A.L. FRANKS ENGINEERING

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ADDENDUM NO. 1

TO: ALL PLAN HOLDERS

RE: CITY OF PERRYTOWN, ARKANSAS
WATER DISTRIBUTION SYSTEM IMPROVEMENTS
PROJECT NO.: PT-01-21

DATE: May 11, 2022

The Plans, Specifications and Contract Documents for the above referenced project are hereby modified as follows:

1. **Technical Specifications: Remove and Replace Technical Specifications with attached.**

2. **Bid Proposal: Remove and Replace Bid Proposal with attached.**

3. **CLARIFICATIONS:**

   a. All ¾" services shall be 1" tap and 1" Poly pipe to meter. Including a new 1" angle stop.

   b. All service taps shall use stainless steel double strap tapping saddle.

   c. All fire hydrants and gate valves shall be properly sized and manufactured by Clow Valve Co.

   d. AIS is not required on this project.

ADDENDUM NO. 1 ISSUED BY:

A.L. FRANKS ENGINEERING

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 9192
ANTHONY L. FRANK

Anthony L. (Andy) Frank, P.E.
President/CEO

CITY OF PERRYTOWN, ARKANSAS

WATER DISTRIBUTION SYSTEM IMPROVEMENTS

BID PROPOSAL

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	3540	L.F.	Furnish and Install material, labor and equipment for 6” C-900 PVC Water Main and Fittings including Trench Excavation, Laying, Bedding, Blocking and Backfilling per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____
2	2560	L.F.	Furnish and Install material, labor and equipment for 4” C-900 PVC Water Main and Fittings including Trench Excavation, Laying, Bedding, Blocking and Backfilling per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
3	2020	L.F.	Furnish and Install 3” PVC DR-21 Class 200 Treated Water Main and Fittings including Trench Excavation, Laying, Bedding, Blocking and Backfilling per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____
4	100	L.F.	Furnish and Install material, labor and equipment for 2” poly water pipe DR-11 treated water main and Fittings including Trench Excavation, Laying, Bedding, Blocking and Backfilling per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____

BID PROPOSAL CONTINUED

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
5	660	L.F.	Directional Bore 6” Certa-Loc Pipe C-900 Water main per plans and specifications for the unit price of (Directional Bore includes the pipe)	$ _____	$ _____
			_____ Dollars and _____ Cents/L.F.		
6	240	L.F.	Directional Bore 4” Certa-Loc Pipe C-900 Water main per plans and specifications for the unit price of (Directional Bore includes the pipe)	$ _____	$ _____
			_____ Dollars and _____ Cents/L.F.		

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
7	140	L.F.	Directional Bore 3” Certa-Loc Pipe DR-17 Water main per plans and specifications for the unit price of (Directional Bore includes the pipe) _____ Dollars and _____ Cents/L.F.	$ _____	$ _____
8	100	L.F.	Bore and Encase 6” Water Main in 0.375” x 12” Steel Encasement per plans and specifications for the unit price of (Bore and Encase does include the pipe and steel encasement) _____ Dollars and _____ Cents/L.F.	$ _____	$ _____

BID PROPOSAL CONTINUED

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
9	5	EA	Furnish and Install 6” Fire Hydrant Assembly including 6” Gate Valve, Blocking and Drain Rock per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____
10	2	EA	Furnish and Install 2” Blow-Off Valves with valve marker per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
11	43	EA	Furnish and Install and 3/4“ Short Side Service Connections Including up to 30 feet of service line, new ¾” meter with smart register and transmitter, meter box and appurtenances at property line per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____
12	16	EA	Furnish and Install and 3/4“ Long Side Service Connections Including up to 120 feet of service line, new ¾” meter with smart register and transmitter, meter box and appurtenances at property line per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
13	5	EA	Tie in Existing 2” Water Line per plans and specifications for the unit price of (Does not include valve) _____ Dollars and _____ Cents/EA	$ _____	$ _____
14	6	EA	Furnish and Install 6” Gate Valve including valve box, valve marker and blocking per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
15	4	EA	Furnish and Install 4” Gate Valve including valve box, valve marker and blocking per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____
16	2	EA	Furnish and Install 2” Gate Valve including valve box, valve marker and blocking per plans and specifications for the unit price of _____ Dollars and _____ Cents/EA	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
17	100	L.F.	Open Cut and Repair Concrete Surface per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____
18	100	L.F.	Open Cut and Repair Asphalt Surface per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
19	1	L.S.	Furnish all labor and install all equipment for testing and sterilization of treated mains and appurtenances per plans and specifications for the lump sum price of _____ Dollars and _____ Cents/L.S.	$ _____	$ _____
20	1	L.S.	Trench Safety per plans and specifications for the lump sum price of _____ Dollars and _____ Cents/L.S.	$ _____	$ _____

TOTAL BASE BID $ _____

NOTES

1) Miscellaneous items, directed work, connections, etc., not specifically listed but required to complete the proposed improvements to a complete and operational system shall be included in the Bid under the most appropriate Bid Item.

2) Time required to complete base bid work shall be 120 calendar days.

3) Contractor is to perform and adhere to all requirements of the Storm Water Pollution Prevention Plan found in Exhibit "A" of the Technical Specs.

4) Contractor is solely responsible for the complete abandonment of all existing mains unless otherwise noted.

BID PROPOSAL CONTINUED
DEDUCTIVE ALTERNATE #1

ITEM	QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL PRICE
21	1580	L.F.	Deduct frombid item # 3 - Furnish and Install 3" PVC DR-21 Class 200 Treated Water Main and Fittings including Trench Excavation, Laying, Bedding, Blocking and Backfilling per plans and specifications for the unit price of _____ Dollars and _____ Cents/L.F.	$ _____	$ _____
22	115	L.F.	Deduct from Bid item #7 - Directional Bore 3" Certa-Loc Pipe DR-18 Water main per plans and specifications for the unit price of (Directional Bore includes the pipe) _____ Dollars and _____ Cents/L.F.	$ _____	$ _____

TOTAL DEDUCTIVE ALTERNATE #1 $ _____

TOTAL BASE BID LESS DEDUCTIVE ALERNATE #1 $ _____

TECHNICAL SPECIFICATIONS

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SECTION 1 - SITE PREPARATION, EXCAVATION, BACKFILL

1A - Sitework

1. DESCRIPTION: The work to be performed under this section shall consist of furnishing all labor, equipment and materials, and in performing all operations necessary in connection with site clearing and restoration as shown in the plans and specifications herein.

   It shall be the responsibility of each bidder to examine the site carefully and make his own calculations as to costs to be incurred by reason of the requirements of this section.

   Site clearing and restoration shall include all of the following:

   A. The cutting and removal of all trees, shrubs, underbrush, and the removal of any debris existing above natural ground surface and within the limits of right-of-way necessary to permit the construction of the improvements. Trees, shrubs, underbrush, and debris removed from the site shall be disposed of by the Contractor.

   B. The removal, storage and reconstruction of fences where necessary to permit the construction of the improvements. As quickly as feasible after the work has been performed, fences shall be reconstructed to conditions at least as good as the original. The Contractor shall furnish new materials as necessary to permit proper restoration.

   C. The replacement of yards, lawns, shrubbery, or plants in the right-of-way that are disturbed by the Contractor while constructing the improvement. Disturbed lawns shall be replaced by solid sodding, using the same kind of grass as existing in the undisturbed portion of the lawn. Yards shall be replaced by seeding, fertilizing and the control of erosion. Shrubbery or plants shall be replaced with the same kind in good condition. Topsoil shall be preserved or shall be hauled in prior to establishment of yard or lawn. All yards and lawns shall have 4 inches of topsoil on all disturbed areas.

   D. The reconstruction of dirt and gravel roads or drives. The alignment and grade shall be restored, as close as possible, to that existing prior to construction. Gravel shall be preserved and hauled in as necessary and utilized for resurfacing per plans.

E. The removal and subsequent replacement of sidewalks, curbs, curb and gutter, culverts, storm drains and other related items which are displaced by the Contractor's operations. The Contractor shall furnish new materials necessary to permit replacement to a condition better than or equal to that existing prior to construction.

F. Where trees, plants, shrubbery, etc. are adjacent to the line of the work and are not to be removed or removed and replaced, the Contractor shall protect such trees, plants, shrubbery, etc. by substantial wooden boxes and guards and shall not permit machinery or employees to scrape, tear the limbs from, or damage, or attach guy cables to them, and if in the opinion of the Engineer such trees, plants, shrubbery, etc. would be damaged by machinery, etc., hand excavation may be required. The Contractor shall be responsible for all damages to adjacent trees, plants, shrubbery, etc.

G. Where construction will occur within state owned right-of-ways, sitework shall conform to Arkansas Highway and Transportation Department requirements. The Contractor shall be responsible for notification of the AHTD at least 48 hours prior to construction.

H. Damage to paved surfaces, not shown on the plans for scheduled repair, shall be repaired at the expense of the Contractor.

I. Contractor shall maintain sufficient steel plates of adequate length and width to maintain access for property owners. The number shall be at the discretion of the Engineer. Costs of emergency repairs to driveways and streets required by and in the opinion of the Owner shall be deducted from the contract price.

J. The Contractor's operations are restricted to street right-of-ways or secured easements. The Contractor shall, when paralleling streets or roads, determine the right-of-way limit and restrict operations to the right-of-way.

K. The Contractor shall provide for traffic control including but not limited to flagging, signage, etc. Through traffic shall be maintained on all streets during construction.

L. The Contractor shall provide barricades on all open ditches and trenches left unattended.

M. All yards shall be raked smoothly to grade and be absent from rocks and all debris as defined by the Engineer.

N. Contractor is responsible for restoring all surfaces to a condition better than or equal to that existing prior to construction within 30 consecutive calendar days after the surface has been damaged due to construction, unless stricter timelines are required by additional state, local, or federal permits.

Should the contractor fail to restore surfaces within the allotted timeframe, the Engineer and/or owner reserves the right to direct the Contractor to discontinue installing any new water mains until all previously disturbed areas have been restored to an acceptable condition.

O. Payment: No separate payment shall be made for any of the items listed in this section, but shall be considered subsidiary to the price for pipeline installation. Twenty percent (20%) of the cost for pipeline installation is considered equitable for site work. Twenty percent (20%) of the unit price bid for pipeline installation may be retained if site work is not being performed in an acceptable manner.

SECTION 1 - SITE PREPARATION, EXCAVATION, BACKFILL

1B - Trench Excavation and Backfilling

1. GENERAL: Excavation shall include the removal of all earth, rock, or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown in the plans, or as specified.

2. MAXIMUM AND MINIMUM WIDTH OF TRENCHES: The sides of all trenches shall be cut as nearly vertical as possible. Unless otherwise specified on the plans, the minimum width of trench in which the pipe may be installed shall be 12 inches plus the outside diameter of the pipe, and the maximum width shall be 24 inches plus the outside diameter of the pipe, measured at an elevation in the trench which is twelve inches above the top of the pipe when it is laid to grade.

   Whenever the prescribed maximum trench width is exceeded, except as such excess may be necessary for compliance with the plans or specifications, the pipe may be cradled with Class 2500 Concrete as directed by the Engineer, and at the expense of the Contractor.

3. SHEETING, SHORING, AND BRACING: The sides of all excavation shall be sufficiently sheeted, shored and braced so as to prevent slides, cave-ins, settlement or movement of the banks, and to maintain the excavation clear of obstructions that will in any way hinder or delay the progress of the work. In wet, saturated or flowing materials, where it is necessary to install tight sheeting or cofferdams, wood or steel sheet piling of a design and type approved by the Engineer shall be used. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and maintain the sides of the excavation properly in place and protect all persons or property from injury or damage. When excavations are made adjacent to existing buildings or other structures, or in paved streets, particular care shall be taken to adequately sheet, shore and brace the sides of the excavation to prevent undermining of, or settlement beneath the structures or pavement. Underpinning of adjacent structures or pavement shall be done by the Contractor at his own cost and expense, and in a manner satisfactory to the Engineer, or, when required by the Engineer, the pavement shall be removed, the void satisfactorily refilled, compacted, and the pavement replaced by the Contractor; the entire expense of such removal and subsequent replacement thereof shall be borne by the Contractor. Sheeting, shoring and bracing shall not be left in place unless otherwise provided for in the contract authorized by the Engineer. The removal of sheeting, shoring and bracing shall be done in such manner as not to endanger or damage either new or existing structures, private or public properties, and so as to avoid cave-ins, or sliding of the banks. All holes or voids left by the removal of the

sheeting, shoring or bracing shall be immediately and completely filled and compacted with suitable materials. If for any reason, the Contractor, with the approval of the Engineer, elects to leave in place the sheeting, shoring or bracing, no payment shall be allowed for such materials left in place.

4. DEWATERING EXCAVATIONS: The Contractor shall immediately remove all surface or seepage water from sewers, drains, ditches, and other sources which may accumulate during the excavation and construction work, by providing the necessary underdrains or otherwise, and by doing the necessary pumping, bailing, and draining. The Contractor shall have available at all times sufficient equipment in proper working order for doing the work herein required. All water removed from excavations shall be disposed of in an approved manner, so as not to create unsanitary conditions, nor to cause injury or damage to persons or property, or damage to the work in progress, nor to interfere unduly with the use of streets, private driveways, or entrances. Pumping, bailing and draining, underdrains, ditches, etc., shall be considered as incidental work and will not be paid for as separate items, but their cost shall be included in such contract price as is provided in the contract.

5. SUBGRADE IN EARTH (TYPE I LAYING CONDITION): Where a firm and stable foundation for the pipe can be obtained in the natural soil and where special embedment is not shown on the plans or specified herein, the trench bottom shall be smooth and free from stones greater than ½", large dirt clods, or frozen material. The bell holes shall be accurately located and shall be of sufficient width and depth to allow ample room for making the joint and to relieve the pipe bell of all load.

   Should the excavation be carried below grade, except as herein specifically provided, the Contractor shall, at his own expense, refill it to the proper elevation with sand or gravel, as directed by the Engineer, which shall be compacted by tamping until it is firm and unyielding.

6. SUBGRADE IN ROCK (TYPE II LAYING CONDITION): If the bottom of the excavation for the pipe line is found to be in rock or other hard material that cannot be excavated to a true subgrade and shaped to provide uniform bearing for the pipe barrel, the rock or other material shall be removed to a depth not less than six inches below subgrade and the bottom of the trench brought to true subgrade elevated by filling with sand to a depth shown on the Detail Sheet and compacting by means of tamping until a firm and uniformly unyielding foundation is obtained, as specified by the Engineer.

7. SOFT SUBGRADE (TYPE III LAYING CONDITION): Where soft or spongy material is encountered in the excavation at subgrade level, it shall be removed, only upon the direction of the Engineer, to such a depth that by replacing the unsuitable material with tamped gravel a firm and stable foundation can be secured.

8. DISPOSAL OF EXCAVATED MATERIAL: Suitable excavated materials shall be piled adjacent to the work to be used for backfilling. Excavated materials unsuitable for the backfilling, or in excess of that required for backfilling shall be disposed of by the Contractor at locations designated on the plans or approved by the Engineer. Desirable top soil, sod, etc. shall be carefully piled separately in its original position when required. Excavated materials shall be handled at all times in such a manner as to cause a minimum inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the work. In parkways and easements where it is necessary to deposit excavated materials on lawns during the work, burlap or similar materials shall be placed on the lawn to prevent contact between excavated materials and the lawn.

9. USE OF EXPLOSIVES: The use of explosives will not be allowed.

10. TRENCH BACKFILLING: Backfilling shall include the refilling and consolidating of the fill in trenches and excavations up to the surrounding ground surface.

Backfilling shall be done with good earth, sand or gravel and shall be free of large rocks or hard lumpy material. All select fill material shall conform to AWWA-C605 Standards. No material of a perishable, spongy or otherwise unsuitable nature shall be used in backfilling.

After the pipe and embedment have been placed, the method of backfilling pipe trenches shall be as follows: Selected material shall first be taken from the spoil bank and placed on both sides of the pipe simultaneously in layers of not more than six inches in loose thickness, and these layers shall be firmly compacted by hand or mechanical tamping. The layers of backfill shall be sprinkled lightly with water if additional moisture is required for proper compaction. This process of filling and tamping in layers shall be continued until the backfill is brought up to one foot above the top of the pipe. Rolling compaction devices shall not be used until at least 18 inches of backfill is over the pipe. Remaining backfill shall be in accordance with Section 1B 11.

11. COMPACTION: All trench backfill in areas under paved surfaces, parking areas, sidewalks and other structures, as determined by the Engineer shall be compacted to a density of at least 90% of the maximum dry density as determined by the AASHO Method T99 to a point 6 inches below the top of the backfill. The top 6 inches shall be compacted to a density of 95% of the maximum dry density as determined by AASHO Method T99. In all other locations, compaction of backfill from the bottom of the trench to a distance of one foot above the top of the pipe shall be in accordance with Section 1B 10. From a point one foot above the top of the pipe to the top of the trench, the backfill need not be mechanically tamped. Before reaching the top of the trench, the trench shall be flooded with water or rolled by passing the wheel or track of a piece of equipment along the trench line to achieve some degree of consolidation.

In place moisture-density test may be ordered by Engineer to insure that all trench backfill complies with the requirements of the specification. Tests will be performed by a recognized testing laboratory, and all costs will be paid for by Owner. Failed tests shall be paid for by the Contractor. Copies of all test results will be furnished to the Contractor.

12. PROTECTION OF EXISTING UTILITIES: It shall be the responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from or the inclusion of utility locations on the plans is not to be considered as the non-existence of, or a definite location of existing underground utilities.

    The Contractor will take the necessary precautions to protect existing utilities from damage due to his operations. Any damage to the utilities will be repaired at the Contractor's expense.

    A sufficient distance back from the edge of the excavation shall be maintained to avoid overloading and to prevent slides or caving. The excavation material shall be kept trimmed in such a manner as to be of as little inconvenience as possible to the public and adjoining property owners.

13. PAYMENT: No separate payment shall be made for any of the various items of "Trench Excavation and Backfill", but shall be considered subsidiary to the price for pipeline installation.

SECTION 1C - TRENCH SAFETY SYSTEMS

1. DESCRIPTION: This section covers excavation and supporting systems for trenches to protect the safety of workers, provide suitable means for constructing utility lines, and to protect public or private property, including existing utilities.

   The Contractor's attention is directed to Bid Item “Trench Safety Systems” under which full compensation will be made for the design, materials, equipment, fabrication and labor required to furnish, install, and remove trench excavation, shoring, bracing and protective systems.

2. EXISTING STRUCTURES: Where existing buildings, other utilities, streets, highways, or other structures are in close proximity to the trench, adequate protection shall be provided by the use of sheeting and shoring to protect the structure, street, or highway from possible damage. In the case of utilities, the Contractor may elect to remove the utility provided that the removal and subsequent replacement meets with the approval of the Engineer, the utility owner, or whoever has jurisdiction of the structure. In all cases, it shall be the responsiblity of the Contractor to protect public and private property and any person or persons who might, as a result of the Contractor's work, be injured.

3. EXCAVATIONS, TRENCHING, AND SHORING: The Contractor shall include in his bid price and be solely responsible for trench safety provisions meeting the requirements of the United States Department of Labor Occupational Safety and Health Administration. The following regulations, as contained in Subpart P, Part 1926 of the Code of Federal Regulations (29), shall be complied with along with all other applicable Subparts and Regulations not herein contained. All excavations left open shall be secured with safety fencing.

SECTION 2A - CAST-IN-PLACE CONCRETE

1. GENERAL:

A. Standards: Concrete work shall conform to all requirements of ACI-30l "Specifications for Structural Concrete for Buildings" and ACI-318 "Building Code Requirements for Reinforced Concrete" except as modified herein.

B. Scope: Work consists of furnishing all plant, labor, materials, equipment, and appliances, and performing all operations in connection with installation of the concrete work, complete, in strict accordance with the Specifications and Drawings.

C. Inspection: Embedded items must be inspected and tests for concrete and other materials shall have been completed and approved by the Engineer before concrete is placed.

D. Slab on Earth: Before proceeding to construct concrete slabs on earth, all pipes under concrete floor on earth shall have received the required tests. All backfill and fill material under slabs on grade shall be compacted in 6" layers to 98% maximum density as measured by ASTM D-698 Standard Compaction Procedure. Unsuitable material encountered in subgrade shall be removed and replaced with material approved by the Engineer. Subgrade shall be brought to true, even plane, and compacted to solid bearing. Gravel drainage fill shall be placed and compacted where shown on Drawings.

2. QUALITY AND CONTROL

A. Design: Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate and water. All concrete shall be designed by an approved testing laboratory in accordance with the ACI Standard Recommended Practice for Selecting Proportions for Concrete (ACI-211) to produce the strength for each class of concrete specified, and with the requirements outlined below. The concrete shall be so designed that the concrete materials will not segregate and excessive bleeding will not occur. Any costs for the testing laboratory for designing concrete mixes shall be borne by the Contractor.

Concrete strengths shall be as follows:

Class A Concrete - 4000 psi @ 28 days

Class B Concrete - 2000 psi @ 28 days

MAXIMUM SLUMPS FOR VARIOUS TYPES OF CONSTRUCTION

Types of Construction	Hand Placed Maximum	High Frequency Vibrator Used Maximum
Reinforced Foundation Walls and Footings	5"	2"
Slabs, Beams, and Reinforced Walls	6"	3"
Building Columns	5"	3"
Pavements	3"	2"

The slump shall not exceed the maximum specified above for the type of construction for which it is to be used. No water will be added after the amount specified by the mix design.

B. Location of Different Concrete Classes: Concrete fill to be Class B. All remaining concrete including structural concrete to be Class A.

C. Production of Concrete: All ready-mixed concrete shall be batched, mixed and transported in accordance with "Specifications for Ready-Mixed Concrete (ASTM C-94)". Plant equipment and facilities shall conform to the "Check List for Certification of Ready-Mixed Concrete Production Facilities" of the National Ready-Mixed Concrete Association. Site mixed concrete shall conform to the requirements of "Specifications for Structural Concrete" (ACI-301). The Contractor may elect to use either ready-mixed or site mixed concrete for this project provided he informs the Engineer of his choice at the time of the pre-construction conference.

D. Laboratory Testing: The Owner shall engage an independent testing laboratory to conduct concrete tests. Contractor will be responsible for sampling concrete for test cylinders, recording, and delivering them to the laboratory, providing all materials required, and for making all slump tests in the field directed by the Engineer. All costs in connection with work performed by the laboratory will be paid by the Owner. The Contractor shall be responsible for the costs of work performed by the laboratory required for redesign of concrete proportions and re-testing of in place concrete when cylinders indicate low strength concrete has occurred.

At least one test shall be made on fresh concrete for each sixty (60) cu. yds. of each class of concrete (or fraction thereof) placed on any one day and in any event, not less than one test for each class of concrete each day it is used. Testing shall be done in accordance with the following ASTM Specifications, latest edition:

C172,	Standard Method of Sampling Fresh Concrete
C31,	Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field
C39,	Standard Method of Test of Compressive Strength of Molded Concrete Cylinders
C143,	Standard Method of Slump Test for Consistency of Portland Cement Concrete

Before any concrete is poured, the Contractor shall construct a storage box in accordance with ASTM Specification C31. Each set of tests shall consist of one (1) slump test and three (3) compression test cylinders. All cylinders shall be kept in the storage box for the first 24 hours. The three (3) cylinders shall be laboratory cured and tested for adequacy of the design for strength of the concrete in accordance with ASTM Specification C31. One cylinder shall be tested at 7 days and two at 28 days.

E. Failure of Concrete to Meet Strength Requirements: The concrete shall be considered acceptable if, for any one class of concrete, the average of all tests or any five (5) consecutive tests is equal to or greater than the specified strength, provided that no more than one (1) test of the five (5) falls between 90% and 100% of the specified strength. The only cylinders to be used to determine concrete acceptability will be those laboratory cured and tested at 28 days. When it appears the tests of laboratory-cured cylinders will fail to meet these requirements, the Engineer may require changes in the proportions of concrete for the remainder of the work in order to meet the strength requirements. In addition, the Engineer may also require additional curing not to exceed a total of 21 days on portions of the concrete already poured.

The Engineer may also require tests in accordance with Methods of Securing, Preparing and Testing Specimen from Hardened Concrete for Compressive and Flexural Strengths (ASTM Specifications C42) when the concrete cylinder tests fail to meet strength requirements. In the event there still is questions as to the quality of the concrete in the structure, the Engineer may require load tests for that portion where the questionable concrete has been placed. Such load tests will be made as outlined in the American Concrete Institute Building Code, (ACI 318), and shall be at the expense of the Contractor.

F. Removal of Under Strength Concrete: If the above tests indicate that a particular batch of previously placed concrete is under strength, the

Engineer may direct that the under strength batch be removed and replaced. The removal of the under strength concrete shall also include the removal of concrete that has obtained the required strength if the Engineer deems this necessary to obtain structural or visible continuity when the concrete is replaced.

The removal, and replacement of any under strength concrete, shall be made at no additional cost to the Owner. This shall include any new formwork required or any reinforcing steel that may be required. The Owner shall not be charged any additional costs for any extra work that is required because of the failure of any concrete to meet the minimum test requirements.

3. FORMWORK:

Forms shall be built true to line and grade, and be mortar tight and sufficiently rigid to prevent displacement or sagging between supports. All formwork and shoring shall be designed for the construction loads to be placed on them and the design and construction of said forms shall be in accordance with ACI Standard "Recommended Practice for Concrete Formwork" (ACI 347). The structural adequacy of the formwork shall rest with the Contractor. All forms shall be so constructed that they can be removed without hammering or prying against the concrete. Forms shall not be removed without approval of the Engineer. Forms shall not be removed before the minimum times given below, or longer if job control tests indicate the concrete has not attained strength specified below, except when specifically authorized by the Engineer.

Beams and Slabs	7 days
Walls up to 12" thick and Vertical Surfaces	3 days
Columns	5 days
Walls greater than 12" thick	7 days

In general, forms or shores for supported slabs and beams shall not be removed until the concrete, so supported, has acquired seventy (70) percent of its design strength; except where loads other than the dead weight of the concrete are added, the shores shall not be removed until twenty-four (24) hours after the concrete has obtained ninety (90) percent of its design strength. Forms shall be removed immediately after expiration of the lapsed time specified above or sooner, if required by the Engineer, where concrete is to receive a rubbed finish.

A. Preparation Before Placing: Water shall be removed from excavations before concrete is deposited. Hardened concrete, wood chips, shavings, and other debris shall be removed from interior of forms and inner surfaces of mixing and conveying equipment. Wood forms shall be oiled or, except in freezing weather, wetted with water in advance of pouring. Reinforcement shall be secured in position, inspected and approved by the Engineer before starting pouring of concrete.

B. Conveying: Concrete shall be conveyed from mixer to forms as rapidly as practicable and by methods which will prevent segregation or loss of ingredients. It shall be deposited as nearly as practicable in its final position. Chutes used shall be such that concrete slides in them and does not flow. Chutes, if permitted, shall have a slope of less than 1 on 2. Where a vertical drop greater than five (5) feet is necessary, placement shall be through elephant trunks or similar devices to prevent segregation.

C. Placing: Concrete shall be placed before initial set has occurred and in no event after it has contained its water content for more than 30 minutes. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces free from running water, or upon properly consolidated fills, but never upon soft mud or dry, porous earth. The concrete shall be compacted and worked in an approved manner into all corners and angles of the forms and around reinforcement and embedded fixtures as to prevent segregation of the coarse aggregate. Construction of forms for the lifts of vertical walls shall be such as to make all parts of the walls easily accessible for the placement, spading, and consolidation of the concrete as specified herein.

D. Vibration: All concrete shall be placed with the aid of mechanical vibration equipment as approved by the Engineer. Vibration shall be transmitted directly to the concrete; in no case shall it be transmitted through forms. The duration of vibration at any location in forms shall be held to the minimum necessary to produce thorough compaction. Vibrations shall be supplemented by forking or spading by hand, and adjacent to the forms on exposed faces in order to secure smooth, dense and even surfaces, with particular care being taken to prevent coarse aggregate from becoming set too near any surfaces that are to receive rubbed finish.

E. Construction Joints: Construction joints shall be formed as indicated on the Drawings or as approved or directed by the Engineer. Where indicated or required, dowel rods shall be used. All concrete at the joints shall have been in place not less than 12 hours, and longer if so directed by the Engineer, before concrete resting thereon is placed. Before placing is resumed, or commenced, excess water and laitance shall be removed, and concrete shall be cut away, where necessary, to insure a strong dense concrete at the joint. In order to secure adequate bond, the surface of concrete already in place shall be cleaned, roughened, and then spread

with a one-half (½) inch layer or mortar of the same cement-sand ratio as is used in the concrete, immediately before the new concrete is deposited. The unit of operation is not to exceed 60 feet in any horizontal direction, unless otherwise required by the Drawings. Constructions joints, if required, shall be located near the mid-point spans for slabs, beams, or girders. Joints in columns or piers shall be made at the underside of the deepest beam or girder at least five (5) hours before any overhead work is placed thereon. Joints not shown or specified shall be so located as to least impair strength and appearance of work. Vertical joints in wall footings shall be reduced to a minimum. Placement of concrete shall be at such a rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is placed in one operation. To insure a level straight joint in exposed vertical surfaces, a strip of dressed lumber may be tacked to the inside of the forms at the construction joint. The concrete shall be poured to a point one (1) inch above the underside of the strip. The strip shall be removed one (1) hour after concrete has been placed and any irregularities in the joint line leveled off with a wood float and all laitance removed. Waterstops shall be installed in all construction joints below grade or in liquid containing structures as noted on the Plans.

F. Patching: Any concrete which is not formed as shown on the Plans, or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these Specifications and shall be removed from job by Contractor at his expense, unless the Engineer grants permission to patch defective area, which shall be done in accordance with the following procedure. Permission to patch any such area shall not be considered a waiver of the Engineer's right to require complete removal of defective work if patching does not, in his opinion, satisfactorily restore quality and appearance of surface. Suitable non-shrink, latex or epoxy mortar shall be used for patching and repairing defective surface if directed by the Engineer.

After removing forms, all concrete surfaces shall be inspected and any poor joints, voids, stone pockets, all tie holes, or other defective areas shall be patched, if permitted by the Engineer. Where necessary, defective areas shall be chipped away to a depth of not less than one (1) inch with edges perpendicular to the surface. Area to be patched and a space at least six (6) inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts of Portland Cement and sand, with sufficient water to produce a brushing consistency, shall then be well brushed into the surface followed immediately by the patching mortar. The patch shall be made of the same material and of approximately the same proportions and shall not be richer than 1 part cement to 3 parts sand. White Portland Cement shall be substituted for a part of the gray Portland Cement to match color of the surrounding concrete. The proportion of white and gray cements shall be

determined by making a trial patch. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be re-tempered without the addition of water by allowing it to stand for a period of one (1) hour during which time it shall be mixed occasionally with a trowel to prevent settings.

The mortar shall be thoroughly compacted into place and screened off so as to leave patch slightly higher than surrounding surface. It shall then be left undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface. On exposed surfaces where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight edge spanning of patch and held parallel to the direction of the form marks.

Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted.

4. FINISHES:

A. Top and bottom slabs of all structures and water carrying conduits except as noted otherwise on the Plans shall be finished as follows: The top of the slab shall be screeded to grade and cross section; lightly tamped as required to bring up a good bed of mortar for finishing and re-screeded as necessary. The surface shall then be finished with a wood float and leveling darby. No further finish will be required on top slabs of structures or conduits which are to be buried. In the case of all exposed top slabs of structures and conduits, they shall be given a final steel trowel and a light broomed, slip resistant finish to a uniform surface which conforms with accuracy to required shape, slope and grade. Slabs shall be edged as appropriate.

B. Rubbed Finish: Unless otherwise indicated, all faces (except top surfaces of slabs) exposed to view, such as walls, grade beams, columns, beams, canopy soffits, and fascias, etc. shall be finished as follows:

Forms shall be removed as specified in paragraph 3 - Formwork, and all fins removed, off-sets leveled, damaged places and depressions resulting from the removal of metal ties or other causes shall be carefully pointed with a mortar of sand and cement in the proportion which has been employed for the concrete. The surface film of all such pointed places shall be carefully removed before setting occurs. After the point has set sufficiently to permit it, all exposed surfaces shall be dampened and rubbed with a No. 16 carborundum stone, to a smooth even plane. Final rubbing shall be done with a No. 30 carborundum stone, or an abrasive of equal quality, to obtain an entire surface of a smooth texture and uniformity in color. Mortar of grout worked up during rubbing shall be

promptly removed by sacking with burlap or other suitable means so that no visible grout film or paste will remain. A cement wash or plaster coat shall not be used. All surfaces shall be finished uniformly smooth and washed clean. The rubbed finish for any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface. If the Contractor does not provide suitable surface finish using carborundum stones specified above, the Engineer, without additional cost to the Owner, may require the use of a power operated grinding machine to produce the desired finish.

5. CURING:

A. General: Immediately following placing, concrete shall be protected from premature drying, hot and cold temperatures, rain, flowing water and mechanical injury. Maintain above 50 deg. F. and in moist condition for at least seven (7) days after placing for normal concrete and three (3) days for high early strength concrete. Comply with "Recommended Practice for Curing Concrete", ACI 308, unless otherwise indicated. Curing compound satisfactory composition and characteristics may be used except on surfaces to which new concrete is to be bonded and provided such compound does not stain or discolor any surface which will be exposed. Curing compound shall be applied in strict accordance with manufacturer's direction.

B. Cold weather procedures shall conform with "Recommended Practice for Winter Concreting", ACI 306. Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during the freezing or near freezing weather. All concrete materials, reinforcement, forms, fillers and ground or other surfaces which concrete will contact shall be free from frost or ice. Salt or other chemicals shall not be used to prevent freezing.

C. Hot weather procedures shall conform with "Recommended Practice for Hot Weather Concreting", ACI 302 & ACI 305. During hot weather adequate provisions shall be made to reduce concrete temperature and water evaporation by proper attention to ingredients, production methods, handling, placing, protection and curing.

D. Protection from the Sun: All concrete shall be adequately protected from injurious action of sun in a manner satisfactory to the Engineer.

E. Temperature Variation: During and at the conclusion of the specified curing period, means shall be provided to insure that the temperature of the air immediately adjacent to the concrete does not fall more than 5 deg. F. in any one hour.

6. EMBEDDED ITEMS:

Before placing concrete, care shall be taken to determine that any embedded metal or wood parts are firmly and securely fastened in place as indicated. They shall be thoroughly clear and free from coating, rust, scale, oil or any foreign matter. Embedding of wood in concrete shall be avoided whenever possible, metal being used instead. If wood is allowed, it shall be thoroughly wetted before concrete is placed.

7. MEASUREMENT AND PAYMENT:

Cast-in-place concrete shall not be measured for separate payment but shall be considered subsidiary to the item of the contract to which the work applies.

SECTION 2B - CONCRETE THRUST BLOCKS AND COLLARS

1. GENERAL: Concrete thrust blocks and anchors shall be provided along the pipe line in accordance with the construction details, plan sheets, or as directed by the Engineer. The concrete mix shall be Class 3000 for thrust collars and Class 2500 for thrust blocks.

Concrete for thrust blocks shall be placed against undisturbed soil. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust.

No concrete shall be placed around any part of a joint or placed so that it interferes with the removal of any joint accessories such as bolts, followers, threads, collars, couplings, etc. Fire hydrant drains shall not be restricted.

The top of the concrete thrust block or collar shall be struck off with a wood straight edge or float.

Concrete shall not be placed when the temperature is below 45 deg. F, or below 40 deg. F if the temperature is rising unless approved by the Engineer. Placement shall be in accordance with Section 2A of these Specifications.

Admixtures are not to be used without the approval of the Engineer.

All placement of concrete must be in the presence of the Engineer or his representative. The Contractor is cautioned that he may be required to remove any concrete placed in the absence of the Engineer or his representative without compensation.

Backfill over concrete thrust blocks or collars shall not be placed before the concrete has attained initial set.

No thrust blocks shall be less than six (6) inches thick between the pipe line or appurtenances and undisturbed soil in the direction of the thrust.

The excavation shall be free of water before concrete is placed. Steel reinforcement, as specified on the Plans, shall be placed as specified.

The pipe or appurtenances shall be cleaned before placing concrete when the concrete is to be in direct contact with the pipe or appurtenances.
The area of contact of the thrust blocks and collars shall be sufficient to resist the thrust. This area will vary depending on the safe bearing value of the soil.

Suggested safe bearing values are as follows:

Type of Soil	Suggested Safe Bearing Values (tons/sq. ft.)
Solid Rock	25
Hard Slate	6
Medium Shale	4
Soft Shale	2
Dry Clay Gravel	4
Soft Clay	1.5
Dry Sand or Loam	2.5
Wet Clay	0.75

The above values are approximate and will vary considerably and are intended to be used only as a guide. The Contractor is responsible for determining the soil bearing value or taking other action to assure that the bearing area is adequate to restrain the pipe or appurtenances.

Where the soil is unstable or in the case of recent fill areas, the following procedures shall apply either singly or in a combination:

A. Thrust blocks shall be of adequate size to restrain pipe or appurtenances by mass alone without depending on horizontal bearing of the soil.

B. The excavation shall extend deep enough to contact firm soil and the block brought up to the pipe or appurtenances and constructed so that the block acts as a beam and will provide restraint required. Such blocks shall be reinforced with steel reinforcing bars.

C. Anchor blocks shall be constructed in a firm soil and tie rods extended to the pipe or appurtenances.

Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

Thrust blocks and collars shall be adequate to restrain the pipe line and appurtenances at the specified test pressure. The following table lists the resultant thrust at certain fittings at pressure of 100 psi. In order to determine the thrust at the test pressure these values are to be multiplied by a factor equal to the test pressure divided by 100.

Thrust Per 100 psi Pressure

Fitting	Thrust (Tons)									
	2"	2 ½"	3"	4"	6"	8"	12"	16"	10"	24"
11¼ deg. Bend	0.03	0.05	0.07	0.12	0.3	0.5	1.1	2.0	3.1	4.4
l5 deg.	0.04	0.06	0.09	0.16	0.4	0.7	1.5	2.6	4.1	5.9
22½ deg.	0.06	0.10	0.14	0.24	0.6	1.0	2.2	3.9	6.1	8.8
30 deg.	0.08	0.13	0.18	0.32	0.7	1.3	2.9	5.2	8.1	11.7
45 deg.	0.12	0.19	0.27	0.48	1.1	1.9	4.3	7.7	12.0	17.3
90 deg.	0.22	0.35	0.50	0.88	2.0	3.6	8.0	14.2	22.2	32.0
Plug	0.15	0.24	0.35	0.62	0.4	2.5	5.7	10.1	15.7	22.6

Concrete thrust blocks or collars that fail to restrain the pipe or appurtenances shall be replaced by the Contractor at his expense.

2. MEASUREMENT AND PAYMENT: No separate payment shall be made for concrete thrust blocks, but shall be considered subsidiary to the price for pipeline installation.

SECTION 3 - PIPE & FITTINGS (WATER)

3A - General

1. GENERAL: This section covers the furnishing and laying, or installing of all water pipe and fittings.

   All pipe furnished shall be designed and used for the distribution of potable water only and have a depth of cover equal to or greater than 36 inches. Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material and shall not impart taste or odor to water. The lubricant containers shall be labeled with the manufacturer's name.

2. PROTECTION OF PIPELINE: Well fitted stoppers or bulkheads shall be securely placed in all openings and in the end of the line when construction is stopped temporarily and at the end of each day's work. It shall be the responsibility of the Contractor to deliver to the Owner a pipeline which is clean throughout its entire length.

3. MEASUREMENT AND BASIS OF PAYMENT: The pipeline, complete in place, will be measured for payment in linear feet along the ground surface above the pipe as installed. Measurement shall be through fittings, valves and specials and no deduction in length shall be made for such appurtenances. Installation of the pipeline will be paid for at the unit contract price per linear foot as provided in the Proposal and Bid Schedules.

   Payment of the unit contract price will be the total compensation for furnishing all labor, pipe, fittings, tools and incidentals and performing all work that is necessary for the installation in accordance with the plans and the provisions of the specifications.

   The installation of appurtenances which are shown on the plans or described elsewhere in these specifications and for which there is no specific item included in the Bid Schedule shall be considered a part of the work to be performed and paid for at the contract price per linear foot of the pipeline.

   Payment will be made for completed sections or blocks of line installed as defined by the Engineer. Completion shall include clean-up, testing, sterilization and reconnects made and the line placed in service.

SECTION 3 - PIPE & FITTINGS (WATER)

3B - Materials

1. WATER MAINS:

A. AWWA C-900 PVC Pipe: (6" - 12") The pipe shall be DR 18 (minimum) Class 150 psi (minimum), cast iron pipe o.d. base that meets all the requirements of AWWA C-900, ASTM D1784, ASTM D2241, and ANSI/NSF standard 61. All pipe shall be suitable for use as a pressure conduit at a maximum hydrostatic working pressure of 235 psi at 73 deg. F. Provisions must be made for expansion and contraction at each joint with an elastomeric ring and integral thickened bell as part of each joint. The dimensions of the gasket joint shall meet the requirements provided in ASTM D 3139 when measured in accordance with ASTM D2122.

All pipe shall bear the National Sanitation Foundation seal for potable water pipe.

The manufacturer shall furnish an affidavit that all delivered materials comply with requirements of the above specifications.

6" - 12" - DR 18, Class 235 PSI

B. AWWA Class 200 PVC Pipe: (1" – 4") The pipe shall be SDR 21 (minimum) Class 200 psi, cast iron pipe o.d. base that meets all the requirements of AWWA Class 200, ASTM D1784, and ASTM D2241. All pipe shall be suitable for use as a pressure conduit at a maximum hydrostatic working pressure of 200 psi at 73 deg. F. Provisions must be made for expansion and contraction at each joint with an elastrometric ring and integral thickened bell as part of each joint. The dimensions of the gasket joint shall meet the requirements provided in ASTM D3139 when measured in accordance with ASTM D2122.

All pipe shall bear the National Sanitation Foundation seal for potable water pipe.

The manufacturer shall furnish an affidavit that all delivered materials comply with requirements of the above specifications:

1" – 4" – SDR 21, Class 200 psi

C. Ductile Iron Pipe: (4" - 12") The pipe shall conform to ANSI A21.51 (AWWA C 151) and ANSI A21.50 (AWWA C150). The minimum tensile strength shall be 42,000 psi, and the modulus of rupture 60,000 psi. The pipe shall have a cement mortar lining and seal coat conforming to ANSI A21.4 (AWWA C 104). Joints shall conform to ANSI A21.11 (AWWA C 111) and may be mechanical joint or push-on joint unless otherwise specified.

The minimum thickness class shall be as follows or as specified:

4" - 12" - Metal Thickness Class 50.

The pipe shall be wrapped in polyethylene and taped in accordance with AWWA C105. Polyethylene material shall conform to ANSI/ASTM D1248. Min. Nominal Thickness = 9 mils.

D. Gray and Ductile Iron Fittings: Fittings shall be designed for working pressures of 350 psi in accordance with ANSI A21.10 (AWWA C153). Joints may be mechanical joint, push-on joint, or standard bell and spigot joint as specified. Mechanical joint fittings shall conform to ANSI A32.22 (AWWA C111) and shall be furnished with cast iron or ductile iron glands, bolts and nuts, and plain rubber gaskets. Fittings shall contain no more than 8.0% lead. The body thickness and radii of curvature of push-on joint fittings shall conform to ANSI A32.22 (AWWA C111). Standard bell and spigot fittings shall be Class D or equal. All fittings except sleeves and plugs shall have a cement mortar lining in accordance with ANSI A 32.4 (AWWA C104). Joint shall conform to ANSI A32.22 (AWWA C111) and may be mechanical joint or push-on joint unless otherwise specified. The minimum thickness class shall be Class 50 unless otherwise specified.

E. Mechanical Joint Restrainer Glands: Mechanical joint restrainer glands shall be made from cast iron or ductile iron and shall be designed for a working pressure of at least 200 psi, Megalug Series 1100 for Ductile Iron Pipe and Megalug Series 2000PV for PVC Pipe or approved equal. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to fit standard mechanical joint fittings (AWWA C111). The minimum number and minimum size set screws shall be as follows:

Size Gland	Size Set Screws	No. Set Screws
4"	½"	4
6"	⅝"	6
8"	⅝"	9
10"	⅝"	16
12"	⅝"	16
16"	⅝"	24
20"	⅝"	28
24"	⅝"	32

F. AWWA C-901 HDPE Pipe: (3/4 " - 3") The pipe shall be SDR 9 (minimum) Class 250 psi (minimum), small diameter pressure-rated hdpe pipe that meets all the requirements of AWWA C-901, ASTM D3035, ASTM F714, ASTM D2737, and ASTM D2239. All pipes shall be suitable for use as a pressure conduit at a maximum hydrostatic working pressure of 250 psi at 73 deg. F.

All pipes shall bear the National Sanitation Foundation seal for potable water pipe.

The manufacturer shall furnish an affidavit that all delivered materials comply with requirements of the above specifications.

3/4" - 3" - SDR 9, Class 250 PSI

G. AWWA C-906 HDPE Pipe: (4 " - 12") The pipe shall be DR 9 (minimum) Class 250 psi (minimum), pressure-rated hdpe pipe that meets all the requirements of AWWA C-906, ASTM D3035, ASTM F714, ASTM D3350 Cell Class 445574C/E, PPI (TR-4) PE 4710, and ANSI/NSF 61/14. All pipes shall be suitable for use as a pressure conduit at a maximum hydrostatic working pressure of 250 psi at 73 deg. F.

All pipes shall bear the National Sanitation Foundation seal for potable water pipe.

The manufacturer shall furnish an affidavit that all delivered materials comply with requirements of the above specifications.

4" - 12" - DR 9, Class 250 PSI

2. JOINTS:

A. Plain End: Plain ends for use with mechanical couplings shall be square cut and the inside and outside edge burrs shall be removed. The pipe shall be sufficiently free from indentations, projections, or roll marks at each end to make a tight joint.

B. Rubber "O" Ring: Rubber "O" ring joints shall conform to AWWA C208 for bell and spigot ends with rubber gasket. The rubber "O" ring gasket materials shall comply with the requirements of AWWA C300.

SECTION 3 - PIPE & FITTINGS (WATER)

3C - Installation

1. GENERAL: Before installation of pipe and appurtenances, the trench bottom shall be graded so uniform support of the pipe and appurtenances is provided. Shallow depressions shall be made in the trench bottom to accommodate bell ends.

Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

All foreign matter or dirt shall be removed from the inside of the pipe and appurtenances before lowering into the trench and the pipe interior shall be kept clean during and after laying. A swab shall be kept in the pipeline as the pipe is being laid. Care shall be taken to prevent dirt from entering the joint space and at times when pipe laying is not in progress, the open ends of the pipe shall be closed by installing a plug or cap of sufficient design to prevent trench water, foreign matter, and dirt from entering the pipeline.

Cutting of the pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or pipe lining. Torch cutting is not permitted. All pipe shall be cut at an angle of 90 deg. to the pipe centerline. Cutting at other angles to provide greater deflections at the joints shall not be permitted.

Field welding or welding except by pipe manufacturer shall not be permitted.

Unless otherwise approved or directed by the Engineer, pipe shall be laid with bell ends facing the direction of laying; and for lines on an appreciable slope, bells shall, at the direction of the Engineer, face upgrade.

No pipe shall be laid in water, or when the trench condition or the weather is unsuitable for such work, except by permission of the Engineer.

A continuous 12-gauge coated solid copper wire shall be installed with all mainline pipe. Coating shall be color blue for water. The wire shall be attached and laid along the pipe. The wire shall be looped around valves, saddles, curb stops and other appurtenances in such manner that there is not interference with the operation of the appurtenances.

All services shall have a tracer wire from the main to the water meter. The tracer wire shall be spliced into the tracer wire located at the main and run along the service line and up into the meter box. Tracer wire shall be solid copper wire

with USE rated insulation and a minimum size of AWG #12. Insulation shall be color blue for water. Splices shall be connected by means of a split bolt or compression type connection with NEC approved underground splice kits. Wire nuts shall not be used. A waterproof or corrosion proof connection for direct bury application shall be used. Tracer wire shall be installed 8”-12” directly above the pipe and shall not be less than 2’ below grade. Tracer wire is not to be taped directly to the pipe unless prior written approval is received from the Engineer and the Owner. After installation, the tracer wire shall be tested in the presence of the Engineer to verify continuity of the tracer wire system.

During the pipe laying operation, deflections at joints or in the pipe itself shall not exceed the amounts recommended by the pipe manufacturer.

2. JOINTING MECHANICAL JOINT PIPE & FITTINGS: Prior to jointing the pipe and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth, removing all foreign materials from the bells, especially the gasket seats.

The cast or malleable iron follower rings shall be placed on the plain end of the pipe or fittings, followed by the rubber gasket which has been thoroughly cleansed and lubricated with the soapy water.

The plain end of the pipe shall be placed in the bell, to which connection is to be made, and shouldered in back of the bell. The rubber gasket shall be advanced into the bell and seated in the gasket seat; the follower ring shall next be brought into contact with the rubber ring, and all bolts entered and nuts started. The pipe may then be given a maximum deflection as prescribed in the preceding table.

Joints shall be made tight by advancing the nuts with a wrench 180 deg. apart until a tight joint is made.

The Contractor shall provide a "torque wrench" suitable for measuring tension on bolts for at least such a time as the workmen making the joints have gotten the "feel" of the required tension. At no time should handles longer than those supplied by the wrench manufacturer be permitted. The torque range shall be as follows:

⅝" Bolts	45-60 ft. lbs.
¾" Bolts	75-90 ft. lbs.
1" Bolts	80-100 ft. lbs.
1¼” Bolts	105-120 ft. lbs.

After the workmen have become accustomed to this torque, a socket wrench with a 10-inch handle may be used.

The rubber gasket and joint bolts of mechanical joint retainer glands shall be installed in accordance with above. Set screws shall be tightened evenly to

approximately 65-foot pounds for larger diameter. Do not attempt to deflect joint after tightening set screws.

3. JOINTING PUSH-ON JOINT PIPE & FITTINGS: Prior to jointing the pipe and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth, removing all foreign material from the bells, especially the gasket seats. Any burrs or imperfections in that part of the plain end or bell which will be in contact with the gasket shall be removed.

The clean rubber gasket shall be inserted in the bell and a thin film of lubricant shall be applied to the inside surface of the gasket.

The cleaned plain end shall initially be entered in the bell straight.

The plain end shall be forced inside the gasket and bell until it strikes the end of the interior of the bell, after which the end of the pipe shall be moved sideways or up eight (8) inches to move it slightly away from home to allow for expansion and to provide flexibility to the completed line. The pipe may then be deflected as prescribed in the preceding table.

Lubricants are normally supplied by the pipe manufacturer in sufficient quantities. No substitutes shall be made.

The Contractor shall furnish such jacks or other devices as are necessary for forcing the pipe into the bell and gasket. Care shall be exercised to avoid damage to the pipe where the pushing device or machine part contacts the pipe. A wood block or suitable pad shall be placed between the pipe and that part of the pushing device which contacts the pipe.

All plain ends that enter a push-on bell shall be beveled at 30 deg. for at least ⅛ inch. All cut pieces or ends of pipe of other classifications shall be so beveled.

4. INSTALLATION OF PVC JOINTS: Both bell and plain end of pipe shall be thoroughly cleaned before attempting to joint the pipe.

Place rubber gasket in bell if not delivered from supplier in place. The colored side of gasket shall be to the outside.

Lubricate the plain end (do not lubricate the bell end) with approved lubricant and insert plain end into the bell until stop mark on plain end is flush with the end of the bell. In the case of pipe which has two marks on the plain end, insert plain end into bell so that only one mark is visible.

When the pipe is cut, the plain ends must be beveled similar to the bevel on full lengths. After beveling, stop marks must be applied to the ends. Use the plain end of another piece of pipe or fitting to determine the location of the stop mark

and mark the piece of pipe that has been cut.

Pipe shall not be exposed to sunlight for more than one (1) day, therefore it must be backfilled or protected the same day it is delivered to the job.

The joints shall be inserted as far as possible on each side of valves that are inserted in the line.

5. INSTALLATION OF WATER MAINS BY DIRECTIONAL BORE:

A. General.

1. Determine drilling length and equipment pull strength for type of soil encountered.

2. Provide method to control line and grade.

   a. Provide and maintain instrumentation that accurately locates pilot hole.

   b. Drill pilot hole along path following Drawings to these tolerances:

      1) Vertical alignment plus or minus 0.5 foot. Vertical path of pilot hole must not establish new high points not shown on Drawings.

      2) Horizontal alignment plus or minus 1.0 foot.

   c. Include electronic monitoring of horizontal and vertical drilling head location. Obtain accuracy range within 1 inch of actual position of pipeline. Record position readings at maximum of 10 foot intervals.

   d. At completion of pilot hole drilling, furnish tabulations of horizontal and vertical alignment to Engineer.

3. When water is encountered.

   a. Provide and maintain dewatering system of sufficient capacity to remove water.

   b. Keep excavation free of water until backfill operation is in progress.

   c. Perform dewatering in manner that removal of soils particles are held to minimum.

4. Maintain close observation to detect settlement or displacement of surface and adjacent facilities.

   a. Notify Engineer immediately if settlement or displacement is detected.

   b. Maintain safe conditions and prevent damage.

B. Drilling Operation.

1. Drilling Fluids.
   a. Maintain drilling fluid in bore hole to increase stability of surrounding soil and reduce drag on pulled pipe.

   b. Dispose of drilling fluid and other spoils at location following laws, ordinances, rules, and regulations of local jurisdiction.

   c. Transport excess fluids and other spoils to disposal site, at no additional cost to the Owner.

   d. Minimize drilling fluid at locations other than entry and exit points. Immediately clean up any drilling fluids that inadvertently surface.

   e. Provide clean water for drilling, at no cost to the Owner, at Engineer's requirement.

2. Pilot Hole Drilling.
   a. Angle entry hole so that curvature of pilot hole does not exceed allowable bending radius of specified pipe.

   b. Be able to make a turn of up to 90 degrees and maintain curvature not to exceed allowable bending radius of specified pipe.

   c. Alignment Adjustment and Restarts.
      1) Follow pipeline alignment on Drawings within tolerances specified herein. Before adjustments, notify Engineer for approval.

      2) Notify Engineer when forward motion of operation is stopped by an obstruction.

      Abandon in place with drilling fluid, unless Engineer directs otherwise.

      Upon Engineer's approval, attempt second installation at approved location or excavate at point of difficulty and install specified pipe by trench method.

      3) Withdrawals, abandonments, and restarts are at no additional cost to the Owner.

      4) Exercise caution including, but not limited to, locating, drilling downholes (test pits) to observe drill stems or reamer assembly to clear other existing utilities at locations following Drawings.

      5) Minimum depth shall be (3) feet to the top of the carrier pipe. Extra vertical depths needed to avoid existing utilities and or obstructions will be at no additional cost to the Owner.

C. INSTALLATION

Installing Specified Pipe.

1. Provide a swivel to reaming assembly and pull section of pipe to minimize torsional stress on pull section after drilling pilot hole.

2. Hold reaming diameter to 1.5 times outside diameter of specified pipe being installed.

3. Protect pull section as it proceeds during pull back so it moves freely and is not damaged.

4. Pull detection wire along with specified pipe and establish continuity with approved connectors.

5. If connecting to adjacent pulled or non-pulled section of HDPE pipe, allow pull section of pipe to extend past termination point. Make tie-ins the next day after pullback of HDPE pipe.

6. Test pit pipe installation to verify horizontal and vertical alignment at Engineer's direction.

   a. One test pit for every 500 feet along length of pipeline.

   b. Engineer may order additional test pit for each test pit that reveals pipeline installation is not in compliance with Contract Documents at no additional cost to the Commission.

7. Replace portions of pipeline not in compliance with Contract Documents at Engineer's direction and at no additional cost to the Owner.

D. MEASUREMENT AND BASIS OF PAYMENT

The directional bored pipeline, complete in place, will be measured for payment in linear feet as shown on the plans or according to the linear feet of the surface material where the bore was approved. Installation of the pipeline will be paid for at the unit contract price per linear foot as provided in the Proposal and Bid Schedule.

Payment of the unit contract price will be the total compensation for furnishing all labor, pipe, fittings, tools and incidentals and performing all work that is necessary for the installation in accordance with the plans and the provisions of the specifications.

SECTION 3 - PIPE & FITTINGS (WATER)

3D - Appurtenances

1. GATE VALVES:

A. General: Gate valves, two (2) inches through twenty-four (24) inches shall be designed for a working pressure of 200 psi. Valves shall conform to AWWA C500 with iron bonnet (bronze mounted), nonrising stem double-disc (parallel seat type), o-ring stem seals and 2" x 2" square operating nut. Valves shall open when the operating nut is turned to the left (counterclockwise). Valve ends shall be mechanical joint complete with accessories or as specified. Tapping valves shall conform to above specifications except that the connections shall be ANSI B16.1, Class 125 flange on one side (inlet) and mechanical joint on the other (outlet) or as specified. Tapping Sleeves are to be Grade 304 Stainless Steel.

All gate valves shall be model A-2360-20 as manufactured by the Mueller Company or approved equal.

B. Valve Boxes: Valve boxes shall be the H-10346, 562-A, two-piece, screw type, 5½" shaft, 24-36" extension, with drop cover marked water as manufactured by the Mueller Co. or equal. Valve boxes shall be set vertical and concentric with the valve stem. Any valve box which is so moved from its original position as to prevent the application of the valve key shall be satisfactorily reset by the contractor at his own expense. A concrete pad of the dimensions shown on the details of the plans shall be poured around all valve boxes.

C. Installation of Valves: Valves shall be jointed in accordance with the methods of jointing pipe as specified elsewhere herein. Valve stems shall be plumb and there shall not be any obstructions which will prohibit the installation of valve boxes directly over the stem.

Concrete anchor collars shall be provided around an adjoining length of pipe for all valves 16-inches in diameter or larger and for smaller valves when specified on the Plans. Mechanical joint retainer glands shall be installed on all valves with mechanical joint ends 12-inches in diameter or larger when cast iron or ductile iron pipe is specified and for smaller valves when specified on the Plans. All valves shall be cradled in concrete with an adequate bearing area to prevent differential settlement between the valve and pipe.

When the distance between the valve operating nut and the finished surface exceeds five (5) feet, a valve stem extension shall be provided.

The stem shall be round steel bar stock at least 7/8 inch in diameter with a 2-inch square operating nut attached to the upper end and of length adequate to reach from the valve operating nut to a point within 18-inches to 12-inches of the finished surface. A box wrench made from steel ¼ inch shall be welded to the lower end of the stem extension which will fit over the valve operating nut. the stem extension shall be attached to the valve operating nut by a ¼ inch bolt which shall pass through the stem extension box and the valve operating nut. The hole for the ¼ inch nut shall be ⅜ inch in diameter. A round center guide made from 3/16 inch or ¼ inch steel plate shall be welded to the valve stem extension approximately 6 inches from the upper end. the diameter of the guide shall be slightly smaller in diameter than the inside diameter of the valve box. shop drawings shall be submitted to the Engineer for approval prior to installing stem extension pieces.

2. AIR RELEASE VALVE:

A. General: The air release valve shall have a combination of large and small orifice units for allowing air to enter or exit the transmission main. The valve shall have a cast iron body and the only moving part shall be a stainless steel ball. The valve shall be capable of fully automatic operation within the full range of pipeline operating conditions and shall not blow shut or collapse the ball during operation. The large orifice seat shall be replaceable.

Normal operating pressure shall be less than 150 psi. All valves shall have flanged inlets and outlets. The valve flange shall be 125 pound and conform to ANSI 16.1 for 150 psi working pressure.

The valve shall be in every way similar to a APCO Model 50C manufactured by APCO Valve Corp., Schaumburg, IL, or approved equal.

B. Connection: Each valve installation shall include a flanged butterfly valve installed below the air release valve between the release valve and the pipeline. The butterfly valve shall be a Pratt Model 2FII, or approved equal.

The butterfly valve shall have a handle operator, mechanical stops and position indicator.

All piping shall be ductile iron, Class 50.

C. Location: The valves shall be installed at locations shown on the plans or as directed by the Engineer.

3. BLOW-OFF VALVE INSTALLATION: Blow-off valves shall be installed at the locations shown on the plans. The unit price shall consist of furnishing and installing all required materials including gate valves, cast iron piping and fittings, and concrete required for blocking and performing all operations necessary for the installation of a blow-off valve in accordance with the details shown on the plans.

4. FIRE HYDRANTS:

A. General: Hydrants shall conform to AWWA C502, the following specifications, and shall be F.M. approved and U.L. listed and be the Standard Fire Hydrant, Catalog Number A-401, manufactured by the Mueller Company, Chattanooga, Tennessee, or equal:

Working pressure	Minimum 150 psi
Size of Valve Opening	Minimum 5"
Diameter of Inlet Connection	6"
Type of Inlet Connection	Mechanical Joint
Number & Size of Hose Connection	2 – 2½", 1-5"
Nozzle Arrangement	All in same plane
Nozzle Thread	ASA Standard
Nozzle Cap Chains	None
Nozzle Cap Washers	Rubber
Direction to Turn to Open	Right (counter clockwise)
Shape & Size of Operating & Nozzle Cap Nut	5-sided, 1¼" from flat to point
Color above ground-barrel & dome	Safety Yellow
Color, Nozzle Caps & Top Nut, including shield	Color selected by Owner

B. Setting Hydrants: Hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and the bottom section up to the main valve.

The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

Hydrants shall be located a safe distance from driveways, roadways and narrow type sidewalks and in a manner to provide complete accessibility and they shall stand plumb with nozzles at proper elevation.

The Contractor shall, if necessary, rotate the hydrant barrel or nozzle section at the flanged joint to obtain the desired nozzle position as specified by the Engineer.

The bowl or bottom of the hydrant shall be supported firmly on the bottom and shall be well braced against unexcavated earth on the back side. Stone slabs, concrete blocks, or other suitable material may be used to block the hydrant. If considered necessary by the Engineer, the hydrant shall be tied to the branch pipe with suitable rods or clamps. These rods or clamps to be furnished by the Contractor without additional compensation.

A drainage bed shall be provided under and around the base of the hydrant of at least six (6) cubic feet in volume and extending at least six (6) inches above the drain outlet and shall consist of gravel or broken stone mixed with coarse sand thoroughly compacted. Under no circumstances shall the waste outlet on the hydrant or the drainage bed be connected to a sewer.

Backfilling and tamping around hydrant barrels shall be continuous in operation.

After installation and before being tested and placed in service, fire hydrants shall be covered with a cloth or water-resistant sack.

5. MEASUREMENT AND PAYMENT. Completed installations of appurtenances in accordance with the plans and specifications including bolts, gaskets, flanges, blocking, piping, and other incidentals shall be paid for at the unit price as provided in the Proposal and Bid Schedule.

SECTION 4 - RESTORATION OF SPECIAL SURFACES

1. DESCRIPTION: This section covers replacement of special surfaces including private drives and parking areas.

   Restoration of other surfaces is covered under Section 1A - SITE WORK.

2. BACKFILL UNDER SPECIAL SURFACES: Backfill under special surfaces shall be specified in Section 1B - TRENCH EXCAVATION AND BACK-FILLING of these specifications as modified herein.

   Backfill from 6-inches above the pipe shall be made of suitable materials from the spoil bank brought up in compacted layers not exceeding 6-inches in depth of loose material. Compaction of backfill shall be carefully and thoroughly done so as not to displace utility lines from their original positions. All the backfill materials shall be at optimum moisture and shall be thoroughly compacted to 90% of the maximum density as determined by the Modified Proctor Compaction Test. However, the top 6-inch of the backfill shall be compacted to 95% maximum density as determined by the Modified Proctor Compaction Test.

3. ASPHALT PAVING REPLACEMENT: After the backfill material has been brought within 10" of the finish surface, the material on either side of the trench shall be removed for a horizontal distance of 6" from the widest point of the trench to a depth of 10". This will provide a shoulder of undisturbed bearing along each side of the trench 6" wide. The cut shall have a uniform width as nearly as is practicable, and shall be made perpendicular to the surface of the pavement in order that the repair shall result in a uniform, neat appearance. If the surface is asphalt, 8" of gravel base (SB-2) will be placed to within 2" of the surface. The surface will be tack coated and surfaced with 2" of hot mix asphaltic concrete meeting the Arkansas Department of Transportation specifications. The above requirements shall apply for all pavement thickness up to and including the thickness outlined above, but in no case shall the total thickness of repairs be less than the total thickness of the pavement in each individual case.

4. CONCRETE PAVING REPLACEMENT: See Plans.

5. MEASUREMENT AND PAYMENT: Restoration of special surfaces will be based on a linear foot basis and be paid for at the unit price specified in the bid proposal. Special surface restoration will not be measured for payment unless the edges have been evenly saw-cut.

SECTION 5 – TESTING AND STERILIZATION

SECTION 5A- WATER

1. DESCRIPTION OF WORK: The work to be performed under this section of the specifications shall consist of furnishing all labor, materials, and equipment necessary to test and sterilize the water main as specified herein.

2. HYDROSTATIC TEST: After the pipe has been laid for at least seven (7) days the line shall be tested in such sections approved by the Engineer. The Contractor shall furnish all labor, materials, tools, and equipment required to bulkhead and seal off the line for testing, fill it with water, raise the filled line to test pressure and measure both pressure and leakage over the test period.

   The entire length of the installed line shall be field tested in accordance with all AWWA formulas and for water tightness in the following manner: The section of the line to be tested shall be filled with water and allowed to stand for such time as is required for the cement lining of the pipe to absorb such water as it will and for the escape of all air from the line. During the filling of the line, care shall be exercised to see that all air vents are open and all bulkheads, valves, manholes, connections, etc. in the section undergoing test shall be carefully examined for leakage. All known leaks shall be stopped, regardless of these test requirements. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the owner.

   The test shall consist of raising and holding the hydrostatic pressure in the test section to 150 psi. Such pressure shall be maintained for a period of not less than two (2) hours, during which time the water pumped into the line to maintain the test pressure shall be accurately measured in a satisfactory manner.

   Water Mains shall be Hydrostatic Tested per AWWA C605 (latest revision) leak test for PVC. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$Q = \frac{LD\sqrt{P}}{148000}$$

   in which Q is allowable leakage, in gallons per hour; L is the length of pipe tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the hydraulic test, in pounds per square inch gage.

In the event any section of the line tested fails to meet the above specified requirements for water tightness, the cause of the excessive leakage shall be determined and remedied to the satisfaction of the Engineer, at the expense of the Contractor, including retesting. The section of line that fails to meet the requirements for water tightness shall be completely removed and replaced with new pipe and fittings. Unless previously approved, in writing, by the Engineer, full circle clamps and couplings shall not be used to remedy leaks. Knock-ons's and other slip style repair couplings will NOT be accepted.

It shall be the responsibility of the Contractor to provide the necessary outlets for testing the pipeline.

Water mains shall be pressure tested within 45 days of installation, unless written approval, extending said timeframe, is received from the Engineer. Request for extension shall be in writing from the contractor and shall include the following information: location of main, including beginning and ending station numbers, reasoning for time extension request, as well as, a new scheduled date of completion for the pressure testing requirements. Engineer reserves the right to grant or deny each request on a case by case basis. Should contractor fail to provide a passing pressure test within the allotted time period, the Engineer and/or Owner reserves the right to direct the Contractor to discontinue installing any new water mains until the section of main in question passes all pressure testing requirements.

3. STERILIZATION: Prior to sterilizing, each valved section of the new pipeline shall be pressure tested and flushed with clean water from the existing system to remove all apparent evidence of dust, soil and fine debris which may have entered the line during construction and testing.

All disinfection to be in accordance with AWWA standard C651(latest revision). Chlorine shall be used to sterilize the pipeline by the following method: The amount of chlorine applied shall be such as to provide a dosage of not less than fifty (50) parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Engineer. After a contact time of not less than twenty-four (24) hours, the system shall be flushed with clean water until the residual chlorine content is not greater than 0.2 parts per million. All valves in the lines being sterilized shall be opened and closed several times during the contact period.

A minimum of three (3) samples shall be collected and submitted for analysis to the State Board of Health for each segment of water line installed. No water main shall be placed into service until satisfactory test reports have been received.

Water mains that have previously passed the hydrostatic pressure testing requirements shall be sterilized and have satisfactory test results back from the

Arkansas Department of Health within 10 working days of passing said pressure test. If samples are not satisfactory, contractor shall immediately re-sterilize the main, and re-sample per guidelines previously stated in this section. Should the contractor fail to receive satisfactory test results within the above allotted time period, the Engineer and/or owner reserves the right to direct the Contractor to discontinue installing any new water mains until the section of main in question passes all testing requirements from the Arkansas Department of Health and is then placed into service.

Unless otherwise provided for in the Bid Schedule and Proposal, the cost of furnishing the chlorine, labor, tools, equipment, and test of chlorine content and bacteriological tests shall be at the expense of the Contractor.

4. MEASUREMENT AND PAYMENT: Testing and sterilization will be paid for at the price shown in the Proposal. All temporary connections between the existing water mains and the proposed water mains for the purpose of flushing and testing is the sole responsibility of the contractor and is not a pay item. Proposed connection locations must be approved by the Engineer or his representative prior to installation and said connections must be completely removed prior to substantial completion.

   Water mains that have passed the testing and sterilization requirements set forth in this section, shall be placed into active service within 5 days of passing said testing requirements.

SECTION 6 - HIGHWAY & RAILROAD CROSSINGS

1. DESCRIPTION OF WORK: This section of the specifications shall comprise the furnishing and installing of pipe under existing railroads, streets, and highways, as designated on the plans and described herein. The work shall include all excavation and backfill incidental to the installation.

2. MATERIALS: When encasement pipe is required, the pipe for bored crossings shall be of the length and size shown on the plans and be constructed of smooth-wall welded steel pipe as follows: Steel encasement pipe shall be smooth-weld steel pipe of the size and thickness shown on the Plans and shall conform to the requirements of ASTM A139-68, Grade B.

3. CONSTRUCTION METHODS: Bores may be made by "wet" or "dry" boring methods unless a dry bore is specifically called for on the Plans. Wet bores may be used at all locations where alternate boring methods are not called for on the Plans providing (1) soil conditions encountered are suitable and there is no danger of damage to above structures and (2) the specific permit from the Highway Department or railroad company does not prohibit "wet" bores.

   The minimum length of carrier and/or encasement pipe shall be determined as

indicated on the plans. Individual encasement pipe sections shall be welded together to prevent leakage. The ends of the encasement pipe shall be plugged with a rubber boot, or brick and mortar, at the Engineer's direction, to prevent entrance of excessive ground water.

No trench excavation shall be carried closer than 10 feet of highway pavement edges and 5 feet of all other pavement edges. No dirt from trench excavation shall be piled on roadway shoulders. All trench backfill shall be mechanically tamped to same density as surrounding ground. Before completion of this proposed work, all roadway shoulders, slopes, ditches and berms shall be restored to their original position. If the tunnel is greater in size than 5% of the encasement pipe diameter the void area between the outside of the encasement pipe and the tunnel wall shall be filled with HOLEPLUG as manufactured by Baroid Industrial Drilling Products or approved equal.

The entire operation of tunneling and setting pipe shall be carried out subject to the inspection and approval of the Engineer and by the Agency having jurisdiction. Adequate means shall be provided to keep the work free from water.

The Contractor shall notify the Railroad Company or Highway Department of his construction schedule not less than 5 days prior to commencing work on the right-of-way of the Railroad Company or Highway Department as to the details of construction methods at the time of construction.

Where PVC carrier pipe is installed within encasement pipe, the carrier pipe shall be banded with treated wood blocks at intervals of approximately 10 feet to carry the weight of the pipe and prevent it from resting on the pipe bells.

4. MEASUREMENT AND PAYMENT: Highway and railroad crossings will be based on a linear foot price from the face of each bore pit where the bore begins and ends. The pay item shall consist of furnishing all tools, equipment, materials, and labor including encasement pipe where indicated, carrier pipe, and appurtenances necessary to install water main under roadways and/or railroads at locations shown on the plans.

I. INTRODUCTION

The City of Perrytown (The Buyer) is located in Hempstead County, Arkansas. Currently the Buyer has approximately 60 Water Customers. The system is a mix of City and Rural applications.

The Buyer wishes to procure a system that has the ability to provide the following:

1) Provide hourly interval data if interrogated.
2) Replace existing water meters and increase the accuracy of the reads associated with the system
3) Increase the efficiency of the water system, lower operating costs and aid in Customer Service
4) Proposed System shall be a fixed-base AMI system, and include the host software and technology. In Fixed Base Mode the system shall be fully two-way allowing the system to actually poll the transmitter for a current read (Polling of the stored data in the collector shall be unacceptable)
5) Proposed system must provide for leak detection on the customer side, and help support leak detection capabilities on the distribution side.
6) The Driveby System shall have multiple means of reading available to the Utility. A Primary and an alternate reading means to use in the event of an emergency.

II. GENERAL CONDITIONS.

1. Reservations:

The City of Perrytown, or the "buyer," reserves the right to reject any or all RFP Responses or any part thereof and/or to waive formalities, if such action is deemed to be in the best interest of the buyer.

The buyer is requiring a proposal for all necessary components to acquire an AMI system project. The Proposer must include all components and be willing to supply any component of the RFP which the buyer in its sole discretion shall award; the buyer will accept only those components that are deemed to be in its best interest. The buyer understands that product choice will affect other components (ex: meters and registers etc.) and as such requires that all components awarded under this RFP shall be from the same Proposer.

The buyer reserves the right to cancel any contract, if in it's opinion, there be a failure at any time to perform adequately to the Terms and Conditions and equipment specifications outlined in this RFP, or in case of any attempt to willfully impose upon the buyer materials or products or workmanship which are, in the opinion of the buyer, of unacceptable quality. Any action taken in pursuance of this stipulation shall not affect or impair any rights or claim of the buyer to damages for the breach of any covenants of the contract by the successful Proposer. The buyer also reserves the right to reject the RFP and/or any Proposer who has previously failed to perform adequately after having been awarded a prior contract for this or any other Buyer.

Should the successful Proposer fail to furnish any item or items, or to complete the required work included in the RFP, the buyer reserves the right to withdraw such items or required work from the operation of the RFP without incurring further liabilities on the part of the buyer thereby.

All items furnished must be completely new and free from defects unless specified otherwise. No other items will be accepted under the terms and intent of the contract.

Upon Award of the project the Buyer and Proposer shall enter into negotiations for an executable contract.

2. Quotations:

Proposer must choose its single best solution that meets the specification for this project. Proposers must determine for themselves which solution to offer. If a Proposer should submit more than one solution, this action will result in the Proposer being deemed non-responsive and the RFP response being rejected.

3. No Deviations To Specifications Allowed:

The Specifications outlined in this RFP are desired by the Buyer. Deviations to this specification shall be listed and provided to the Buyer with the proposal. Any products not meeting specification will be grounds for rejection. Buyer intends to hold the

Proposer strictly accountable to the specifications as written. Listed deviations will be considered in the proposal evaluation.

4. Cartage, Freight & Transportation Charges:

No charge will be allowed for cartage or packing unless by special agreement. Unit prices shall include freight and delivery charges to locations as specified by the buyer.

5. Taxes:

Buyer shall pay sales, use, consumer, and like taxes, when applicable. Proposer shall be responsible for securing at its sole expense any other necessary approvals, easements, assessments, or required zoning changes. Buyer shall be responsible for personal property taxes and real estate taxes on the Project. Proposer shall be responsible for all taxes measured by Proposer's income

6. Warranty:

All equipment, accessories, and component parts shall be guaranteed by the Proposer to be free of defects in workmanship and design and to operate as specified and intended. The manufacturer's standard warranty or a minimum one year warranty, whichever is greater, shall be given to the buyer at time of acceptance. The effective date of the warranty shall be the date of acceptable delivery by the buyer. Minimum equipment shall meet or exceed parameters outlined in Appendix A.

COPIES OF THE MANUFACTURER'S WARRANTY SHALL BE INCLUDED WITH

EACH RFP RESPONSE.

If, within the guarantee period, any defect or signs of deterioration are noted, which, in the opinion of the buyer, are due to faulty design and installation, workmanship, or materials, upon notification, the successful Proposer, at their expense, shall repair or adjust the equipment or parts to correct the condition, or they shall replace the part or entire unit to the complete satisfaction of the buyer. These repairs, replacements or adjustments shall be made only at such time as will be designated by the buyer as least detrimental to the operation of the business. Any part which fails to meet the warranty shall be replaced free of charge for materials, handling, or shipping charges.

7. Collusion:

The Proposer, by affixing their signature to the RFP, agrees to the following: Proposer certifies that the proposal is made without any previous understanding, agreement or connection with any person, firm or corporation making a proposal for the same items, and is in all respects fair, without side control, collusion, fraud or otherwise illegal action.

8. Interpretation:

Should any Proposer have any questions as to the intent or meaning of any part of this RFP, he should contact the buyer 48 hours (min.) prior to Buyers receipt of proposals in time to receive a written reply before submitting his response.

9. Errors In Proposals:

Proposers or their authorized representatives are expected to fully inform themselves as to the conditions, requirements, and specifications before submitting their response. Failure to do so will be at the Proposers own risk and cannot secure relief on the plea of error. Neither law nor regulations make allowances for errors by either omission or commission on part of the Proposer. In case of error in extensions or price in the bid, the unit price shall govern.

It shall be the responsibility of the Proposer to make sure that his response arrives at the proper place and time as required in the RFP. The buyer takes no responsibility for response mailed to the wrong place, or for response received late due to error or delay caused by the Postal Service. The Proposer should allow himself ample time and opportunity when hand carrying a response to the proper place, so that the response will be received on time.

10. Federal And State Laws:

All items (equipment, products, accessories, and services) supplied by the Proposer shall comply with all Federal and State standards, applicable and effective on the date of acceptance. All items must meet or exceed all existing Federal, State, and Local health, safety, lighting, emissions, and noise standards.

11. Service Manuals:

The successful Proposer shall supply the buyer with two copies of the operation and service manual.

12. Title Papers:

All title papers shall be made out to the buyer and delivered to the Mayor or his authorized representative.

13. Service after the sale:

Proposers shall list the name and address of the nearest authorized service location. Proposers must provide service phone number and describe the hours of operation.

14. Equipment Specifications:

Proposed equipment must meet the specifications and guidelines as stated in Appendix B.

15. Qualified Proposers Only:

It is the intention of the Buyer to value service components after the sale as due and valuable consideration in this RFP. As a provision of this requirement all Proposers shall meet the minimum requirements as follows:

A. Proposer must have previously installed at least 5 mass meter change outs in the last 3 years and must have installed the proposed AMI system in the last 24 months within the State of Texas. Proposer must submit a minimum of 5 references for the installation services provided.

B. Proposer must provide a letter from the factory authorized AMR distributor as to its service and training plans. This Factory Authorized distributor must have a

local facility with a minimum of 5 full-time personnel assigned to it located within 150 miles of the Buyer and capable of stocking future equipment needs of the Buyer, said facility must be staffed and in operation at the time of the Proposal Submission. And said distributor must have an on-staff, factory trained, AMR support specialist with the sole responsibility of providing AMR system support and sales. (Proposer must provide resume of all key support personnel as part of their response)

Proposer must submit evidence of their compliance with this section in their response. All provisions of Section 15 shall be strictly enforced.

16. Ongoing Service Requirements:
Proposer must provide a detailed service plan for the ongoing AMR/AMI solution. Service plan must detail options for providing service & technical support and meter inventory over the product usage period.

17. The evaluation of this proposal will be based on the following criteria:

PRICE	25%
EQUIPMENT QUALIFICATIONS	40%
LOCAL SERVICE AND SUPPORT	25%
QUALITY OF THE RFP RESPONSE	10%

18. Rights of parties: The Buyer retains the right to award or not award the contract or any portion herein to the party most qualified in the city's sole discretion. Responding firms shall have the right to withdraw their response in the event that selection is not made within 90 days or final contracts are not negotiated. In this event, Frenchport Water Association will have the right to choose from other subcontractors or re-list the work as desired.

19. Migrate ability Requirements:
The AMR transmitter proposed must be capable of being read with a fixed base collector with only the addition of a small number of collectors and headend software/server being required. No additional hardware shall be required at the meter box location. In Fixed Base Mode the transmitter shall be fully two-way and able to provide a demand read to the meter transmitter (Two-way to the collector shall not be considered fully two way)

20. Proven System:
The Respondents Proposed Meters and transmitter models shall have been commercially produced and sold in the United States for a minimum of 5 years. Proposer shall provide a reference list of at least 3 customers from the state of Texas using the brand and model of radio transmitter quoted in this response. One customer shall be using the transmitter in a radio read driveby mode, one customer shall be using the transmitter in a fixed base transmitter mode, and one customer shall be have transitioned from a driveby to a fixed base mode using the style and type transmitter proposed. References from customers in the State of Texas are preferred for similar

weather, terrain characteristics. In addition the proposer shall provide an additional reference in the State of Texas using the proposed meter model quoted.

The Buyer wishes to purchase only proven systems and as such does not wish to purchase systems which fail to meet the requirements listed above. As such *the requirements of this section shall be strictly enforced. Failure to comply with this section shall result in the immediate disqualification of Proposers Response.*

21. Bonding Requirements:

Winning Proposer agrees to furnish the Buyer a payment and performance bond guaranteeing the performance of the contract as awarded, in the amount of the contract awarded and a performance period of at least one (1) year from the date of project completion.

22. Installation Aspects:

Proposer shall be required to submit installation of its Transmitters and meters.

The Proposer shall comply with the following conditions:

- Installation guidelines must be included in the Proposer's contract response.
- Installation Proposal must include project management component
- Proposer must submit a minimum of five (5) utilities where he has successfully provided installation and project management services.
- Water meter installation must include installing the equipment field under standard conditions, data collection of required information, and collecting GPS coordinates. Data must be delivered to the Buyer in an electronic format, (Excel, CSV, etc)

23. Installation Guidelines:

As part of this RFP, the Proposer shall submit pricing for the installation of the water meters and endpoints. If selected the Buyer and Proposer shall enter into negotiations for a final contract. The following provisions shall be utilized to establish the basic requirements of the endpoint and meter installation provision.

Installation Responsibilities of the Proposer:

Water Shutoffs. The Proposer, its agents and subcontractors, will be responsible for shutting off the water to each meter serviced as well as notifying each customer of the water shutoff. Some assistance may be required by Buyer with the notification of its customers. The Installation team will knock on the doors of residential customers as well as leave notifications on their doors. In the case of large commercial customers such as: schools, hospitals, nursing homes or any other commercial customer, special efforts will be made to ensure minimum disruption to their water needs. In order to prevent any damage from running flush valves or any other plumbing fixtures that are sensitive to water shutoffs, The Proposer will schedule replacements with these

commercial customers and will notify the maintenance personnel when turning the water back on at these facilities. Regardless of any effort of the Proposer, ultimate responsibility of any and all fixtures inside buildings will remain the responsibility of the end user and/or Buyer as detailed in any Service Contract that exists between Buyer and its Customers.

Meter Boxes, Vaults, and Roadways. The Proposer is responsible for repairing any damage it causes to meter boxes, vaults that result from the installation of the Project; the Proposer shall not be liable for pre-existing conditions or leaks. The Proposer may install new meter boxes as part of the project as authorized by the Buyer, if this work is requested it shall be billed per item at a rate established by negotiation prior to installation. Boxes shall be plastic boxes with lids. Some areas of concrete and other hard surfaces may need to be broken-up in order to gain access to meters. If this is the case, the affected area will be restored to a condition as close as possible to the condition as it existed prior to installation at no additional cost to the Buyer.

Disposal. The Buyer will work with The Proposer for the disposal of all waste, debris and materials from the installation of the Project. The Proposer shall collect and dispose of all debris from the work area The Buyer shall establish a storage location for any goods they wish to salvage. In the event that the pricing depends on a loyalty program, the meter register will be left in the meter box and the Proposer will return the meter for exchange.

Liability. The Proposer is responsible for any damages that occur within 6" on either side of the water meter resulting from the Project installation. Any damages incurred within this 6" area will be promptly repaired at the expense of the Proposer. The Proposer is not liable for damages outside the 6" zone, either on the water distribution side or on the customer side incurred from the Project installation including shutoff, temporary outage, and restart of water service. The Proposer is not liable for any pre-existing conditions including leaks, faulty workmanship and materials from previous projects or rust. Should such conditions occur (*i.e* .leaks) the Proposer may document them and at Buyer's written request repair them for a negotiated price.

Programming and other required Work: The Proposer shall be responsible for properly programming the transmission mode for each AMR Endpoint, and mount each transmitter through the pit lid. Each endpoint shall be mounted through the pit lid to optimize the performance of the system. The Contractor is responsible for drilling or cutting holes in all Metal and plastic lids. In the event that concrete or other lids are not drillable, lid replacement may be required or if allowed by the customer mounting the endpoint high in the box on a piece of rebar or like material may be permitted on a limited basis at the utilities discretion.

Non-Covered Work. Contracted meter change outs contemplate a standard meter change out. In the event that locations conditions require nonstandard work (i.e. move a service location etc., move fences for or other customer structures & items for access, install systems in heavy traffic locations alleys, parking lots, resize or re-plumb services,

etc.), The Proposer and the Buyer will discuss pricing and work may proceed from this point or the Buyer may elect to excuse this work from the project.

Data integration. The Proposer shall be responsible for the integration of all data collected with its Implementation system and shall configure its software to interface with the Buyers Import/Export file.

Data Management: The Proposer or its agents shall be required to acquire certain data as it completes the aforementioned installation work. This data shall include, the previous meter reading, the current meter reading, the new meter serial number, the new register serial number, the transmitter serial number, GPS coordinates for the location of the work. This information will be acquired and delivered to the Buyer in an electronic form.

During the installation the Proposer must provide electronic data management. Information gathered in the field must be available to the Buyer in an electronic format. Preliminary Required information to be collected shall include:

- Old Meter Reading
- New meter Serial Number
- New Register Serial Number
- New Transmitter Serial Number

Meter GPS coordinates 2-5m accuracy

Warranty: Proposer shall warrant to the buyer that all Work and Services provided by the Proposer shall be performed by the Proposer in a workmanlike manner and in compliance with any specifications set forth in the negotiated contract, with such warranty to expire one year from the date when such Work was performed or such Services were provided (the "Warranty Period").

Responsibilities of Buyer during Installation.

(a) Owner-Furnished Data. Buyer shall provide the Proposer all technical data in Buyer's possession, including previous reports, maps, surveys, and all other information in Buyer's possession that the Proposer informs Buyer's representative is necessary as it relates to Project. Buyer shall be responsible for identifying the location of meters. Should the Proposer require assistance in finding the meter location, Buyer shall locate the meter in a timely manner.

(b) Access to Facilities and Property. Buyer shall make its system facilities and properties available and accessible for inspection by the Proposer and affiliates.

(c) Buyer Cooperation. Buyer support will be required during implementation of this Improvement Measure to obtain access to meter boxes/pits and to coordinate utility interruptions. Buyer will provide notification in its billing to its customers that the Proposer is

performing the designated work and that possible service interruption may result.

(d) Utility Data Integration. Buyer shall provide Proposer with an Import Export file format for its billing software, and ensure it makes necessary Upgrades to its billing system to enable it to accept data from and push necessary data to the proposed AMR and implementation system. Proposer will investigate Buyers existing billing system software and provide all associated costs for upgrades or improvements in the proposal in Bid Item No. 6 to ensure that the Billing system has the necessary file Import/Export capability so that data collected in the field can be accepted by the billing software.

Timely Review. That Buyer through its designated representatives shall examine all invoices, and inspect all completed work by the Proposer in a timely manner. In the event that a Buyer delay results in the lack of a progress payment disbursement, the Proposer may reserve the right to delay further work without penalty until such time as payments are made.

Appendix A
Required Product Specifications

Specifications For Driveby Automatic Meter System

It is the intent of these specifications to specify in detail an Automatic Meter Reading system (AMI) which can be upgraded at a later date as well as the meter requirements of the buyer.

Seamless product warranty: In order to prevent determination of fault arguments, all components from, the actual water meters, encoded registers, AMR transmitters and collectors, shall be of one manufacturer when bid and installed and the proposer shall be the authorized distributor capable of processing warranty claims for the equipment proposed. The Transmitter shall carry a 20 year warranty, (10 full replacement, 10 pro-rated).

Failure of the proposed equipment to meet the minimum requirements and comply with this section shall result in the immediate disqualification of the Proposer.

Non Integrated Radio:
The Automated Reading Technology shall consist of a Radio Transmitter and associated reading equipment. The Transmitter shall be a separate component from the water meter (Transmitters integrated within the Meter Register shall be unacceptable). The Transmitter shall be hermetically-sealed and shall interface with the water meter through an inductive "touch-read" type of connection. Field splicing of wires and modular connectors with exposed copper pins shall not be acceptable. The Transmitter shall mount thru the meter pit lid.

Operating Frequency and Transmission Power:
In order to eliminate any potential communications disruptions, the successful Proposer must provide a system that operates on a primary use (Unshared) FCC license for the communications frequency. The Utility requires that the operating frequency for the AMR system be of a primary-license type, reserved for meter reading exclusively, with The Utility being granted an operational lease of the assigned spectrum. While the 900MHz frequency range is desired, products operating in the "public" portion of this frequency 902-928MHZ- ISM (Industrial, Scientific, Medical) - shall not be Allowed.

Upgradeability:
Although the Utility is only looking to implement a driveby AMR system at this time, the proposed transmitter shall be capable of upgrading to a fixed base mode without any additional hardware at the meter locations. To convert to fixed base mode only the addition of fixed base collectors and headend software and servers shall be required.

Residential Meter Specification(s) 5/8” through 1”

5/8”-1” Water Meters

5/8” – 1” Water meters shall be of a positive displacement design, specifically of the piston-type variety. Meters shall feature a solid-state register. The meter’s register is all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The meter maincase shall be constructed of AWWA accepted low-lead bronze, conforming to NSF-61 annex G.

The register shall feature a 20 year warranty (10 years full replacement / 10 years pro-rated). Registration shall be displayed in a digital, odometer-type format and shall feature a secondary rate-of-flow display. Register shall be secured to the meter using a secure, countersunk and metallic screw-type fastener. The removal tool for such a fastener shall not be made publically available (distribution limited to purchasing utilities). Plastic pins are not acceptable as a means of securing the register to the body of the meter.

The register must be solid state. Electro-mechanical registers, containing gearing or other mechanical parts are not acceptable.

The Register shall feature an ASCII-type AMR output, utilizing an induction-type “touch-read” style of connection to reading devices. AMR Resolution and units of measure shall be programmable. **Register must be capable of transmitting an 8 digit read to allow for reading of 1/10 of a gallon**.

Residential Meter Specification(s) 1 1/2” through 2”

CONFORMANCE TO STANDARDS:

The meter package shall meet or exceed all requirements of AWWA Standard C701 for Class II turbine meter assemblies and exceeds AWWA C700 Residential Standard. Each meter assembly shall be performance tested to ensure compliance. The meter package shall meet or exceed all requirements of NSF/ANSI Standard 61, Annex F and G.

MAINCASES:

The meter maincase shall be of epoxy coated ductile iron composition. The epoxy coating shall be provided as standard fusion-bonded and adhere to NSF for non-lead regulation compliance.

MEASURING CHAMBER:

The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring element comes integrated with the advanced Floating Ball Technology design. The measuring chamber shall be capable of operating within the

above listed accuracy limits without calibration when transferred from one maincase to another of the same size. The measuring shall be so configured to capture all flows as specified above.

DIRECT MAGNETIC DRIVE SYSTEM:

The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. The direct drive system with Floating Ball Technology is designed to extend service life, enhance low flow sensitivity and provide extended flow capacity and overall accuracy of the meter assembly. Any and all additional intermediate, magnetic or mechanical, drive couplings are not acceptable.

ELECTRONIC REGISTER:

The meter's register is all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The electronic register includes the following partial list of features:

- AMR resolution units fully programmable
- Large, easy-to-read LCD display
- 10-year battery life guarantee

MAXIMUM OPERATING PRESSURE:

The meter assembly shall operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).

STRAINERS:

The meter strainer shall be integral and cast as part of the meter's maincase. The strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-bonded epoxy identical to that of the meter's maincase. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and physical dimensions:

STRAIGHTENING VANES:

A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber.

CONNECTIONS:

Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration.

CERTIFICATIONS AND MARKINGS:

All sizes of meter packages shall display the sizes, model, manufacturer name, and direction of flow. Such display shall be cast on the side of the meter maincase.

GUARANTEE AND MAINTENANCE PROGRAM:

Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment. In addition, the meter supplier shall submit nationally published literature clearly outlining its factory maintenance program and current price schedule covering complete measuring chamber exchange.

INTENT:

Subject meter specifications are designed to establish minimum guidelines for selecting an extremely critical metering device. Areas of concern to be evaluated in the selection process include, but are not limited to, ease of installation, operational features and benefits, readability and future system maintenance expense. A design, which reflects longevity of proper operation in all elements and high degree of sustained accuracy within the entire range of the meter assembly, is to be considered mandatory. Enhanced accuracy levels and performance are desired and will not be compromised.

Commercial Meter Specifications through 1 ½"-4"
Turbo & Compound

The meter package shall meet or exceed all requirements of ANSI/AWWA Standard C701 for Class II turbine or Compound meter assemblies as specified. Each meter assembly shall be performance tested to ensure compliance. The meter package shall meet or exceed all requirements of NSF/ANSI Standard 61, Annex F and G.

MAINCASES:

The meter maincase shall be of epoxy coated ductile iron composition. The epoxy coating shall be provided as standard fusion-bonded and adhere to NSF for non-lead regulation compliance.

PERFORMANCE:

The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands.

DIRECT MAGNETIC DRIVE SYSTEM:

The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. The OMNI direct drive system with Floating Ball Technology is designed to extend service life, enhance low flow sensitivity and provide extended flow capacity and overall accuracy of the meter assembly. Any and all additional intermediate, magnetic or mechanical, drive couplings are not acceptable.

Change gears will not be allowed to calibrate the meter. All registers of a particular registration and meter size shall be identical and completely interchangeable. Should meters arrive with registers containing more than one gear combination, the entire shipment will be returned to the manufacturer freight collect and the next responsible Proposer will receive the award.

Measuring Chamber:
The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one maincase to another of the same size.

The Measuring Chambers for both the Compound and Turbo meter configurations shall utilize the same method of measurement and shall be interchangeable within the maincase. The purpose of this shall allow Turbo meter service locations to be upgraded to Compound meters and visa versa without the need for the meter service to be replumbed. Both Compound and Turbo meters shall utilize a drop-in type measuring chamber that allows replacement of the measuring chamber without the necessity of pulling the meter maincase from the service location.

Requirements of this section shall be strictly enforced failure to comply with this section shall result in Proposers Immediate Disqualification.

Electronic Register:
The meter's register shall be electronic and shall not contain any mechanical gearing to display flow and accurate totalization. The electronic register must include the following partial list of features:
● AMR resolution units fully programmable
● The Register must be capable of providing two outputs from one register simultaneously, one encoded output for the AMR/AMI function and one Pulse output for any SCADA or customer output
● Integral data logging capability
● Integral resettable accuracy testing feature
● Large, easy-to-read LCD display
● A minimum 10-year battery life guarantee for the register

To eliminate accuracy loss associated with cross-over Compound meters will utilize a single measuring chamber and all compound meter configurations must provide a single register design. Compound meters which require separate registers for the low-flow and high-flow sides are prohibited and will result in an immediate disqualification.

Maximum Operating Pressure:
The meter assembly shall operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).

Strainer:
The meter strainer shall be integral and cast as part of the meter's maincase. The strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-

bonded epoxy identical to that of the meter's maincase. All fasteners shall be stainless steel.

STRAIGHTENING VANES:
A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber.

CONNECTIONS:
Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3", 4", 6", 8" and 10" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

Guarantee:
Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment. In addition, the meter supplier shall submit nationally published literature clearly outlining its factory maintenance program and current price schedule covering complete measuring chamber exchange.

INTENT:
Subject meter specifications are designed to establish minimum guidelines for selecting an extremely critical metering device. Areas of concern to be evaluated in the selection process include, but are not limited to, ease of installation, operational features and benefits, readability and future system maintenance expense. A design, which reflects longevity of proper operation in all elements and high degree of sustained accuracy within the entire range of the meter assembly, is to be considered mandatory. Enhanced accuracy levels and performance are desired and will not be compromised.

Additional Requirements:

INSTALLATION AND TRAINING:
Complete installation and operating instructions must be included for all of the supplied hardware and software equipment. Response must include any additional costs for training and assistance to install and begin operation of the Radio Transmitter. The vendor will also inform the customer what pre-installation activities are to be completed and what support materials will be needed for the initial installation. Vendor must supply Buyer written notice outlining pre-installation activities, expected routine and ongoing maintenance, and system performance expectations in the form of a description or statement of work.

Advanced Applications:

The Radio system shall have the ability to interface with an Acoustic leak detection system that has the ability to detect leaks in the Buyer's distribution lines and report

them to the Buyer via the Driveby or fixed base system. Acoustic leak detection system shall have the ability to connect via a magnet coupling device and shall be moveable across the system to allow for rapid deployment and removal.

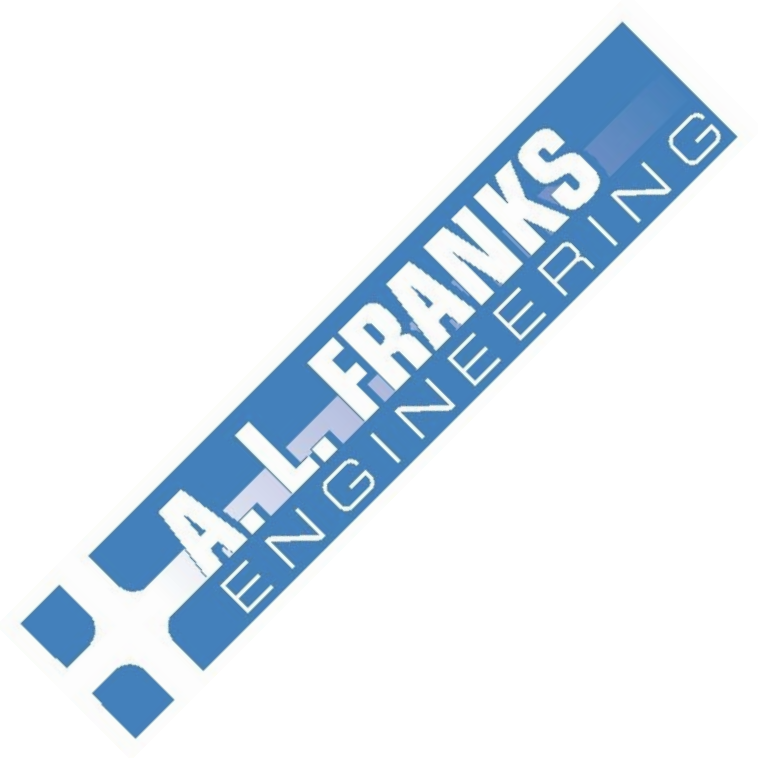

EXHIBIT "A"

STORM WATER POLLUTION

PREVENTION PLAN