce a 4-20 mA control signal for processing by the control system. Separately mounted NEMA 4X enclosed units with adequate structural support racks shall be provided for the variable-speed drive electronics and the two pump motor controllers. Where required by the equipment manufacturer, a building or other approved shelter shall be provided as a part of the work in order to utilize NEMA 12 type enclosures.

The control box shall house the common level detecting and speed processing components. These components shall be of solid-state electronic design. The following minimum features shall be provided on the control panel:

a. Digital depth of liquid in feet.

b. Hand-off-automatic switching for each pump.

c. Manual speed set for each pump.

Pump motor controllers shall be variable frequency, pulse width modulated, voltage source design, and shall be marketed as a successful controller by a nationally known firm as an equal product for a minimum of one year. Internal controller circuitry shall be solid-state electronics. The following minimum features shall be provided:

a. Controller horsepower rating shall be a minimum of 1.15 of the pump motor nameplate rating.

b. Speed turn-down of 10:1 (minimum).

c. Internal speed monitoring without remote feedback.

d. Hand-off-automatic switch.

e. Manual speed set.

f. Reset pushbutton.

g. Digital speed readout, RPM.

h. Internal adjustment settings for:

(1) Acceleration rate.

(2) Deceleration rate.

(3) Speed limit.

(4) Overcurrent protection.

i. Ambient temperature rating 0-40 degrees C.

j. Controller overheat shut-down with alarm indication.

k. Motor overheat shut-down.

l. Voltage, phase, and frequency input to suit the characteristics of the power supply system at the station location.

m. Power system harmonics filters both before and after the variable frequency drivers.

2.8.20 **SCADA Service**

"At Cost" means the actual cost to the Henderson Water Utility for the design and installation of the SCADA service including the cost of the labor, materials, equipment, contract labor, etc., used in providing the service in accordance with the policy of the Henderson Water Utility. HWU shall furnish and install, At Cost to the Contractor, the SCADA system service at the locations shown on the plans or as directed by the Engineer. The SCADA system components shall consist primarily of the following, however individual components may change with technology:

1. SCADA Enclosure

A SCADA Enclosure consisting of a 24" by 24" by 10" NEMA 4 all aluminum weather-proof enclosure shall be furnished and installed by HWU. The liquid level indicator, PLC or RTU, radio controls, and battery backup shall be installed in the SCADA panel.

2. Ultrasonic Liquid Level Sensor

An ultrasonic liquid level transducer shall be provided and installed by the Contractor as shown on the plans or as directed by the Engineer. The liquid level control unit shall be a Siemens/Milltronics MultiRanger 200 with Siemens/Milltronics EchoMax XPS-15F Ultrasonic Transducer (Order Number XPS15F61D011) or approved equivalent. The control unit shall be mounted in the SCADA panel by HWU.

3. Radio Telemetry

A radio transmitter/receiver unit shall be wired into the SCADA panel. The radio transmitter/receiver shall be a iCOM Model IC-F420 or approved equal. Radio frequencies shall be tuned to RX: 451.4875 MHz and TX: 456.4875 MHz. Cables shall be provided to connect the radio transmitter/receiver to the PLC or RTU.

4. Control Equipment

A PLC or RTU shall be utilized as determined by HWU. The PLC shall be a GE Fanuc Model 90-30 with a 5 slot Baseplate (IC693CHS398), 120VAC Power Supply (IC693PWR330), CPU (IC693CPU374), Analog I/O Module (IC693ALG221), Communications Module (IC693CMM311), and Discrete I/O Module (IC693MAR590) or approved equal. The RTU shall be Zetron Model 1708 or approved equal.

5. Battery Backup

A 12 volt DC, 2.5 AMP battery backup system shall be wired into the SCADA panel. The battery backup shall be capable of providing one hour of operation for the PLC or RTU and radio transmitter in the event of a power outage.

2.9 MOUNTING PLATES

There shall be furnished and installed on the panel prior to shipment ½" thick aluminum mounting plates. These plates shall be drilled and tapped to accept ¼" stainless steel mounting bolts for securing plates to panel and panel to pedestal. A sufficient number of gas tight cord grips for all cables shall be factory installed inside the control panel. Mounting plates shall be equal to U.S. FOUNDRY MP2AL.

2.10 PANEL MOUNTING

The control panels shall be positioned per drawings for general location. All field adjustments shall be approved by the Engineer. Control panels shall not be set on top of wetwell structures. Control panels shall be installed on a four (4) inch thick minimum concrete pad extending a minimum of 8 inches past each end/side of control panel post and in front and rear of control panel. Provide ¾ inch chamfer on all exposed edges of concrete.

At least two 3 inch diameter galvanized steel fence posts with caps shall be installed for control panel mounting. Posts shall be a minimum of 10 feet long, with a minimum of 4 feet buried. The bottom of the control panel(s) shall be set to a minimum of 42" from top of slab. Posts shall be anchored in concrete from 3" below bottom of post, to one foot below finished

grade. The posts shall be furnished with 1-5/8" hot-dipped galvanized Uni-Strut or equivalent channel strut. Isolate dissimilar metals with rubber gaskets.

2.11 LIFT OUT RAIL SYSTEM

Each pump shall have a lift out rail system consisting of a flanged ductile iron discharge base, cast iron pump attaching and sealing plate, cast iron pump guide plate, and cast iron elbow. All exposed nuts, bolts, and fasteners shall be of 300 series stainless steel. No fabricated steel parts shall be used. All rail systems shall be non-sparking and adhere to Class 1, Division 1, Group C & D locations.

Mating flanges shall be metal-to-metal with machined mating surfaces to prevent leakage and recirculation.

Fiberglass systems with stainless steel hardware are also acceptable.

2.12 ELBOW

The discharge elbow size shall be as specified herein. The elbow shall bolt onto the base and have standard 125 pound flanges. Rail systems requiring piping increasers to attach larger discharge pipe which might interfere with pump installation and removal will not be considered equal.

2.13 SEALING

A sealing plate shall be attached to the pump. A simple downward sliding motion of the pump and guide plate on the guide rails shall cause the unit to be automatically connected and sealed to the base. The open face of the sealing plate shall have dove-tailed grove machined into the face to hold a sealing "o"-ring. The "o"-ring shall provide a leak-proof seal at all operating pressures. ANY LEAKAGE WILL NOT BE ACCEPTABLE.

2.14 GUIDE RAILS

Two rail pipes shall be used to guide the pump from the surface to the discharge base connection. The guide rail shall be 2 inch schedule 40 stainless steel pipe. When sealed, the weight of the pump shall bear solely on the discharge base and not on the guide rails or floor of the sump. Rail systems which require the pump to be supported by legs which might interfere with the flow of solids into the pump suction will not be considered equal. The guide rails shall be firmly attached to the access hatch frame. Systems deeper than 21 feet shall use an intermediate guide for each 21 feet of wetwell depth.

Fiberglass systems with stainless steel hardware are also acceptable.

2.15 LIFTING CHAIN

An adequate length of stainless steel lifting chain shall be supplied for each pump for removing the pump. An aluminum, fabricated hook shall be provided for each chain. These hooks shall be secured to the top rail support plates with stainless steel bolts and nuts. The stainless steel chain shall be of adequate strength and length to permit raising the pump for inspection and removal. The chain shall be sized for a safety factor of two (2) times the pump weight.

2.16 DISCHARGE PIPING – STATION PIPING – VALVES - ACCESSORIES

Piping within the station and valve pit shall be flanged joint Class 53 cement lined ductile iron with proper bolts and gaskets. All concrete anchor bolts used for any part of this station installation shall be stainless steel. All flange bolts shall be stainless steel. All valves shall be cast-iron meeting AWWA standard D-509. Gate valves shall be flanged non-rising stem type complete with hand wheel operator. Check valves shall be flanged swing check valves with outside lever and spring. Gate valves shall be installed on the discharge side of the check valves.

2.17 TOP RAIL SUPPORT PLATES

One (1) each aluminum top rail support plate shall be provided for each installed pump. This plate shall be fabricated of aluminum plate and shall contain expandable rubber bushings to accept the 2’ stainless steel guide rails. These rubber bushings when completely tightened shall provide for a tight, vibration free guide rail installation. Notched openings in the rail support plates shall provide for horizontal adjustment. All fasteners shall be stainless steel.

2.18 DISCHARGE PIPING

All piping shall be installed plum and without strains or binds. Piping shall be properly supported. A minimum of two (2) mechanical joint long sleeves shall be used between the wetwell and valve vault. Any fabricated pipe supports used shall be stainless steel or aluminum.

2.19 GATE VALVES – PUMP DISCHARGE

All gate valves for pump discharge service shall be flanged A.W.W.A. type with resilient seat and hand wheel operators.

2.20 CHECK VALVES – PUMP DISCHARGE

All check valves for pump discharge service shall be flanged A.W.W.A. type with outside springs and levers. In some cases, where special air or oil cushioned check valves are shown on the plans, these shall be APCO or approved equal.

2.21 PIPE FITTINGS – FLANGED

All flanged pipe fittings shall be ductile iron, cement lined A.W.W.A type. Flange bolts shall be stainless steel.

2.22 PIPE FITTINGS – MECHANICAL JOINT

All mechanical joint pipe fittings shall be ductile iron cement lined with restrained joint connections. All mechanical joint fittings shall be properly blocked as required.

2.23 COMBINATION AIR RELEASE VALVES

Where shown on the drawings, each combination 2" air valve shall automatically release air and gas from a filling system, admit air into an emptying system and continuously release accumulated air and gas in a pressurized flowing system. The valve shall have a conical body shape, funnel shaped lower body, nylon seal plug assembly, rolling resilient seal, stainless steel internal metal parts, and upper flushing inlet and lower body drain. The body and all fasteners shall be stainless steel. The valve shall be a APCO model 445 C with backflushing attachments or approved equal.

2.24 GAUGES & GAUGE TAPS

A minimum of three ¾" N.P.T. taps shall be supplied in the valve vault as shown on the plans. Each tap shall be supplied with a type 304 stainless steel nipple and bronze ball valve.

One (1) 3 ½" diameter liquid filled gauge with stainless steel diaphragm seal shall be supplied. A tamper proof strap shall be installed between the gauge and seal to prevent the seal from being broken. The gauge shall be ASHCROFT or approved equal. The gauge range shall be sized to allow the gauge to operate in its mid range. A gauge protector shall be installed between the seal and gauge.

2.25 VALVE VAULT DRAIN

If shown on the plans, a 4" schedule 40 PVC drain shall be installed from the valve vault floor to an open drain. This drain line shall be properly laid to grade and bedded with stone. A 4" molded Tideflex® valve shall be installed as shown on the plans. The valve vault floor shall slope toward the drain.

2.26 ACCESS HATCHES FOR WETWELL AND VALVE VAULT

There shall be furnished two (2) aluminum access hatches at each pump station. Hatches shall be sized to allow removal of all pumping equipment. The hatches shall be of non-skid design and designed to handle a weight of 300 pounds per square foot. A recessed, vandal proof locking device shall be provided. A positive hold open bar shall be provided to secure the hatch in the open position.

All hinges and hinge bolts shall be stainless steel. All hinge bolt nuts shall be tack welded to prevent removal of bolts. All fasteners used on the hatches shall be non corrosive.

All areas of hatch frames that will be in contact with concrete shall be coated with bitumastic paint.

All valve vault hatches shall be trough frame type with a 1 ½" pipe drain coupling and the same features as described above. They shall be equal to U.S. FOUNDRY type T.P.S.

All single door wetwell hatches shall be equal to U.S. FOUNDRY type A.P.S. All double door wetwell hatches shall be equal to U.S. FOUNDRY type A.P.D.

All wetwell hatches shall be furnished with factory installed stainless steel bolts for securing the guide rail support plates, float mounting bracket, chain hooks and cable strain reliefs. Holes for these bolts shall be drilled and tapped at the factory. Bolts as required shall be threaded into the hatch frame from the concrete side and secured with stainless steel nuts.

2.27 HATCH NET

The pump access hatch shall include a Hatch Net 121, or approved equal, which is a fall-through prevention system. The net is to be factory installed and easily retractable within the inside opening of the aluminum access. When access to the wetwell is required, the net can be slid to one side to facilitate full access. The Hatch Net 121 is manufactured by Safe Approach, Inc., and must meet all OSHA safety standards.

2.28 SHUT-OFF GATE VALVE & CHECK VALVE

A shut-off, flanged gate valve shall be installed for each pump outside the basin in the valve pit. A flanged check valve with outside spring and lever shall be installed in the valve pit. Valve sizes shall be as shown on the plans.

2.29 PUMP BASINS – WETWELL AND VALVE VAULT

Pump station basins shall be precast reinforced concrete pipe in conformance with ASTM C478(LR) constructed as shown on the drawings. The basin and interior piping shall be protective coated with coal-tar epoxy coating such as Tnemed "Hi-Build Tnemetor or Koppers "Bitumastic 300M".

2.30 DEFINITION OF ACCEPTANCE

System acceptance shall be defined as the point in time when all of the following requirements have been fulfilled:

A. All submittals and documentations have been submitted, reviewed and approved.

B. Operations and Maintenance Manuals have been submitted on all equipment items.

C. The complete system has successfully passed all testing requirements.

D. All fees, permits and reports have been satisfactorily completed.

E. All Owner's staff personnel training programs have been completed.

F. Beneficial use by the Owner has occurred.

2.31 CLEAN-UP

After final operation tests, the interior and exterior of the station shall be cleared of all trash and debris and left in final operating condition. Final grading of the site and restoration of surfaces with grass shall be in strict accordance with the applicable plans.

TABLE OF CONTENTS

CHAPTER 3 – SUBMERSIBLE PUMPS AND APPURTENANCES **PAGE**

Chapter 3 - SUBMERSIBLE PUMPS AND APPURTENANCES

3.1 PUMP CHARACTERISTICS AND OPERATING CONDITIONS

The vendor shall supply the submersible solids handling sewage pumps complete with quick-disconnect, discharge elbows, two-guide rail system as follows:

Item	Description
A. Number of Pumps	
B. Pump Operating Points*	
C. Horsepower	
D. Electrical	
E. Control Panel Voltage Feed	
F. Electrical Cord Length	
G. Minimum Service Factor	
H. Minimum Hydraulic Efficiency	
I. Solids Handling	
J. Discharge Pipe Size	

- Each pump shall meet the minimum GPM at the indicated head. Each pump shall be capable of pumping the specified flows against a head range of __' to __'.

The acceptable pump brands are:

Hydromatic
Cornell
Pumpex

Other manufacturers may be considered by HWU for special applications on a case by case basis.

As part of the bid submittal, the Pump Vendor shall provide pump curves and other appropriate information to demonstrate that the pumps proposed meet the stated requirements.

3.2 GENERAL PRODUCT REQUIREMENTS

The Vendor shall provide products that comply with the requirements of the specifications and that are undamaged and, unless otherwise indicated, unused at the time of installation. The Vendor shall provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for complete installation and for the intended use and effect.

3.3 COMPLIANCE WITH SAFETY REGULATIONS

The equipment items furnished shall comply with all governing federal and state laws regarding safety, including all requirements of the Occupational Safety and Health Act of 1970 (OSHA).

3.4 VENDOR'S RESPONSIBILITIES

The Vendor shall notify Owner, in writing at time of submission, of deviations in submittals from requirements of specifications and project drawings.

The Vendor shall begin no work, and have no material or products fabricated or shipped which require submittals until return of submittals with Owner's stamp and initials or signature indicating review.

3.5 SUBMITTAL PROCEDURES

Submittal Preparation: The Vendor shall mark each submittal for identification and provide information for proper processing and recording of action taken.

Submittal Transmittal: The Vendor shall package each submittal appropriately for transmittal and handling. The Vendor shall also transmit each submittal from the Vendor to the Owner, and to other destinations as indicated, by use of a transmittal form.

Detail drawings shall be prepared for all fabricated and manufactured equipment. Where applicable, fabrication, assembly, layout, setting and erection details shall be shown.

All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s).

Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.

Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators.

Fastener specifications of manufacturer shall be indicated on equipment shop drawings.

All submittals shall be furnished in at least four (4) copies and shall be checked and reviewed by the Owner. The review of the submittals shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Vendor of the responsibility for any errors which may exist as the Vendor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory manufacture of all materials and/or equipment.

3.6 DEFINITIONS

When the term “pumping unit” is used, it shall be deemed to mean a pump or pumps, complete with, but not limited to, drive motor, accessories, appurtenances and all associated equipment.

3.7 CONTRACT DRAWINGS

The contract drawings are intended to show a general arrangement of pumping equipment, controls, connected piping, and valves. The pump manufacturer shall furnish each pumping unit complete with motor and all components necessary for the intended function of the unit and shall be held entirely responsible for the compatibility of all components furnished.

3.8 MANUFACTURER

All pumping units shall be an approved design, make and products of manufacturers who have built equipment of similar type, size, and capacity.

The Vendor shall submit, upon request, any additional information that the Engineer and/or owner may deem necessary to determine the ability of the proposed manufacturer to produce the specified equipment.

Pumping units shall be products of manufacturers who can produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the pumps.

Approval of manufacturers or suppliers will not be given until all information required by the specifications or requested by the Engineer has been submitted and found acceptable.

There shall be provided at no cost to the Owner, the services of an accredited representative of the pump manufacturer who shall supervise the testing of each pumping unit and also give operating and maintenance instruction to the Owner's personnel. Pumping equipment shall be tested for performance according to curves and other approved data. Failure of the equipment to perform as curves indicate and with other approved data shall be sufficient cause for rejection. As one condition necessary to acceptance of any pumping unit, the supplier shall submit a certificate from the manufacturer, stating that the installation of the pumping unit is satisfactory, that the unit is ready for operation, and that the Owner's operating personnel have been suitably instructed in the operation and maintenance of the unit.

3.9 CERTIFIED FACTORY TESTING

Prior to shipment, each pump shall be factory tested for performance. A certified test curve is to be provided to the engineer showing that each pump meets or exceeds the duty point. All tests shall be run in strict accordance with the Hydraulic Institute. Normally, certified curves will be required only for pumps 25 hp or greater in size; however, HWU reserves the right to request certified curves for smaller pumps.

3.10 SUBMITTALS (Shop Drawings)

The following shall be included in submittals as a minimum. However, any additional information or data shall be added if and whenever requested by the Owner of Engineer. Separate data for each pumping unit shall be submitted.

3.10.1 Submittals shall contain descriptive literature as to dimensions and materials of construction. Performance data shall include size of pump, GPM, TDH, BHP, pump efficiency (inlet through discharge head), RPM, performance curves, shutoff head, weight of complete motor/pump as a unit and discharge diameter.

3.10.2 Installation information shall include drawings and information necessary for connecting piping and valves, electrical connections, starting and auxiliary equipment. Drawings shall be submitted showing dimensions and assembly outline of the complete pump and

all associated equipment. For all pumping units, a cross-sectional drawing of the assembled pump showing full details, parts list of all items and materials of construction shall be submitted for approval.

3.10.3 A drawing shall be supplied showing the exact location of all hatches, vents, panel mounting pedestals, hoist sockets and internal wetwell piping to be certain that all equipment will properly fit and can be installed and/or removed without undue effort. This drawing shall clearly show location of hinge side of hatch and an exact location of the hoist sockets to insure that each pump can be pulled.

3.11 MAINTENANCE AND OPERATIONS MANUAL

The pump manufacturer shall submit an Operations and Maintenance Manual containing all information necessary for proper operation and maintenance of pumping units as well as location of the nearest permanent service headquarters. There shall be four (4) copies of each manual submitted two HWU, for each pumping station, when pumps are delivered. These shall be detailed in instructions to the Owner's personnel. They shall be attractively bound for the Owner's records.

The Operation and Maintenance manuals shall be complete with required drawings for each item of equipment furnished or modified under this requirement.

Equipment manufacturer's manuals shall be written for average journeymen mechanics without prior knowledge of the specific equipment.

In addition to maintenance and operations requirement provisions, the manufacturer's printed recommended installation practice shall also be included. If not part of the Operations and Maintenance Manual, separate written installation instructions shall be provided, serving to assist the Owner's Contractor in equipment installation.

The Operation and Maintenance Manual shall include detailed diagrams and instructions for complete assembly and disassembly.

3.12 SHIPMENT AND DELIVERY

Unless otherwise specified or approved by the Owner, no materials or equipment as part of this requirement shall be delivered without the Owner's approval and without a minimum of 24 hours notice prior to delivery. Materials will be received on Mondays through Fridays (except for holidays) between the hours of 7:00 A.M. and 2:00 P.M.

Unless otherwise specified or approved by the Owner, all materials under this requirement must be delivered at one time. Partial deliveries will not be accepted.

3.13 GUARANTEE

Except as otherwise specified herein, the Vendor shall guarantee all materials and/or equipment from latent defects in materials, equipment and workmanship for one (1) year from the date of final completion of installation and startup. The date of startup shall be that date when the

equipment or product is placed in service and shall be recorded by the Owner. This guarantee is in addition to the pump warranty described in Section 1.31.

The Vendor shall promptly make such repairs or replacement as may be required under the above specified guarantee.

When the Owner deems it necessary, and so orders, such replacements or repairs under this section shall be undertaken by the Vendor within twenty- four (24) hours after service of notice. If the Vendor unnecessarily delays or fails to make the ordered replacements or repairs within the time specified, or if any replacements or repairs are of such nature as not to admit of the delay incident to the service of a notice, then the Owner shall have the right to make such replacement or repairs and the expense thereof shall be paid by the Vendor or deducted from any moneys due the Vendor.

3.14 GENERAL NON-CLOG SUBMERSIBLE PUMP CONSTRUCTION REQUIREMENTS

All pumping units shall be designed and built for the specified operation without overheating, without excessive vibration or strain and requiring only generally acceptable maintenance.

The pumps shall be non-clogging sewage pumps capable of operating in a partially or entirely submerged condition. The design shall be such that pumping units will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be removed for this purpose and no need for personnel to enter the pump well.

Major pump components shall be gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate METAL-TO-METAL CONTACT between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

All openings in the pump impeller and volute case shall be large enough to pass a three (3) inch diameter sphere. The discharge flange shall be as shown on the plans.

3.15 MOTOR

The pump motor shall be of the sealed submersible type. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in either an oil filled or an air filled watertight chamber, NEMA design B. The stator windings and stator leads shall be insulated with moisture resistant Class F. insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of (40°C)(104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer 0-ring seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. Wire nuts or crimping type connection type devices are not acceptable. The motor and pump shall be designed and assembled by the same manufacturer.

A heat sensor thermostat shall be attached to and imbedded in the winding and shall be connected in series with the motor starter contractor coil to stop motor if temperature of winding overheats. The thermostat shall reset automatically when the motor cools to a safe operating temperature. Two heat sensors shall be used on 3 phase motors. The common pump, motor shaft shall be of 416 stainless steel.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.20. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

The pumps and motors shall be made by the same manufacturer and shall be designed to operate in a sewage pumping station pumping raw sewage.

3.16 BEARINGS

The motor shall have two heavy duty ball bearings to support the pump shaft and take radial and thrust loads and a sleeve guide bushing directly above the lower seal to take radial load and act as flame path for the seal chamber. Ball bearings shall be designed for 50,000 hours B-10 life. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. SINGLE ROW LOWER BEARINGS ARE NOT ACCEPTABLE.

3.17 MECHANICAL SEAL

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating TUNGSTEN-CARBIDE ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary TUNGSTEN-CARBIDE seal ring and one positively driven rotating TUNGSTEN-CARBIDE steel ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor DEPEND ON DIRECTION OF ROTATION FOR SEALING.

THE FOLLOWING SEAL TYPES SHALL NOT BE CONSIDERED ACCEPTABLE NOR EQUAL TO THE DUAL 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 seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. THE MOTOR SHALL BE ABLE TO OPERATE DRY WITHOUT DAMAGE WHILE PUMPING UNDER LOAD. The seal lubricant shall be FDA approved, nontoxic.

A double electrode shall be mounted in the seal chamber to detect any water entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control panel. This signal shall not stop the motor but shall act as a warning only, indicating service is required.

3.18 IMPELLER

The impeller(s) shall be of gray ductile iron, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be keyed to the shaft, retained with an expansion ring and shall be capable of passing a minimum 3 inch diameter solid. All impellers shall be coated with paint appropriate for the material to be pumped.

Vane inlet tips shall be carefully rounded to prevent stringy material from catching in vanes. Pump out vanes shall be used in front and back chamber. Impellers shall be dynamically balanced by grinding on shroud faces. No holes are to be drilled for balancing.

3.19 PUMP CASE

The pump volute case shall be single-piece of gray cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

The volute case shall be cast iron and have a flanged center line discharge. The discharge flange shall be as required on the plans and shall be standard with bolt holes straddling center line. A bronze wear ring shall be pressed into the case for guiding impeller neck and to prevent corrosion freeze up. The wear ring is to be held from rotating by locking with stainless steel set screw. The wear ring is required on all vane type impellers but not recessed vortex type impellers.

3.20 PUMP AND MOTOR CASTINGS

All castings shall be of high tensile cast iron and shall be treated with phosphate and chromate rinse. All fasteners shall be 302 stainless steel.

3.21 BEARING END CAP

The upper motor bearing cap shall be a separate casting for ease of mounting and replacement.

3.22 COOLING SYSTEM

Each unit shall be provided with an adequately designed cooling system. The cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and seal flushing shall also be provided. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104 degrees F. Restrictions below this temperature are not acceptable.

3.23 PUMP SHAFT

The pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be of carbon steel C1035 and shall be completely isolated from the pumped liquid or stainless steel if not isolated from the pumped liquid.

3.24 WEAR RINGS

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a stainless steel, cast iron, brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

The pump, if 6” discharge or larger, shall also have an impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

3.25 PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125^{o}C (260^{o}F) the thermal switches shall open, stop the motor and activate an alarm.

3.26 PAINTING

The pump shall be painted after assembly with an alkyd enamel. The paint shall be a minimum thickness of 3 to 4 mils.

3.27 ELECTRICAL POWER CORD

The electrical power cord shall be water resistant 600V, 60 degree Celsius minimum, and applied dependent on amp draw for size.

The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump. A separation between the junction box areas of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.

The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire, at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy potting compound which will prevent water contamination to gain entry even in the event of wicking or capillary attraction. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire to wire connection, rather than a terminal board.

The connection box wiring shall be separated from the motor housing wiring by stripping each lead down to bare wire, at staggered intervals, and separating each strand. This area shall be filled with an epoxy potting compound.

The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall each be sealed with a Buna N Rubber O-ring on a beveled edge to assure proper sealing.

The power cord and control cord shall be double sealed. The power and control conductor shall be single strand sealed with epoxy potting compound and then clamped in place with rubber seal bushing to seal outer jacket against leakage and to provide for strain pull. Cords shall withstand a pull of 300 pounds to meet U.L. requirements. The minimum cable length shall be 25’ unless specified elsewhere.

Insulations of power and control cord shall be type SO or STOW. Both control and power cords shall have a green carrier ground conductor that attaches to motor frame.

3.28 IDENTIFICATION NAMEPLATE – ACCESSORIES

Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data. A second identical nameplate shall be provided for all submersible pumps and affixed to the control panel. Technical information to be provided shall include:

Motor:

- horsepower
- voltage
- amperage and service factor
- number of phases
- rpm
- efficiency
- frame number

Pump:

- discharge flow rate and pressure design point
- rpm
- impeller number and trim diameter

The Contractor shall furnish with each type, kind or size of pumping unit, two sets of any special suitably marked high-grade tools, gauges and fixtures which may be needed to adjust, operate, maintain or repair the equipment. Such tools and accessories shall be furnished in neat, special steel cases fitted with locks and keys and delivered to the Engineer prior to the initial operation of equipment.

3.29 SERVICE DEPARTMENT

The pump supplier shall have a repair facility and service trucks with 4,000 lb. capacity winches and have been actively servicing pumps and controls for a minimum of 5 consecutive years. The service department shall be factory certified as well as a warranty service center. The service department shall also carry local stock of repair parts and replacement pumps.

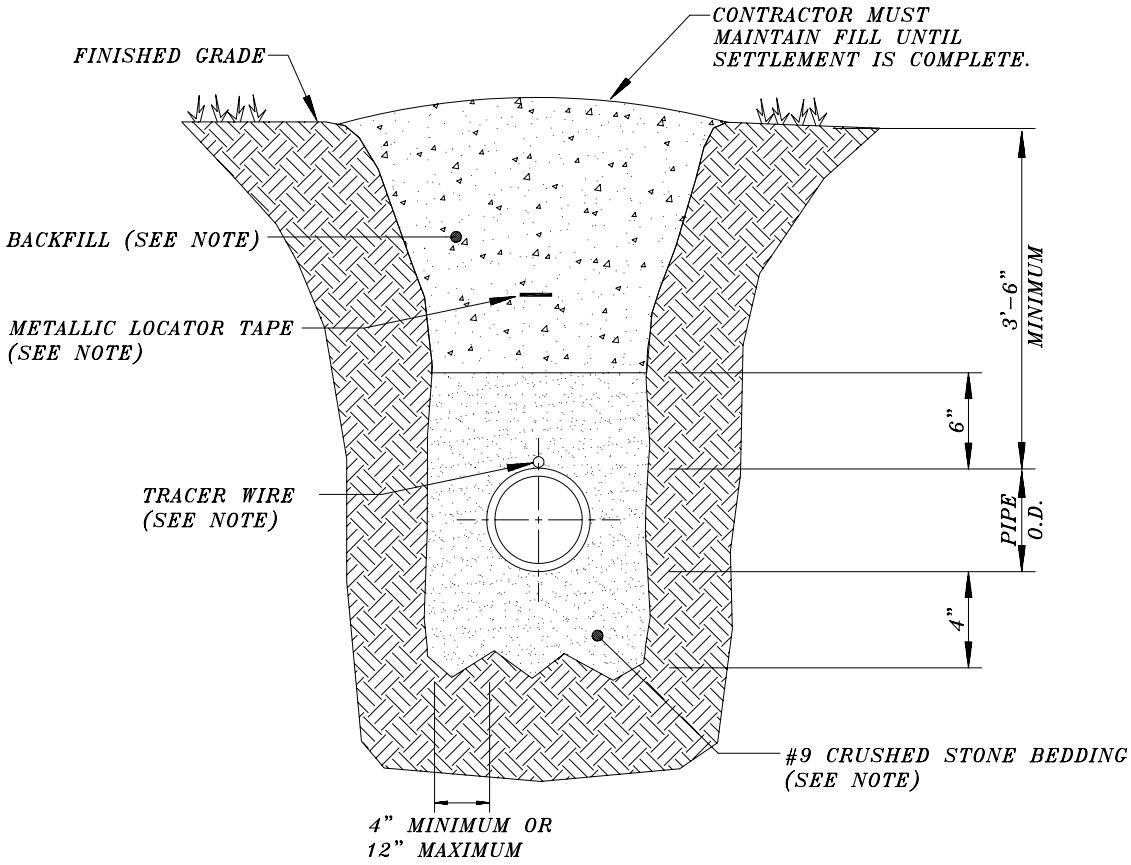
3.30 ACCESSORIES

Standard accessories, including the necessary amount of power and control electrical cables and stainless steel lifting chain shall be provided as part of the bid.

3.31 PUMP WARRANTY

The pumps are to have a five-year non-prorated warranty which covers defects in materials and workmanship. A prorated warranty or a warranty of less than five years shall not be acceptable, unless a complete spare pump/motor unit is furnished, at no additional cost to the owner.

HWUS001A



TRENCH SECTION METHOD "A" OPEN TERRAIN DUCTILE & PVC GRAVITY SEWER MAIN & HDPE FORCE MAIN: OPEN CUT INSTALLATION

NOTE:

HAND PLACE AND TAMP BACKFILL MATERIAL TO 6" ABOVE TOP OF PIPE SO AS NOT TO DISTURB OR DAMAGE PIPE.

UPPER PORTION OF TRENCH USE EXCAVATED MATERIAL FREE FROM OBJECTS HAVING A VOLUME EXCEEDING EIGHT CUBIC INCHES.

PLACE BURIED METALLIC LOCATOR TAPE 18"-24" ABOVE TOP OF PIPE AS SHOWN. TAPE MUST CONTINUOUSLY READ: "CAUTION: BURIED SEWER LINE BELOW".

USE TRACER WIRE FOR FORCE MAIN INSTALLATION ONLY.

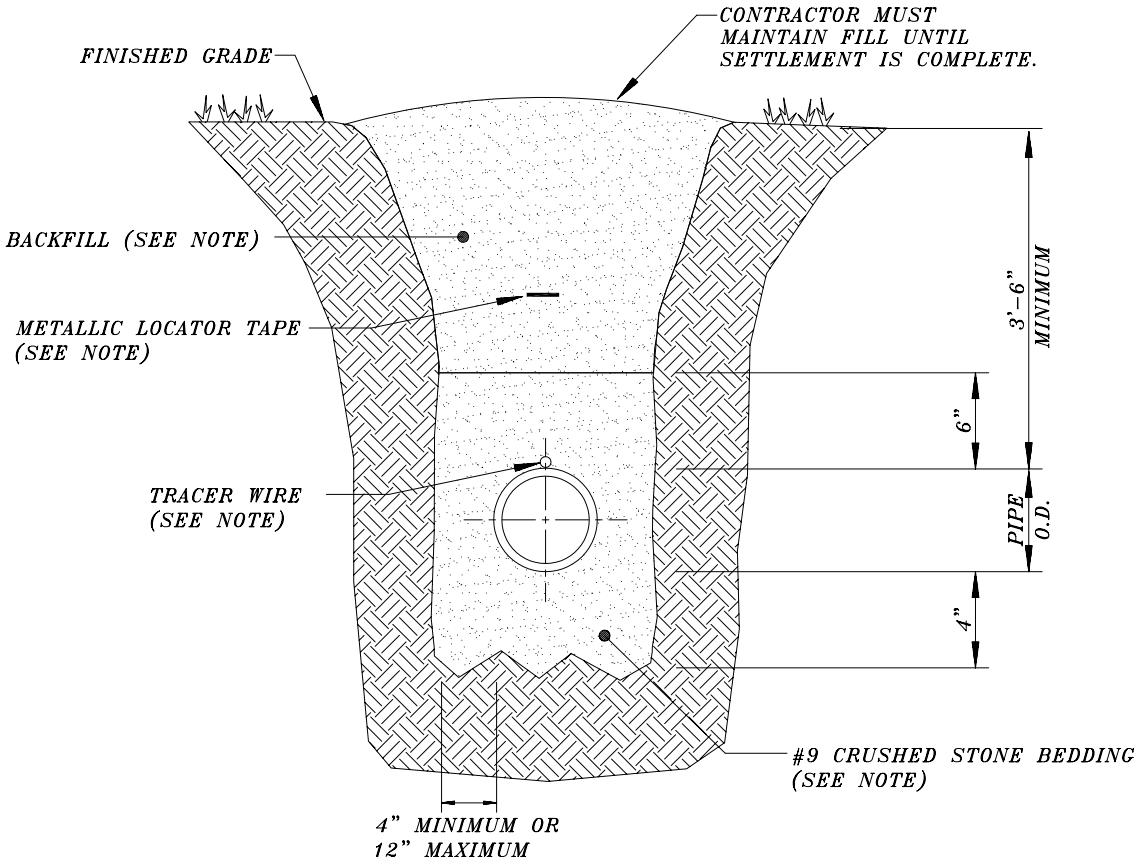
FORCE MAIN DEPTH 3'-6" MIN. TO 5'-0" MAX.

HOLES IN BEDDING FOR PIPE BELLS MUST BE PROVIDED AT EACH JOINT.

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

SCALE: NONE	FILE: HWUS001A.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 01/09/2002
REVISED BY: WFK	DATE: 03/19/2003
REVISED BY: WFK	DATE: 09/02/2003

HWUS001B



TRENCH SECTION METHOD "B" SIDEWALKS & UNPAVED DRIVEWAYS DUCTILE & PVC GRAVITY SEWER MAIN & HDPE FORCE MAIN: OPEN CUT INSTALLATION

NOTE:

BACKFILL TRENCH FROM BEDDING TO FINISH GRADE WITH #9 CRUSHED STONE. HAND PLACE AND TAMP BEDDING TO 6" ABOVE TOP OF PIPE SO AS NOT TO DISTURB OR DAMAGE PIPE.

PLACE BURIED METALLIC LOCATOR TAPE 18"-24" ABOVE TOP OF PIPE AS SHOWN. TAPE MUST CONTINUOUSLY READ: "CAUTION: BURIED SEWER LINE BELOW".

USE TRACER WIRE FOR FORCE MAIN INSTALLATION ONLY.

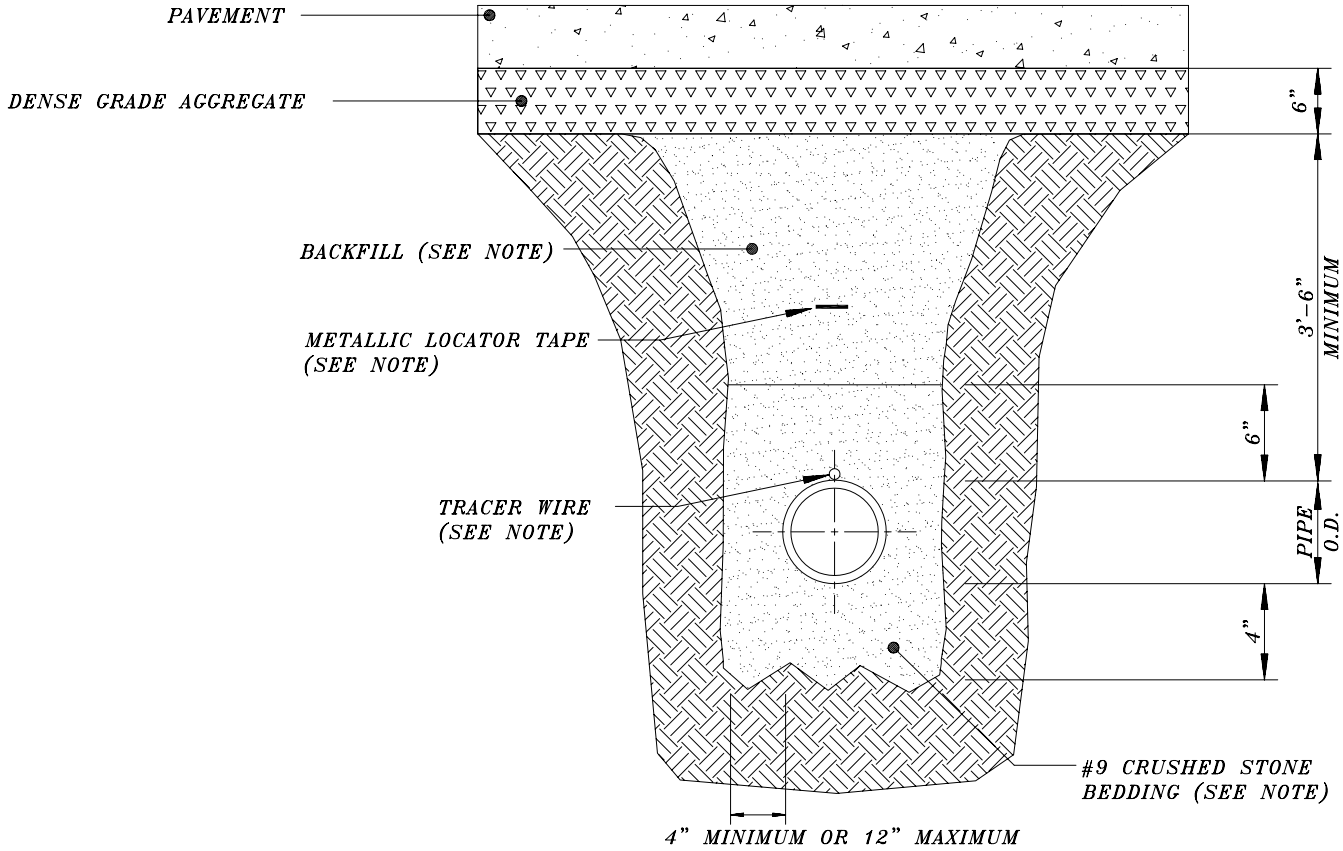
FORCE MAIN DEPTH 3'-6" MIN. TO 5'-0" MAX.

HOLES IN BEDDING FOR PIPE BELLS MUST BE PROVIDED AT EACH JOINT.

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

SCALE: NONE	FILE: HWUS001B.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 01/09/2002
REVISED BY: WFK	DATE: 03/19/2003
REVISED BY: WFK	DATE: 09/02/2003

HWUS001C



TRENCH SECTION METHOD "C"
STREETS, ROADS, & PAVED DRIVEWAYS
DUCTILE & PVC GRAVITY SEWER MAIN
& HDPE FORCE MAIN: OPEN CUT INSTALLATION

NOTE:

HAND PLACE AND TAMP BEDDING MATERIAL TO 6" ABOVE THE TOP OF PIPE SO AS NOT TO DISTURB OR DAMAGE PIPE.

LOWER PORTION OF TRENCH FROM BEDDING TO SIX INCHES BELOW BASE OF PAVEMENT USE #9 CRUSHED STONE.

UPPER PORTION OF TRENCH FROM #9 STONE TO BASE OF PAVEMENT USE A BASE COURSE OF DENSE GRADED AGGREGATE.

PLACE BURIED METALLIC LOCATOR TAPE 18"-24" ABOVE TOP OF PIPE AS SHOWN. TAPE MUST CONTINUOUSLY READ: "CAUTION: BURIED SEWER LINE BELOW".

USE TRACER WIRE FOR FORCE MAIN INSTALLATION ONLY.

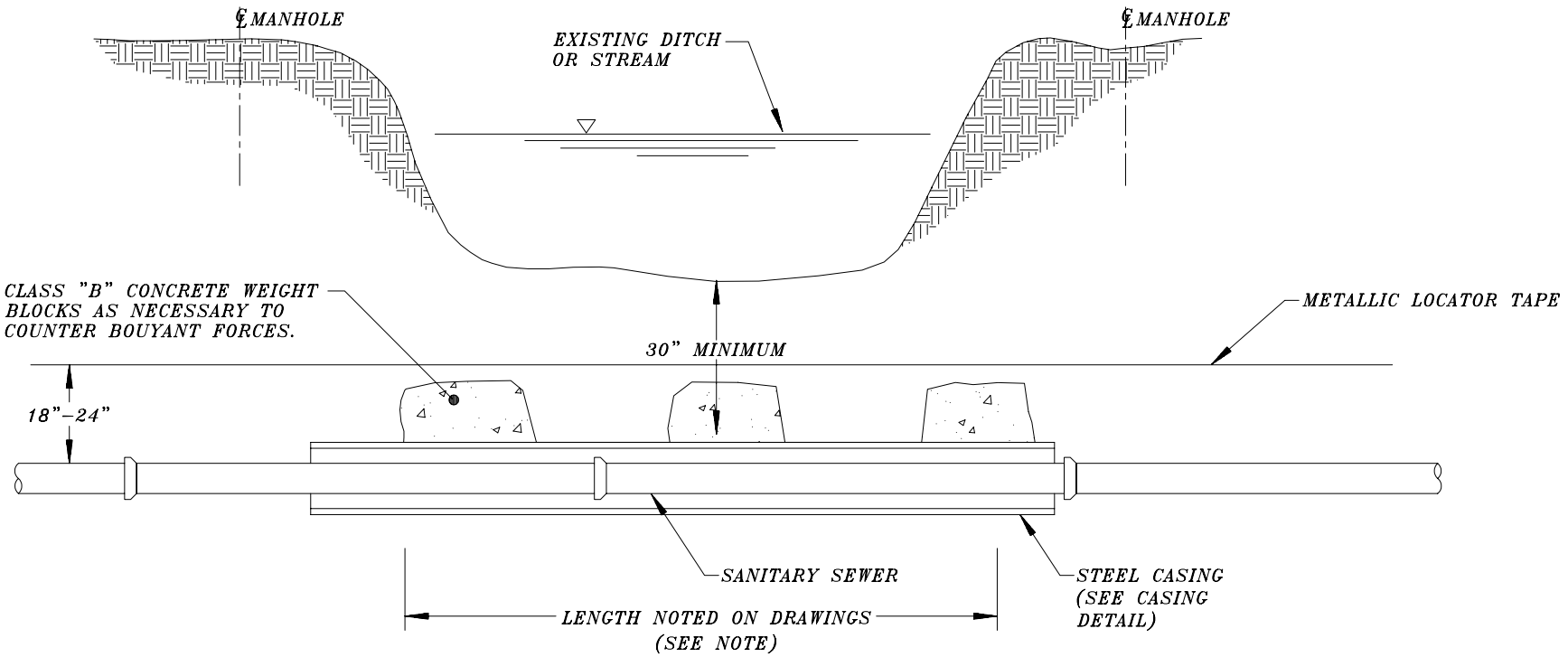
FORCE MAIN DEPTH 3'-6" MIN. TO 5'-0" MAX.

HOLES IN BEDDING FOR PIPE BELLS MUST BE PROVIDED AT EACH JOINT.

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

SCALE: NONE	FILE: HWUS001C.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 12/09/2001
REVISED BY: WFK	DATE: 03/19/2003
REVISED BY: WFK	DATE: 09/02/2003

HWUS003



GRAVITY SEWER MAIN: DITCH OR STREAM CROSSING (OPEN CUT INSTALLATION)

NOTE:

PLACE BURED METALLIC LOCATOR TAPE 18"–24" ABOVE TOP OF PIPE AS SHOWN. TAPE MUST CONTINUOUSLY READ: "CAUTION: BURIED SEWER LINE BELOW".

CONCRETE TO BE POURED TO MINIMUM WIDTH OF LOW POOL WHERE NECESSARY.

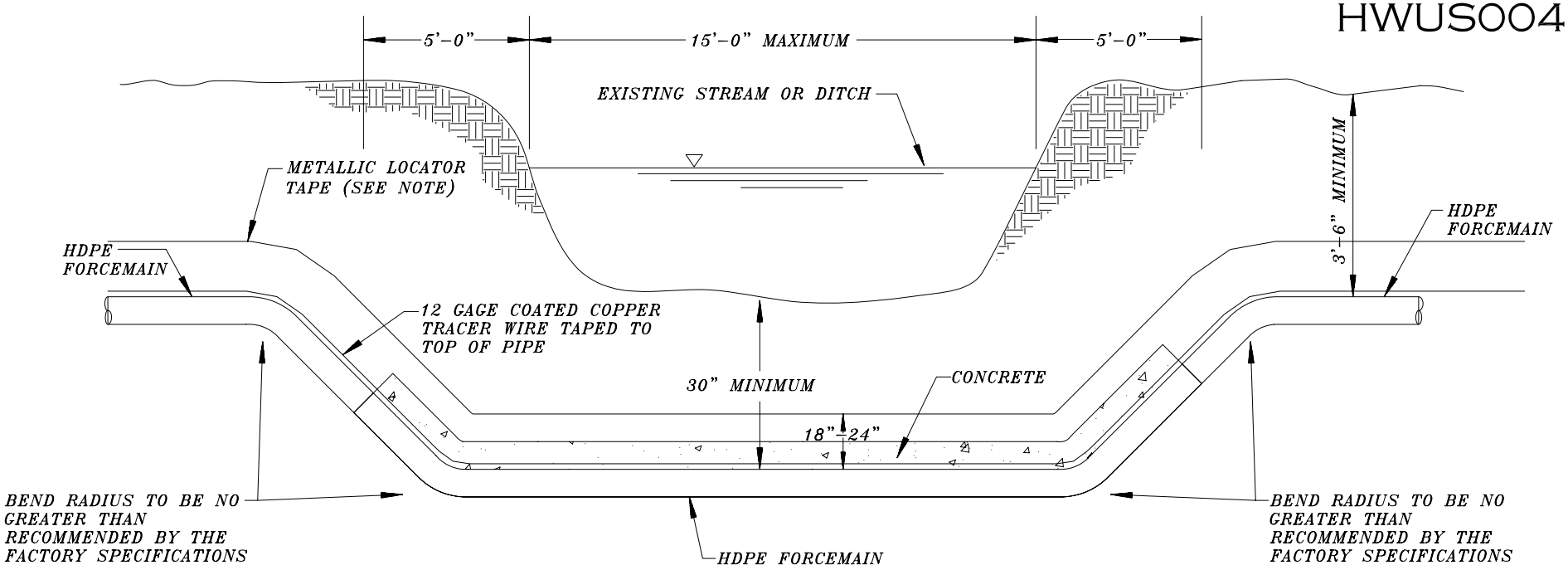
STEEL CASING PIPE TO EXTEND TO TOP OF BANK.

FOR DITCHES OR STREAMS WITH A CONSTANT FLOW A MANHOLE MUST BE SET ON BOTH SIDES A MINIMUM OF 10' PAST THE BANK.

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

SCALE: NONE	FILE: HWUS003.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 01/09/2002
REVISED BY: WFK	DATE: 09/02/2003

HWUS004



HDPE FORCEMAIN: DITCH OR STREAM CROSSING

NOTE:
CROSSING FOR STREAMS GREATER IN WIDTH THAN 15'-0" SHALL BE APPROVED ON A CASE BY CASE BASIS.

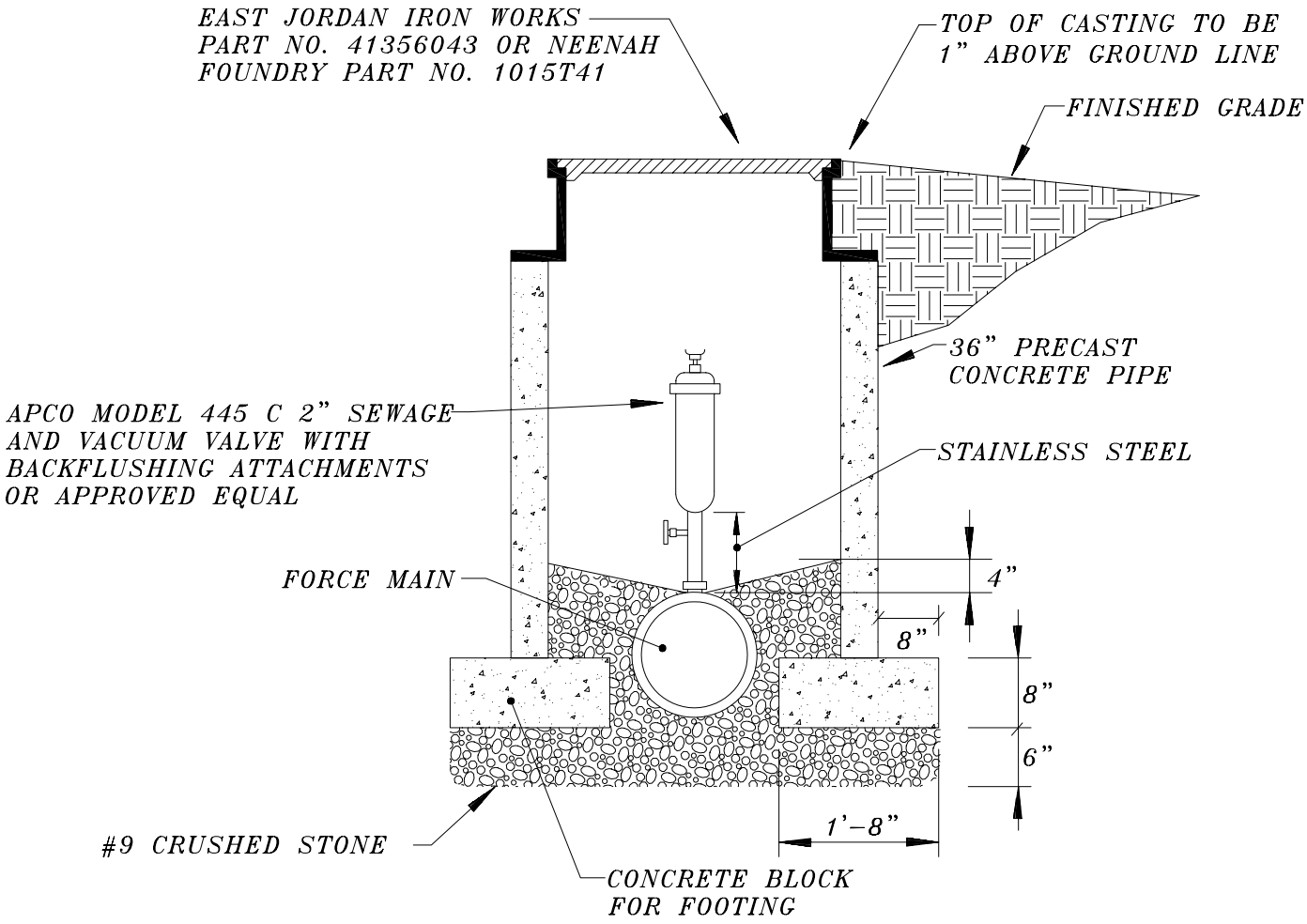
MAINTAIN CONTINUITY OF TRACER WIRE AT ALL TIMES.

PLACE BURIED METALLIC LOCATOR TAPE 18"-24" ABOVE TOP OF PIPE AS SHOWN. TAPE MUST CONTINUOUSLY READ: "CAUTION: BURIED FORCEMAIN BELOW".

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

SCALE: NONE	FILE: HWUS004.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 01/03/2002

HWUS005



FORCE MAIN

AIR & VACUUM RELEASE VALVE

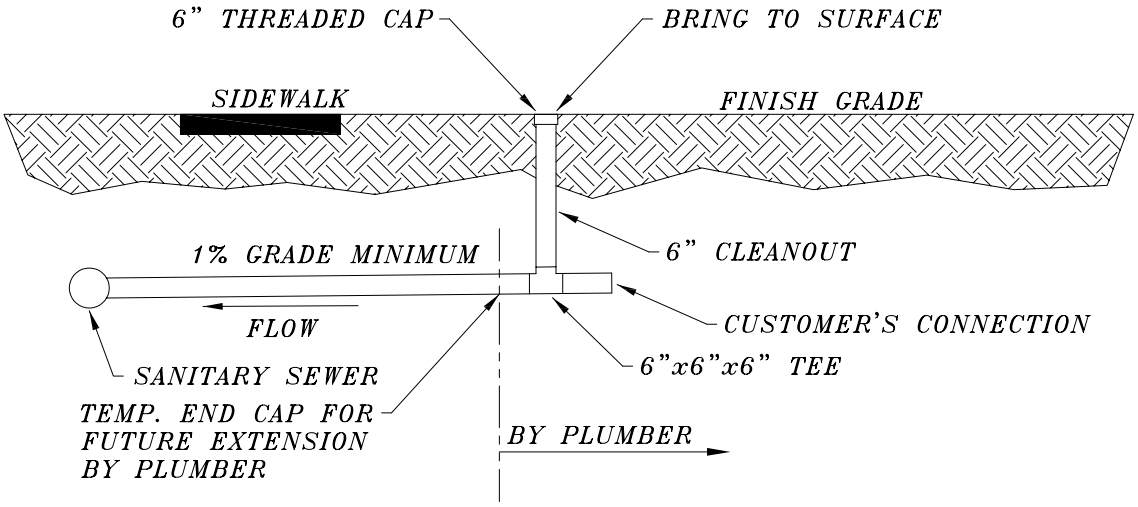
HENDERSON WATER UTILITY 111 FIFTH STREET HENDERSON, KENTUCKY	SCALE: NONE	FILE:	HWUS005.DWG
	REVISED BY: JAB	DATE:	10/29/2001
	REVISED BY: JEG	DATE:	01/09/2002

HWUS006

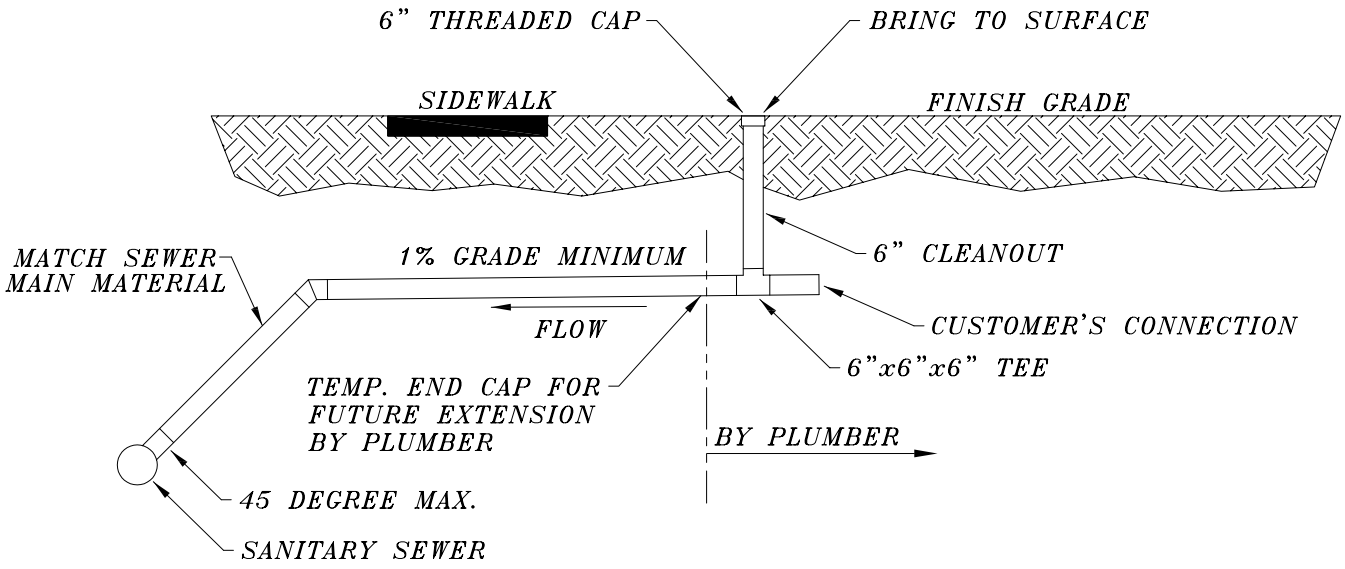
HENDERSON
WATER
UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

Scale:	None	File:	HWUS006.DWG
Revised By:	JAB	Date:	10/29/2001
Revised By:	JEG	Date:	01/03/2002
Revised By:	WFK	Date:	03/20/2003
Revised By:	WFK	Date:	09/02/2003



PROFILE VIEW
TYPICAL 6" PVC SEWER LATERAL, LESS THAN 10' DEEP



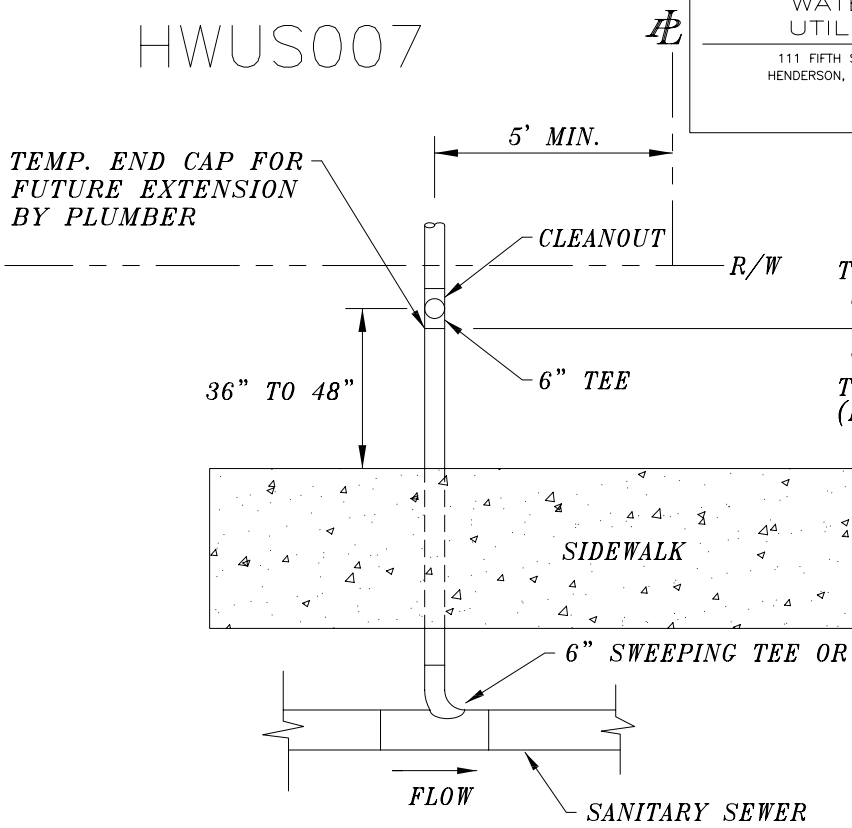
PROFILE VIEW
TYPICAL 6" PVC SEWER LATERAL, GREATER THAN 10' DEEP

HENDERSON
WATER
UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

Scale: None	File: HWUS007.DWG
Revised By: JAB	Date: 10/29/2001
Revised By: JEG	Date: 01/03/2002
Revised By: WFK	Date: 03/20/2003
Revised By: WFK	Date: 09/03/2003

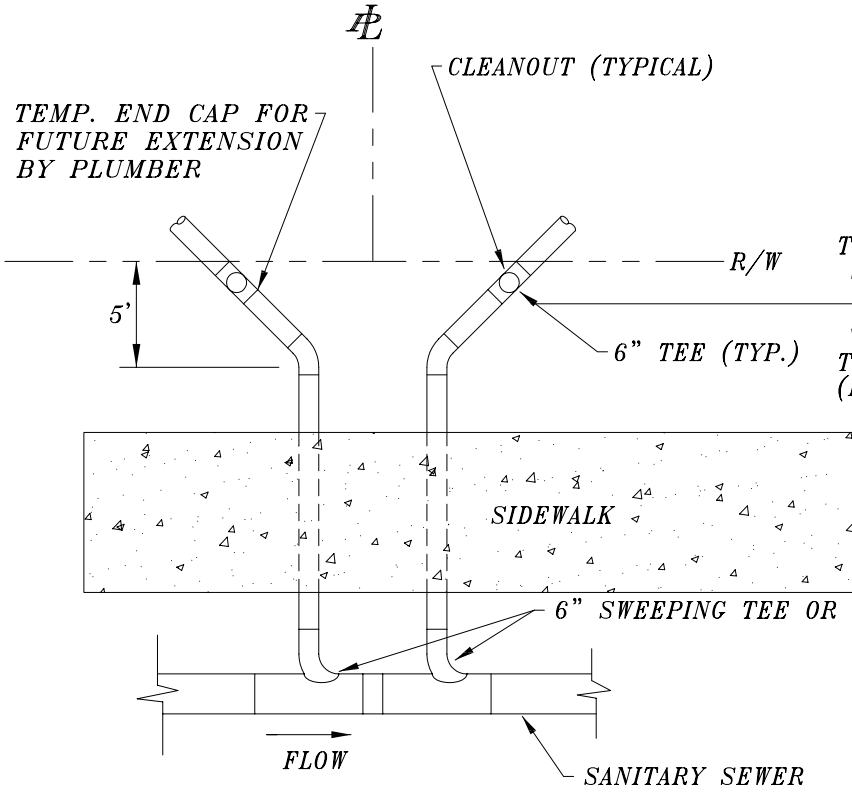
HWUS007



NOTE:

DIRECTION OF WASTE LEAVING WYE OR SWEEPING TEE MUST BE ORIENTED TO FLOW IN THE SAME DIRECTION AS FLOW IN THE EXISTING GRAVITY SEWER LINE.

PLAN VIEW
SINGLE SEWER TAP



NOTE:

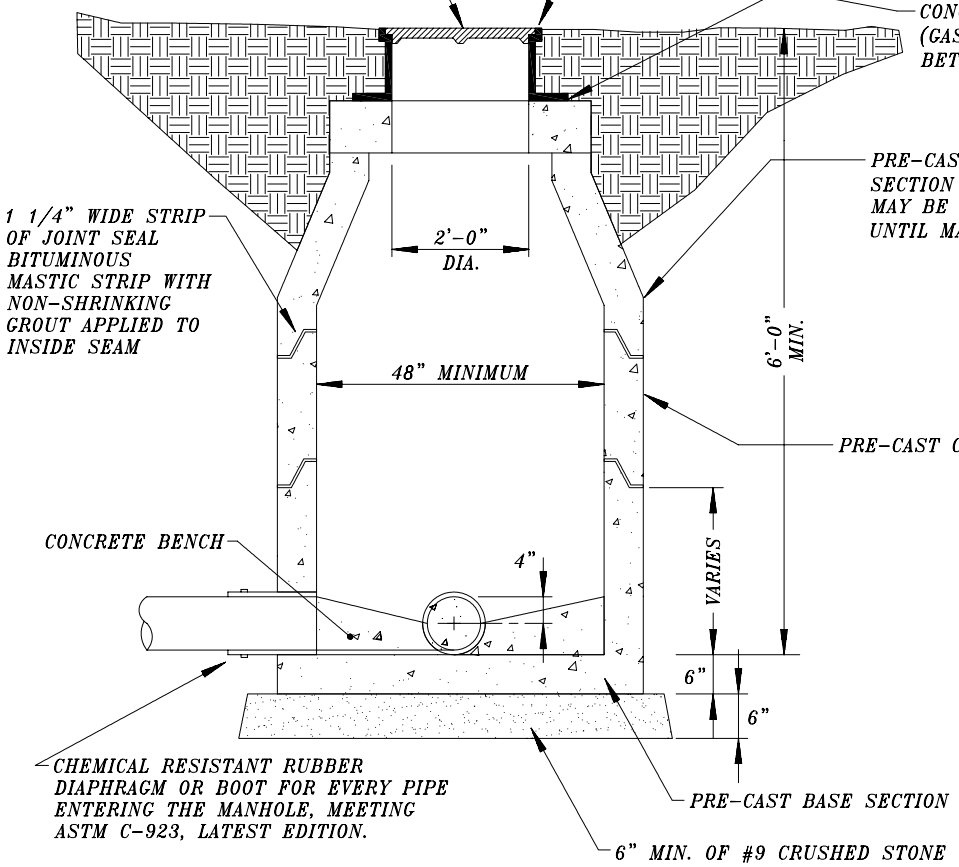
DIRECTION OF WASTE LEAVING WYE OR SWEEPING TEE MUST BE ORIENTED TO FLOW IN THE SAME DIRECTION AS FLOW IN THE EXISTING GRAVITY SEWER LINE.

PLAN VIEW
DUAL SEWER TAP

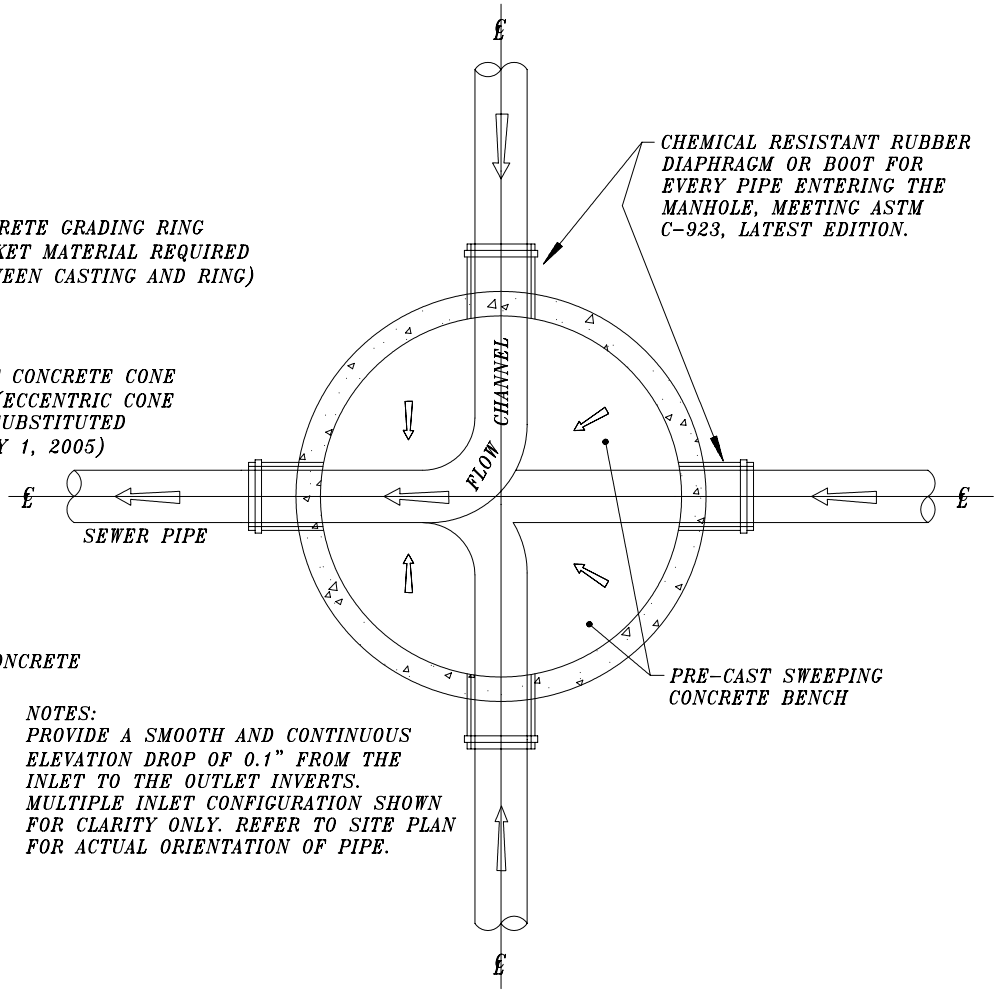
NOTES:
CONCRETE TO CONFORM TO ASTM C-478 STANDARDS
2" MIN. CONCRETE COVER RESILIENT CONNECTORS
MEET ASTM C-923 MEETS OR EXCEEDS ASTM C-478
#5 REBAR @ 12" C.C. EA. WAY FOR CAST-IN-PLACE
BASE SLAB

NOTES:
WEIGHT: BASE - 4,350 LBS. (30" HT.)
RISER - 850 LBS./VERT. FT.
CONICAL - VARIES
LEVEL AND TAMP BEDDING MATERIAL PRIOR TO PLACING MANHOLE SECTION
CONCRETE TOP SECTION TO BE USED UNLESS SPECIFICALLY APPROVED
OTHERWISE ON A CASE-BY-CASE BASIS

HWUS008



SECTION



NOTES:
PROVIDE A SMOOTH AND CONTINUOUS ELEVATION DROP OF 0.1" FROM THE INLET TO THE OUTLET INVERTS. MULTIPLE INLET CONFIGURATION SHOWN FOR CLARITY ONLY. REFER TO SITE PLAN FOR ACTUAL ORIENTATION OF PIPE.

PLAN VIEW

STANDARD PRE-CAST MANHOLE

GREATER THAN OR EQUAL TO 6'-0" IN DEPTH

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

Scale:	None	File:	HWUS008.DWG
Revised By:	JAB	Date:	10/29/2001
Revised By:	JEG	Date:	01/03/2002
Revised By:	WFK	Date:	03/20/2003
Revised By:	WFK	Date:	09/05/2003
Revised By:	WFK	Date:	04/26/2004

HWUS009

NOTES:

CONCRETE TO CONFORM TO ASTM C-478 STANDARDS

2" MIN. CONCRETE COVER

RESILIENT CONNECTORS MEET ASTM C-923

MEETS OR EXCEEDS ASTM C-478

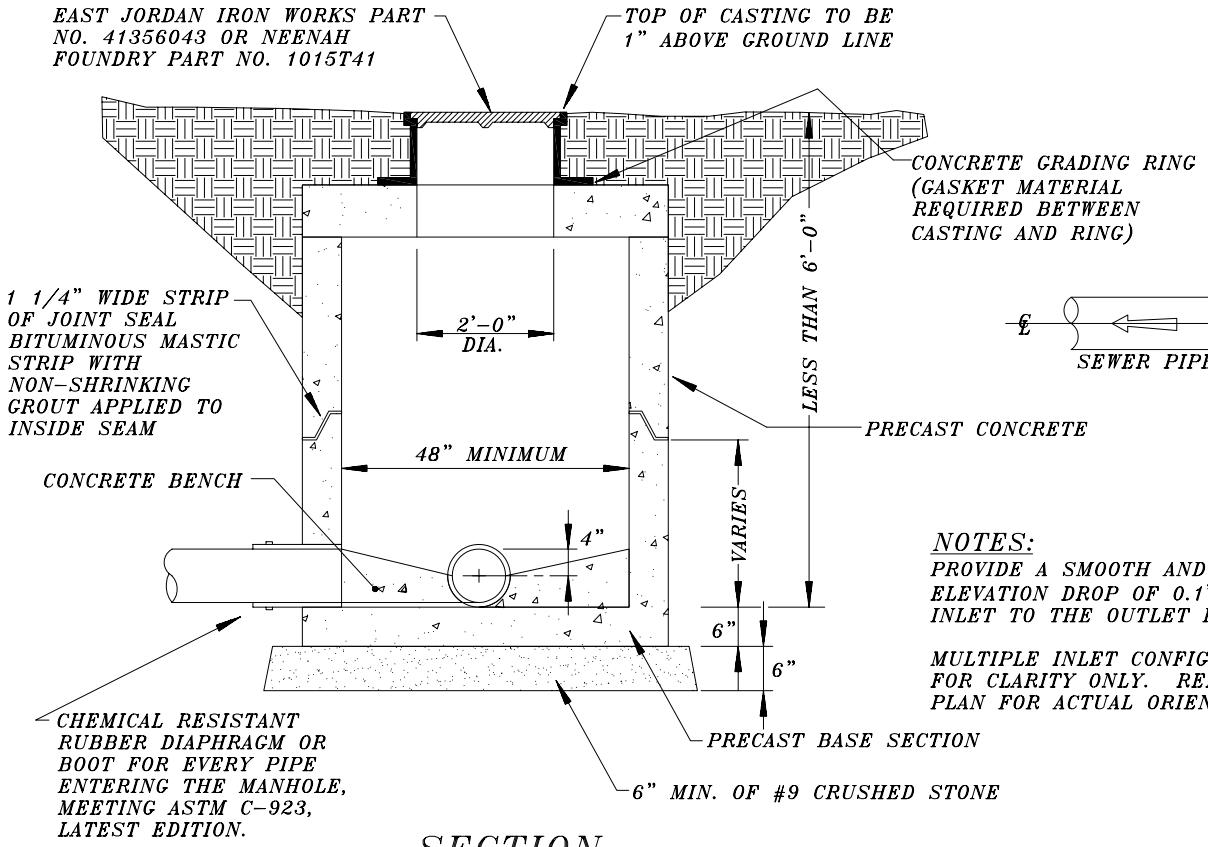
#5 REBAR @ 12" C.C. EA. WAY FOR CAST-IN-PLACE BASE SLAB

NOTES:

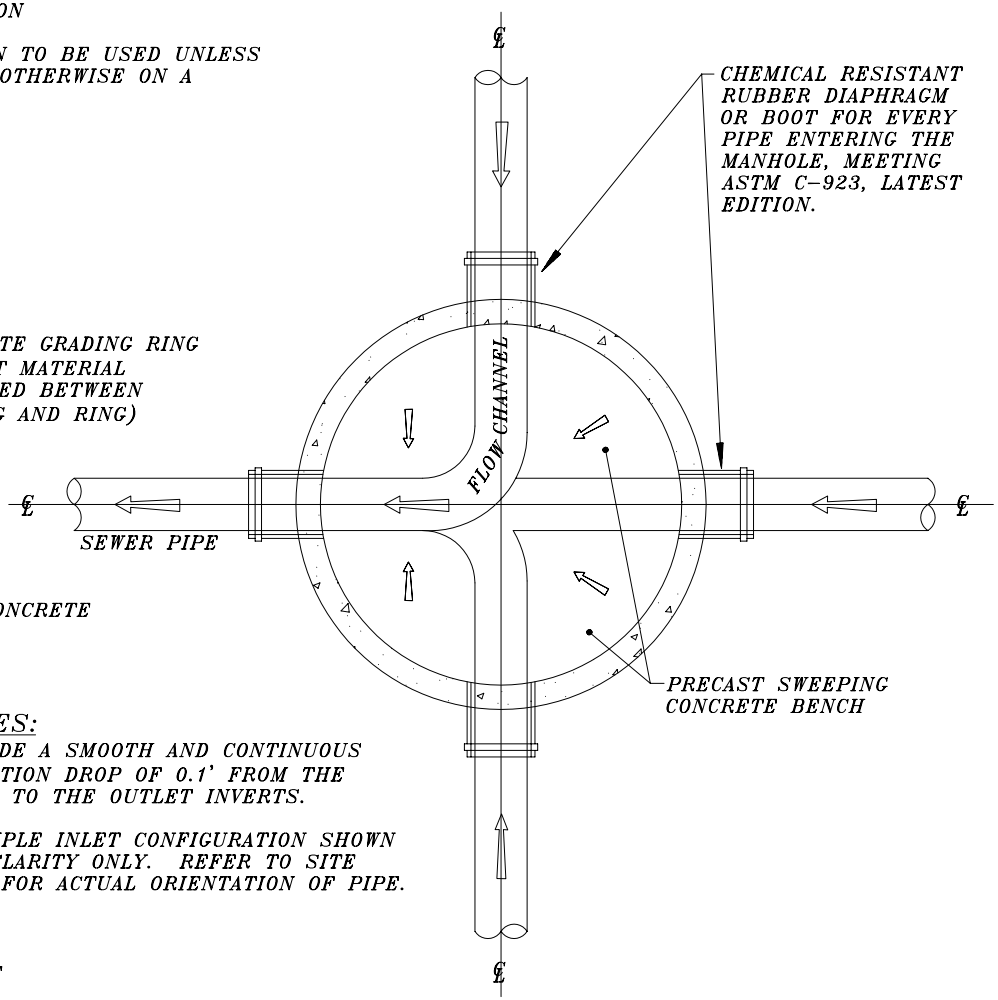
WEIGHT: BASE - 4,350 LBS. (30" HT.)
RISER - 850 LBS./VERT. FT.
CONICAL - VARIES

LEVEL AND TAMP BEDDING MATERIAL PRIOR TO PLACING MANHOLE SECTION

CONCENTRIC TOP SECTION TO BE USED UNLESS SPECIFICALLY APPROVED OTHERWISE ON A CASE-BY-CASE BASIS



SECTION



PLAN VIEW

NOTES:

PROVIDE A SMOOTH AND CONTINUOUS ELEVATION DROP OF 0.1' FROM THE INLET TO THE OUTLET INVERTS.

MULTIPLE INLET CONFIGURATION SHOWN FOR CLARITY ONLY. REFER TO SITE PLAN FOR ACTUAL ORIENTATION OF PIPE.

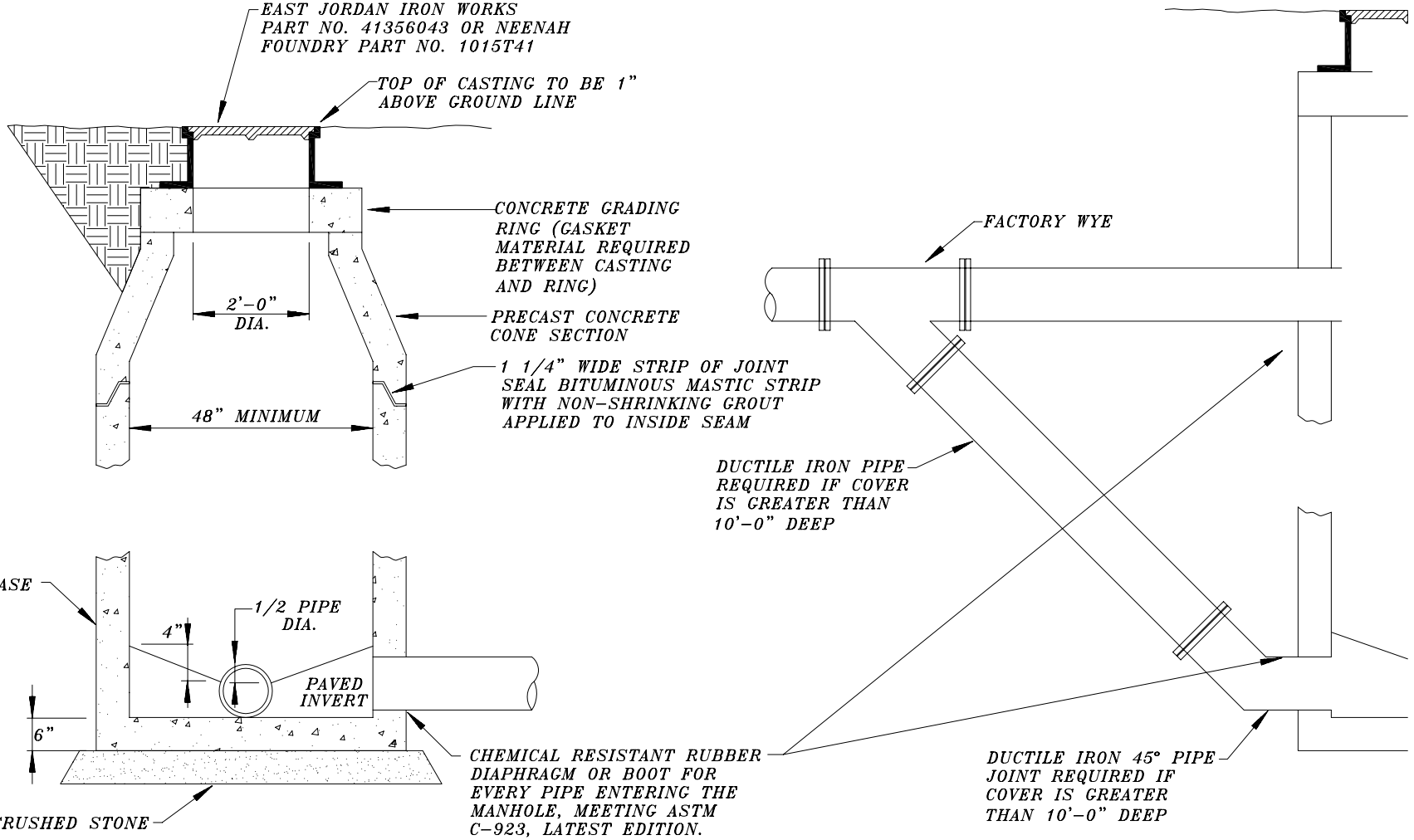
SHALLOW PRECAST MANHOLE

LESS THAN 6'-0" IN DEPTH

HENDERSON WATER UTILITY
111 FIFTH STREET
HENDERSON, KENTUCKY

Scale: None	File: HWUS009.DWG
Revised By:JAB	Date: 10/29/2001
Revised By:JEG	Date: 01/03/2002
Revised By:WFK	Date: 03/20/2003
Revised By:WFK	Date: 04/26/2004

HWUS0010



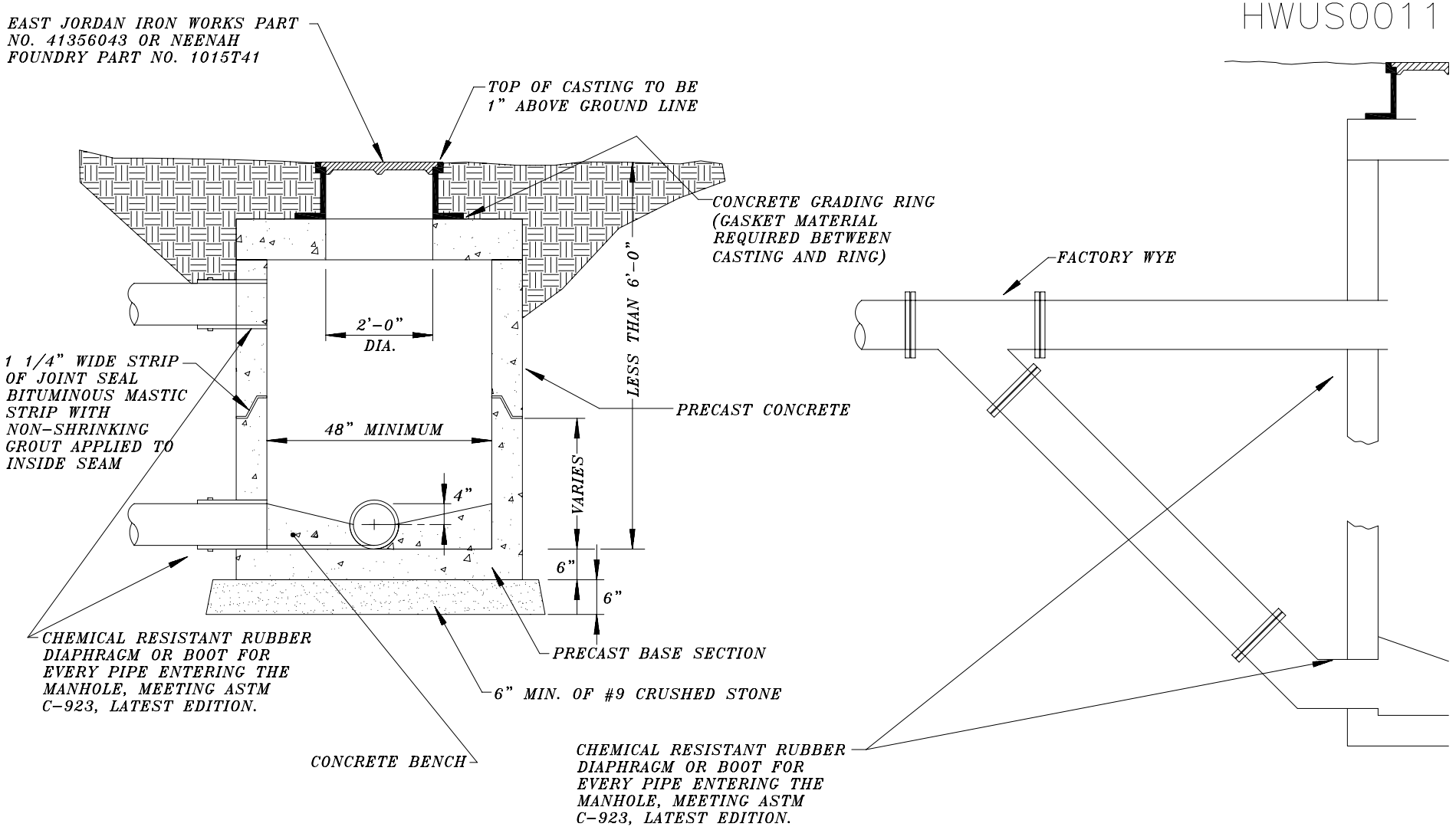
PRECAST MANHOLE WITH DROP INLET
GREATER THAN OR EQUAL TO 6'-0" IN DEPTH

HENDERSON
WATER
UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

Scale: None	File: HWUS0010.DWG
Revised By: JAB	Date: 10/29/2001
Revised By: JEG	Date: 01/09/2002
Revised By: WFK	Date: 03/20/2003
Revised By: WFK	Date: 04/26/2004

HWUS0011



PRECAST MANHOLE WITH DROP INLET

LESS THAN 6'-0" IN DEPTH

NOTES:

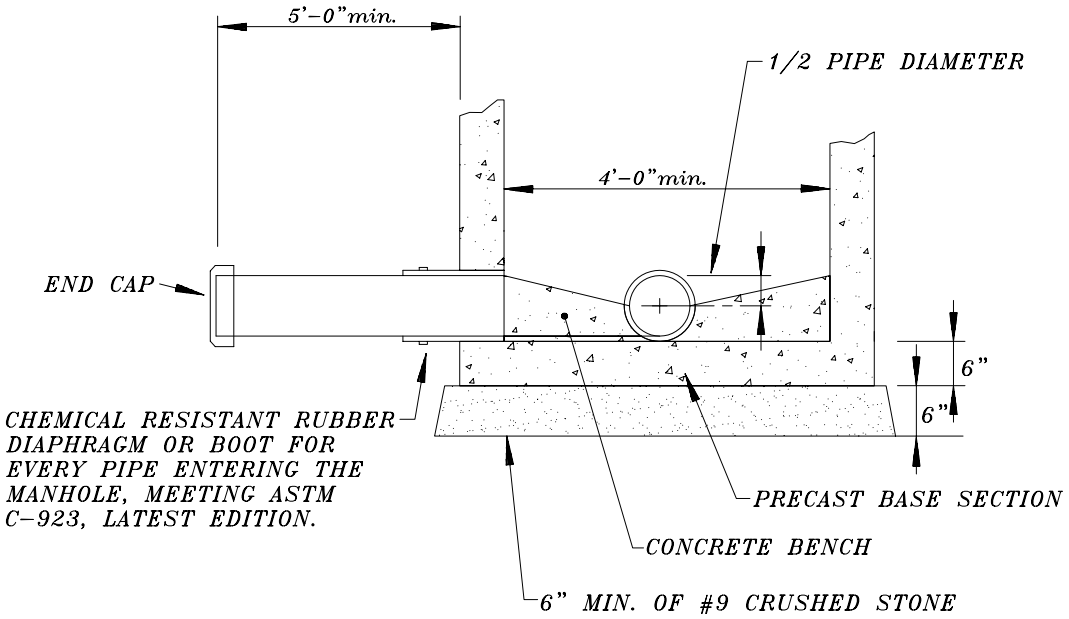
PROVIDE A SMOOTH AND CONTINUOUS ELEVATION DROP OF 0.1' FROM THE INLET TO THE OUTLET INVERTS.

MULTIPLE INLET CONFIGURATION SHOWN FOR CLARITY ONLY. REFER TO SITE PLAN FOR ACTUAL ORIENTATION OF PIPE.

HENDERSON WATER UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

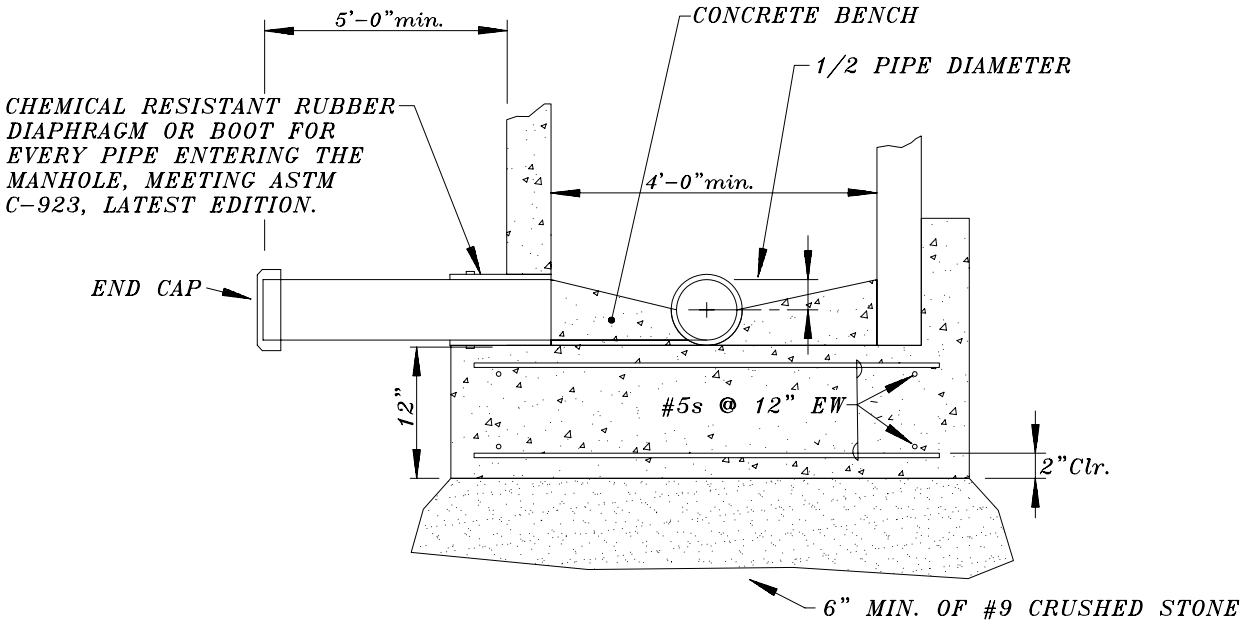
Scale: None	File: HWUS0011.DWG
Revised By: JAB	Date: 10/29/2001
Revised By: JEG	Date: 01/09/2002
Revised By: WFK	Date: 03/20/2003
Revised By: WFK	Date: 04/26/2004



STUBOUT AT MANHOLE (PRECAST)

HENDERSON WATER UTILITY 111 FIFTH STREET HENDERSON, KENTUCKY	
SCALE: NONE	FILE: HWUS0013.DWG
REVISED BY: JAB	DATE: 10/29/2001
REVISED BY: JEG	DATE: 01/09/2002
REVISED BY: WFK	DATE: 04/26/2004

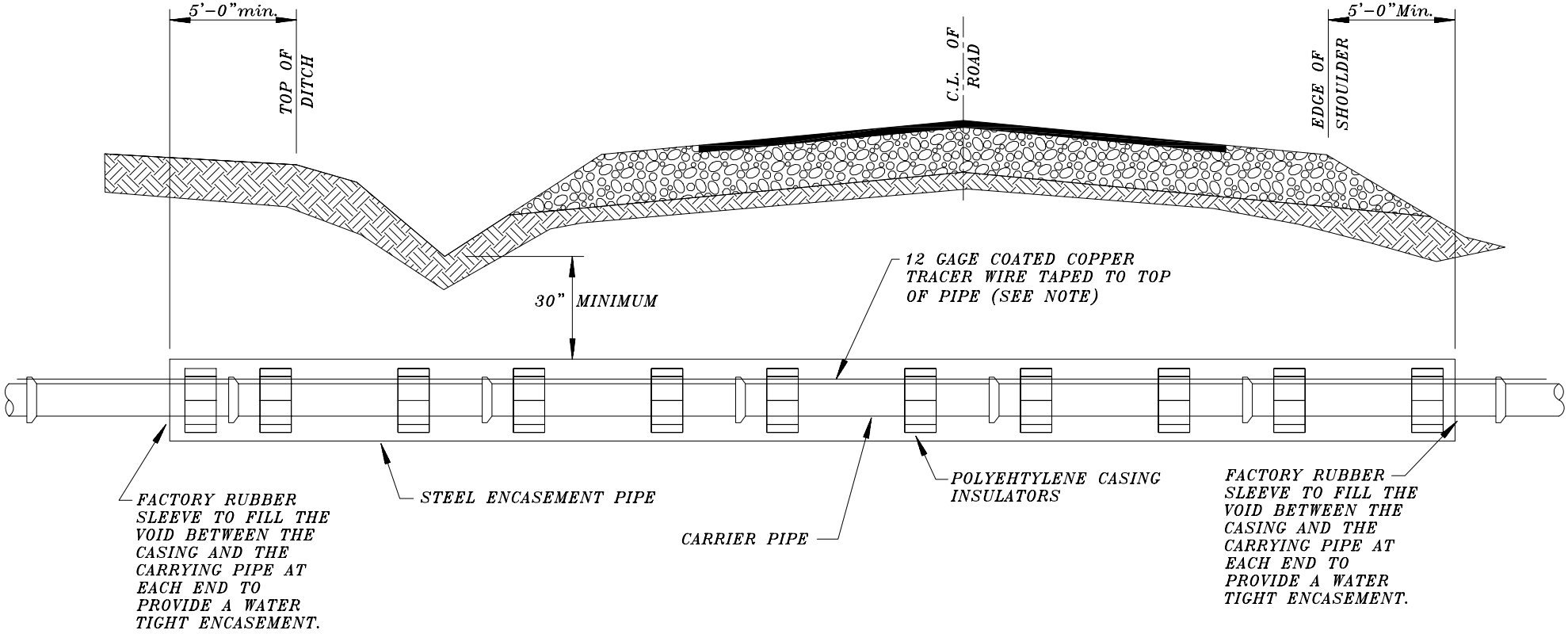
HWUS0014



STUBOUT AT MANHOLE (CAST IN PLACE)

HENDERSON WATER UTILITY 111 FIFTH STREET HENDERSON, KENTUCKY	SCALE: NONE	FILE:	HWUS0014.DWG
	REVISED BY: JAB	DATE:	10/29/2001
	REVISED BY: JEG	DATE:	01/09/2002
	REVISED BY: JEG	DATE:	04/26/2004

HWUS0015



CASED GRAVITY SEWER OR FORCE MAIN CROSSING UNDER A ROADWAY

NOTE:

EXTEND CASING PIPE AT LEAST 5'-0" PAST THE EDGE OF THE SHOULDER OR 5'-0" PAST THE TOP OUTSIDE EDGE OF THE DITCH IF PRESENT, WHICHEVER IS GREATER.

FOR GRAVITY SEWER INSTALL FIELD LOK GASKETS FOR DIP WITHIN ALL ENCASEMENT PIPE AND ONE PIPE LENGTH OUTSIDE OF THE CASING ON BOTH ENDS.

THE SLEEVE USED WILL BE CASING SEAL MODEL "AM" BY ADVANCE PRODUCTS & SYSTEMS, INC. OR APPROVED EQUAL.

FORCE MAIN INSTALLATION: MAINTAIN CONTINUITY OF TRACER WIRE AT ALL TIMES. TRACER WIRE IS TO BE RUN THROUGH CASING WITH FORCE MAIN.

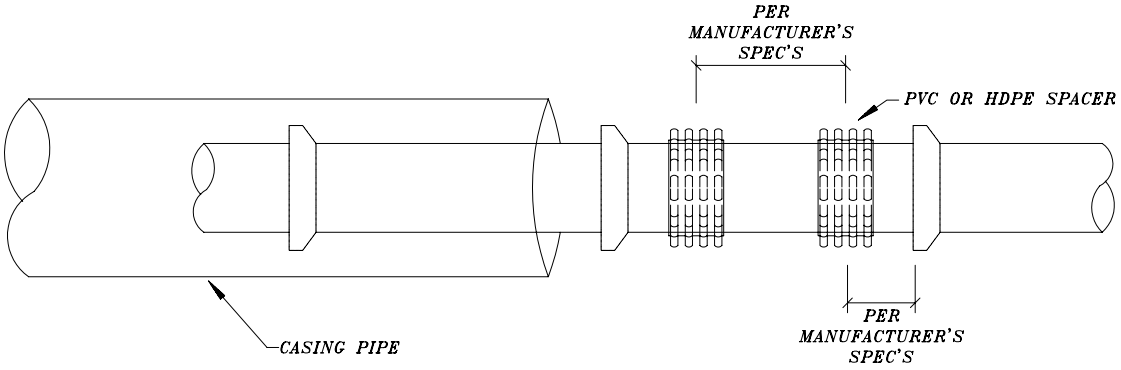
SEE LATEST EDITION OF HWU "REQUIREMENTS AND SPECIFICATIONS FOR SANITARY SEWER FACILITIES" FOR SPECIFIC PART NUMBERS OF ITEMS SHOWN IN DIAGRAM.

HENDERSON WATER UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

Scale: None	File: HWUS0015.DWG
Revised By: JAB	Date: 10/29/2001
Revised By: JEG	Date: 01/03/2002
Revised By: WFK	Date: 03/20/2003
Revised By: WFK	Date: 09/05/2003

HWUS0016



CASING DETAIL

NOTE:

SEE LATEST EDITION OF THE HWU "REQUIREMENTS AND SPECIFICATIONS FOR SANITARY SEWER FACILITIES" FOR SPECIFIC PART NUMBERS OF ITEMS SHOWN IN DIAGRAMS.

FOR GRAVITY SEWER: INSTALL FIELD LOK GASKETS WITHIN ALL ENCASEMENT PIPE AND ONE PIPE LENGTH OUTSIDE OF THE CASING ON BOTH ENDS.

THE SLEEVE USED WILL BE CASING SEAL MODEL "AM" BY ADVANCE PRODUCTS & SYSTEMS, INC. OR APPROVED EQUAL.

FORCE MAIN INSTALLATION: MAINTAIN CONTINUITY OF TRACER WIRE AT ALL TIMES. TRACER WIRE IS TO BE RUN THROUGH THE CASING WITH THE FORCE MAIN.

WATER SHALL BE REMOVED FROM TRENCH AND CASING PRIOR TO INSTALLATION OF RUBBER SLEEVES.

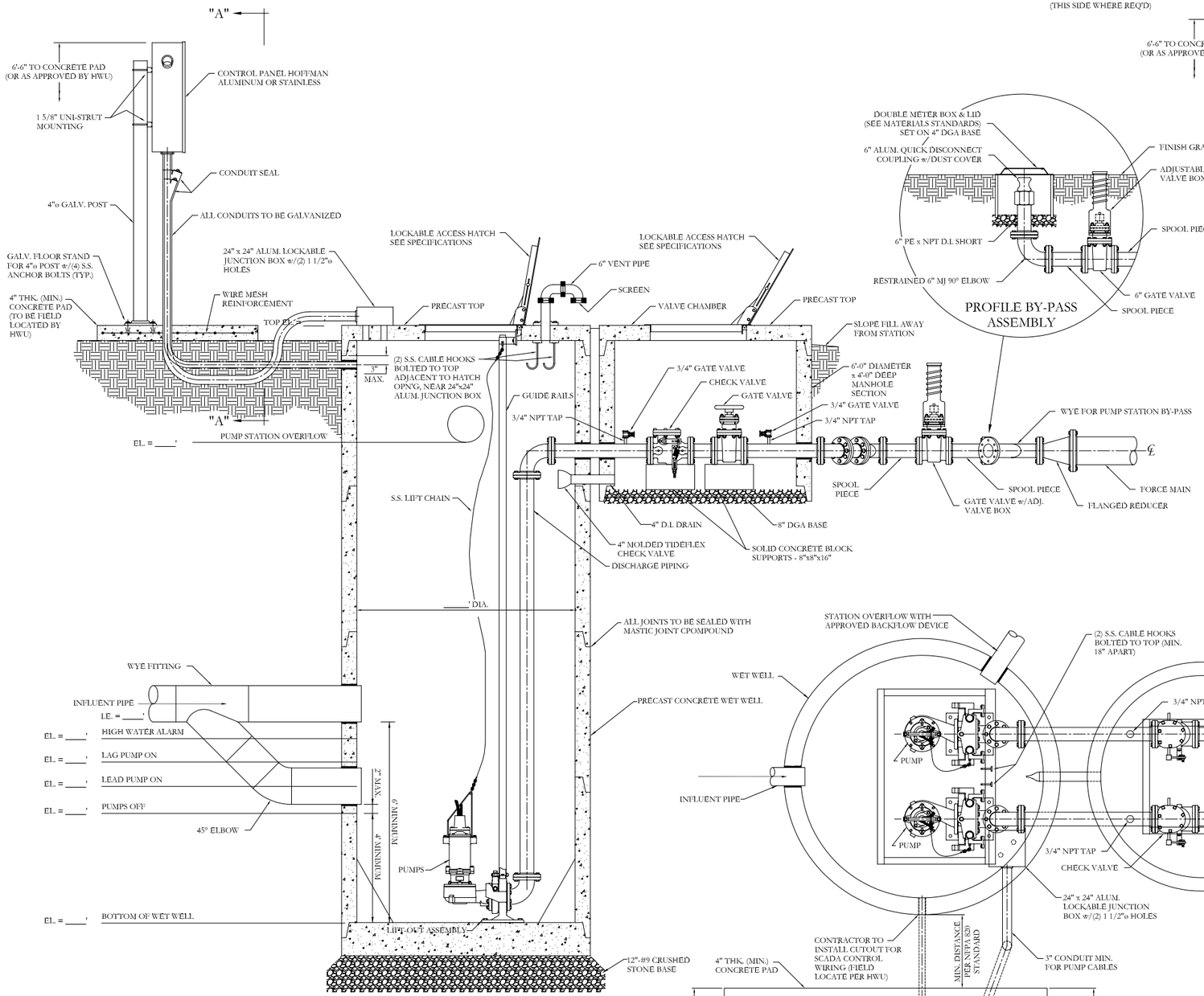
IN THE CASE OF A SLOPED BORING, CASING SHALL BE INSTALLED FROM THE DOWN-HILL SIDE WHERE POSSIBLE.

ALL BORE AND CASING MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS AND THE HWU "REQUIREMENTS AND SPECIFICATIONS FOR SANITARY SEWER FACILITIES".

HENDERSON
WATER
UTILITY

111 FIFTH STREET
HENDERSON, KENTUCKY

Scale: None	File: HWUS0016.DWG
Revised By: JAB	Date: 10/29/2001
Revised By: JEG	Date: 01/09/2002
Revised By: WFK	Date: 03/20/2003
Revised By: WFK	Date: 09/05/2003



PUMP SPECIFICATIONS

MOTORS	
HORSEPOWER	___ HP
RPM	____
VOLTAGE	480 V
PHASE	3 PH
HERTZ	60 HZ
PUMPS	
CAPACITY IN GPM	____
TDH IN FEET	____
FORCE MAIN	
LENGTH =	_____ FEET
SIZE =	_____ INCHES
MATERIAL =	_____
SUCTION EL. =	____ FEET
DISCHARGE EL. =	____ FEET
DISCHARGE PIPE	
MATERIAL =	DUCTILE IRON
SIZE =	_____ INCHES

NOTE: ALL FITTINGS TO BE FLANGED UNLESS OTHERWISE NOTED. WET WELL TO PROVIDE TWO HOURS OF STORAGE BETWEEN HIGH LEVEL ALARM AND OVERFLOW AT AVERAGE FLOW. SEE SPECIFICATION FOR DETAILS OF CONTROL EQUIPMENT.

HENDERSON WATER UTILITY
111 FIFTH STREET, HENDERSON, KENTUCKY

DRAWN BY: W.F. KELLER
DATE: 09/08/03
CHK'D BY:
JOB NO.:
1 OF 1

DESIGNER:
SCALE: N.T.S.
FILE:

STANDARD LIFT STATION
HWU STANDARD DETAILS

SPEC

\\Hoth\Engineering\Master CAD Files\HWU Standard Details\Official Sewer Lift Station Spec\Standard Lift Station.dwg