Appurtenances ANSI/AWWA C600 (Latest Revision)

Description of Work

The work to be done in accordance with these specifications and the accompanying plans consists of furnishing all labor, materials, and accessories necessary to extend and/or replace the existing water main system as shown on the plans. The work will include: excavation; sheeting, shoring and dewatering as required; furnishing, laying and jointing pipe; making connections with existing water mains as may be required: protecting gas and water services, underground telephone or electric cables; backfilling the trench; and such other work as may be necessary in order that the water main be made serviceable and that the work be completed in a satisfactory manner.

Materials - ZINC COATED DUCTILE IRON PIPE

The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes" -External zinc-based coating -Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01.

All Zinc coated ductile iron pipe shall be centrifuaally cast according to the latest revisions of ANSI/AWWA C151/A21.51. in lengths not less than eighteen (18') feet long. All water mains shall be cement—lined in accordance with ANSI/AWWA C104/A21.4-90

All Zinc coated ductile iron pipe 6" in diameter and larger shall be Pressure Class 350, or Class 50 as determined in accordance with ANSI/AWWA C150/A21.50, unless otherwise designated on the appropriate drawings for a particular installation. In case there is any question as to the class of pipe to be used in connection with a particular installation, it shall be the duty of the party or firm supplying ductile iron pipe to obtain written verification from the Water Superintendent of the classification of pipe in

The bell end of all Zinc coated ductile iron pipe shall be cast for either a mechanical joint or for an approved push—on (slip) joint with rubber gasket, including all joint

An insulated #10 solid copper tracing wire will be required on all water mains and service lines

- Zinc coated Ductile Iron Pipe with Mechanical Joints Zinc coated Ductile iron pipe with mechanical joints, for normal water main installations, shall be complete with accessories, including corrosion resistant bolts and nuts in accordance with the latest revisions of ANSI/AWWA C111/A21.51. The bolts and nuts used with this type of joint shall be made in accordance with the above specifications except the material from which they are made shall be Cor-Ten, Usalloy, Acipcoloy, or approved equal, corrosion-resistant steel

All flexible joints used on river-crossing pipe shall be of "Usiflex" type or approved equal, and shall be equipped with plain rubber gaskets.

- Ductile Iron Pipe with Push-On Joints

Zinc coated ductile iron pipe with push-on (slip) joints shall be complete with appropriate rubber aasket in accordance with the latest revisions of ANSI/AWWA C111/A21.11.

Pipe with this type of joint shall be furnished and installed with at least two (2) serrated brass wedges in each joint, for 3" through 12" pipe; four (4) for larger diameter pipe, or the rubber gasket shall be made with three or more contact strips molded into it (or other approved method) to effect conductivity of electricity across the joint for thawing purposes. The wedges or strips shall be of sufficient size and number to carry a minimum of four hundred (400) amperes of direct current and to limit the voltage drop to not more than one—tenth (1/10) of one (1) volt per joint, and there shall be no perceptible temperature rise and no evidence of smoking, arcing or fuming.

All fittings connected to zinc coated ductile iron water mains shall be mechanical joint or push—on joint ductile iron, made in accordance with the latest revisions of ANSI/AWWA C110/21.10 and ANSI/AWWA C111/A21.11, and with Sections 1.1.2 and 1.1.3 of this specification, and cement-lined according to the latest revisions of ANSI/AWWA

PVC PRESSURE PIPE:

C104/A21.4.

of the latest revision of ANSI/AWWA C900. PVC water main shall be manufactured from compounds conforming to PVC cell classification of 12454 as defined in ASTM D1748. PVC C900 pipe shall conform to DR18 (235 P.S.I.). Pipe shall be furnished in twenty-foot lengths. 2. Restrained Joint PVC pipe shall utilize either JM Eagle Eagle loc 900 restrained joint system or Certain Teed Certa—Lok restrained joint system or equal approved by Water Superintendent 3. Fittings to be used with PVC pipe shall meet all the requirements of the latest revision of ANSI/AWWA C110/A21.10. 4. Mechanical restraint devices for PVC pipe shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Twist off nuts be used to insure proper actuating of the restraining devise. Restrained mechanical joints for PVC pipe shall be Megalug, Series 2000PV by EBAA Iron, or approved equal by Water Superintendent. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low alloy steel having the characteristics specified in ANSI?AWWA C111/A21.11. 5. PVC pipe shall incorporate a formed bell complete with a single rubber gasket conforming to ASTM F477. Joints shall be designed to meet the zero leakage test requirements of ASTM

1. PVC pressure pipe water main shall meet all the requirements

6. Pipe shall be marked per AWWA C900 and shall include as a 1. Nominal size

3. Dimension Ratio. Standard Dimension Ratio or Schedule 4. AWWA presure class or rating 5. AWWA Standard designation number

6. NSF-61 mark verifying suitability for potable water service 7. Manufacturer's name and date. 7. All PVC pipe used for potable water lines shall be BLUE in color. Pipe shall be new, manufactured within the last 12 months as determined from the date stamp on the pipe and free from defects. Pipe will be rejected if surface chalking from UV exposure is visible. Pipe O.D. shall be the equivalent to ductile iron pipe of same nominal size. Maximum length of each PVC section of pipe between elastomeric rings shall be 20 feet $(\pm 1")$ fo all sizes. An insulated #10 solid copper tracing wire will be required on

Installation

All water mains, fittings, hydrants, and valves shall be installed in accordance with ANSI/AWWA C600latest revision, unless otherwise specified.

All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the owner or his representative.

All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign materials before the pipe is laid.

The excavation shall be at the locations as shown on the plans. The trench shall be excavated so that the pipe can pe laid to such alianment and depth that a minimum of 5'-0" earth cover is maintained over the top of the pipe, and as per City Ordinance a maximum depth of 6.0 feet. Trenches for water mains shall be excavated such that the walls of the trench are vertical from the bottom of the trench to a point one foot above the top of the pipe. Trench width shall be no more than two feet greater than

the outside diameter of the pipe being laid. Trench preparation shall proceed ahead of the pipe-laying operation no further than the maximum distance allowed by the relevant governmental agencies.

Sheeting, Shoring, and Bracing

All trenches and other excavations shall be properly sheeted and braced, when and where necessary to provide safe working conditions and to protect the new or existing structures. No unreasonable width of trench will be permitted to avoid use of sheeting. Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength to avoid possible damage. Any damage to new or existing structures whatsoever occurring through settlements due to failure or lack of sheeting or bracing shall be repaired by the Contractor at his own expense.

In general, the sheeting and bracing shall be removed, as the trench or excavation is refilled in such a manner as to avoid the caving in of the work. The voids left by the withdrawal of the sheeting shall be carefully filled by ramming, or otherwise as directed. Whenever the sheeting or shoring cannot be removed without injury to the new work or existing structures, it shall be left in place at the

Contractor's expense. Removal of Water

The Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and dispose of all water entering the excavations or other parts of the work and shall keep said excavations dry until the structures to be built therein are completed. No masonry shall be laid in water nor shall water be allowed to rise over masonry, until the concrete and mortar has attained a sufficient and satisfactory set. In no event shall water be allowed to rise over masonry i there is danger of floatation or of setting up unequal pressures in the concrete, until the concrete has set at least 24 hours and any danger of floatation has been removed.

In order to provide a dry foundation, the Contractor, if required by the Engineer, shall pre-drain all wet material (except hard pan or rock) by lowering the ground water to a depth of at least one foot below the deepest point of the subgrade. The work of pre-draining shall be done by the use of a well point system or by any other method approved by the Engineer that will permit the construction work to be carried on under dry foundation conditions. All discharge water shall be piped to the nearest point of disposal in order to prevent such water from again entering the excavation. Any method or system that may be used to lower the ground water shall be kept in operation continuously unless otherwise especially permitted. The approval of the Engineer for the use of any proposed system shall not relieve the Contractor from the responsibility of providing and maintaining dry excavations as required

The Contractor shall dispose of water from the work in a suitable manner without damage to adjacent property or sewers. No water shall be drained into work built or unde construction unless the consent of the Engineer is first

All removal and handling of water required to maintain dry trenches or other excavations for the construction of sewers, water mains, or other structures in the dry, shall be at the expense of the Contractor.

- Pipe Bedding and Backfilling

or four (4) inches, whichever is greater

bell holes are required in this type of installation.

The pipe shall be bedded in accordance ANSI/AWWA C150/A21.5 for laying condition Type 5 under paved areas, unless otherwise noted. All pipe shall rest on a firm bedding which supports the pipe over its entire length. The bedding shall be sand placed from the trench bottom to a depth of one-eighth (1/8) the outside pipe diameter

If soil conditions permit, and approved by the Water Superintendent, pipe may be installed using a flat bottom trench on undisturbed earth,

The Contractor shall be responsible for informing the Engineer if an unsuitable bedding is encountered which will cause excessive pipe settlements and deflections. If unsuitable material is encountered, such material shall be removed to minimum of at least six (6) inches below the trench bottom or to a depth as indicated by the Engineer. The removed material shall be replaced, under direction of the Engineer, with clean, stable backfill material.

All backfill for water mains shall be material excavated from the trenches free from rocks boulders large or frozen lumps, wood or other extraneous material, unless

All trenches or excavations shall be backfilled to the shown or directed. The Engineer has final approval on the type of backfill and may substitute an alternative backfill if the excavated material is deemed unsuitable.

In areas where the proposed water main will be installed under existing or proposed asphalt roadways, concrete curbs, or sidewalks, the pipe will be bedded and the trencl backfilled with I.D.O.T B-Borrow in lifts not exceeding six (6) inches and compacted to 95% Standard Proctor Density. The granular backfill will be placed to the bottom of the proposed, or replacement, pavement structure.

The Owner may, at any time, conduct compaction tests of the trench backfill and require the Contractor to remove and recompact, at the Contractor's expense, any backfill found to be compacted to a density less than that specified.

- Existing Utilities

Location of existing water mains are shown on the plans and are based on all available information. In order to determine details of interconnections between existing and new lines, it will be necessary to locate the existing mains both vertically and horizontally and the Contractor shall make all the necessary investigations promptly to allow ample time for the details to be worked out and the necessary fittings for making the connections to be

The entire sequence of construction of the pipe lines and connections with existing mains shall be scheduled by the Contractor and shall be subject to the approval of the Engineer. The schedule shall be arranged to cause the minimum of interference with traffic and interruption of

Where the water mains are to be constructed parallel to and close to existing sewers or drains, the exact location of which is unknown, an adjustment of alignment of the new water main will be made so as to least interfere with the existing sewer or drain. In general, the Contractor shall determine the exact location of existing sewers, drains, aas lines, underground power cables, telephone and television cables before starting construction of any water mains.

Pipe Deflection

When pipe must be laid such that there are deflections imposed at the pipe joints, these deflections shall not exceed the maximum allowable amounts as shown in the following Tables: Push-On Type Joint

		Max. De	Max. Deflection		Curve Radius	
Pipe Diam.	Deflection Angle	18' Length	20' Length	18' Length	20' Length	
6" 8" 10" 12" 14" 16"	5° 5° 5° 3°	19" 19" 19" 19" 11"	21" 21" 21" 21" 12" 12"	205' 205' 205' 205' 340' 340'	230' 230' 230' 230' 380' 380'	
			echanical Jo	oint		
		Max. De	eflection	Curve	Radius	
Pipe Diam.	Deflection Angle	18' Length	20' Length	18' Length	20' Length	
6" 8" 10" 12" 14"	7° 5°21' 5°21' 5°21' 3°35' 3°35'	27" 20" 20" 20" 13.5"	30" 22" 22" 22" 15"	145' 195' 195' 195' 285' 285'	160' 220' 220' 220' 320' 320'	

See "MATERIAL SPECIFICATIONS FOR INSTALLATION OF WATER MAINS AND SERVICE LATERALS" for PVC Pipe deflection

All plugs, caps, tees, reducers, and bends, unless otherwise specified, shall be provide with restrained ioints as shown on the plans.

Concrete shall not be used for restraint Restraining mechanisms for push-on or mechanical joints may be used. All tie rods, clamps, glands, bolts, etc. used in the restraining mechanism shall be made of non-corrosive material, not plated.

Separation of Water and Sewer Lines

a. The main is laid in a separate trench, or

Water mains, where possible, shall be laid such that the minimum horizontal separation from sanitary sewers be ten (10) feet. If this lateral separation cannot be maintained the water main may be laid closer than ten feet to the sewer provided the following requirements are met:

. The main is laid in the same trench with the sewe but located at one side on a ledge of undisturbed earth c. In either case, the elevation of the crown of the sewer is at least 18 inches below the bottom of the water main Wherever sewers and water mains cross, the sewer shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer.

This shall be the case where the water main is either above At crossing one full length of pipe shall be located so both joints are equidistant from the point of crossover.

When it is impossible to obtain proper horizontal and vertical separation as stipualted above, one of the following methods must be specified: a) The sewer shall be designed and constructed equal to water pipe, and shall be pressure tested at 150 p.s.i. to assure water tightness prior to backfilling; b) Either the water main or the sewer line my be encased in a watertight carrier pipe which extends 10 feet on both sides of the crossing measured perpendicular to the water main.

Temporary Test Riser:

Test riser installations shall be approved by the Water Superintendent. Test risers shall be installed and removed by the contractor unless

removing all other materials. Temporary Blow-Off Installation:

Blow-Off installations shall be approved by the Water Superintendent. Temporary Blow-Off shall be installed and removed by the contractor unless noted otherwise.

Test riser removal shall consist of closing lower corporation and

Test Restrictions

Test pressures shall be two (2) times the working pressure, or a minimum of 150 p.s.i.. Test pressure shall not exceed pipe or thrust-restraint design pressures. 150 p.s.i. @ highest elevation as per form Angola Water Works Pressure And Leakage Tests For New Main Extensions. The hydrostatic test shall be of at least two hour

Test pressure shall not vary by more than plus or minus 5 psi for the duration of the test.

Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision. independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if

Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly

- Pressurization.

After the pine has been laid all newly laid pine or any valved section thereof shall be subjected to a hydrostatic pressure of at least two (2) times the working pressure a the point of testing. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the

Air Removal.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants Supervised by City of Angola Water Department personnel 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. Examination.

Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the owner.

Leakage Defined.

Leakage shall be defined as the quantity of water that mus be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of

Allowable Leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

L = [SD VP]/133,200Where: L = allowable leakage, in gallons per hour S = length of pipe tested (ft.)D = nominal diameter of the pipe (in.)

This formula is based on an allowable leakage of 11.65 gpd/mile/in. of nominal diameter at a pressure of 150 psi. Allowable leakage at other pressures is shown in the

ALLOWABLE LEAKAGE PER 1000 FT. OF PIPELINE IN GALLONS PER HOUR

P = average test pressure during the leakage test

Test sure	Nominal Pipe Diameter (inches)								
si)	4	6	8	10	12	14	16		
00	.30	. 4 5	.60	. <i>7</i> 5	.90	1.05	1.20		
50	.37	.55	.74	.92	1.10	1.29	1.47		
00	.43	.64	.85	1.06	1.28	1.48	1.70		
50	.47	.71	.95	1.19	1.42	1.66	1.90		
00	.52	. <i>78</i>	1.04	1.30	1.56	1.82	2.08		

When testing against closed metal-seated valves, ar additional leakage per closed valve of 0.0078 g.p.h./in. of nominal valve size shall be allowed. When hydrants are in the test section, the test shall be made against closed hydrant valves.

- Acceptance of Installation

Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, the contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance. All visible leaks are to be repaired, regardless of the amount

- Disinfection of Water Mains

Disinfection of new water mains shall follow the procedures

outlined by AWWA C651-(latest revision) and produce bacteriologically satisfactory water in two successive sets of samples collected at 24-hour intervals before the new water mains are released for use

The public utility owning the new water mains shall maintain a minimum free chlorine residual of 0.5 parts per million in the distribution system during construction and for a period of thirty (30) days following the last connection to the distribution arid.

- Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the disinfection operations are liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules.

Liquid chlorine shall be used only (1) in combination with appropriate gas-flow chlorinators and ejectors to provide a controlled high-concentration solution feed to the water to be chlorinated; (2) under the direct supervision of a person who is familiar with the physiological, chemical, and physical properties of liquid chlorine, and who is trained and equipped to handle any emergency that may arise: and (3) when appropriate safety practices are observed to protect working personnel and the public

Sodium hypochlorite is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 qt. to 5 gal. Sodium hypochlorite contains approximately 5-percent to 15-percent available chloring but care must be used in control of conditions and length of storage to minimize deterioration.

Calcium hypochlorite is available in granular form and contains approximately 65-percent available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration

- Basic Disinfection Procedure

The basic disinfection procedure consists of: (1) Preventing contaminating materials from entering the water main during storage, construction, or repair; (2) Removing, by flushing or other means, those materials that may have entered the water main: (3) Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main; (4) Determining the bacteriological quality of laboratory test after

- Preventative Measures During Construction

Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this specification be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.

Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal

work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry. No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used

Joints of all pipe in the trench shall be completed before

for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in closed containers and shall be kept If dirt enters the pipe, and in the opinion of the Engineer, the dirt will not be removed by flushing

operation, the interior of the pipe shall be cleaned by mechanical means and then shall be swabbed with a 1-percent hypochlorite disinfecting solution. If it is not possible to keep the pipe and fittings dry during installation, every effort shall be made to assure that any of the water that may enter the pipe-joint spaces contains an available chlorine concentration of approximately 25mg/L. This may be accomplished by adding calcium hypochlorite granules or tablets to each length of the trench water with hypochlorite tablets.

If the main is flooded during construction, it shall be cleared of the flood water by draining and flushing with potable water until the main is clean. the section exposed to the flood water shall then be filled with a chlorinated potable water that, at the end of a 24-hour holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous-feed or slug

Chlorination

 Placing of Calcium Hypochlorite Granules During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft. intervals. The quantity of granules shall be as

Table 1	
——— Pipe Diameter (in.)	Calcium Hypochlorite Granules (oz.)
4	0.5
6	1.0
8	20

Filling and Contact

When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24-hours. If the water temperature is less than 41øF, the water shall remain in the pipe for at least 48-hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service.

– Final Flushing

After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, and local regulatory agencie should be contacted to determine special provisions for the disposal of heavily chlorinated water. Bacteriological Tests

Bacteriological tests of the water in the mains shall be taken after final flushing and prior to the main being placed in service. Bacteriological samples shall be

taken and tested in accordance with the requirements of

the City of Angola Water Department.

Two successive sets of samples collected at 24-hour intervals from the new water main extension shall produce bacteriologically satisfactory water before the new water main extension is released for use. Samples to be taken @ every 1200' intervals and @ all dead-ends.

- Jacking and Boring Pipe

Description of Work The work shall consist of jacking or boring pipe through or under a road embankment in accordance with these specifications and in conformance with the lines and grades shown on the plans or established by the Engineer. Any

This method shall consist of pushing steel or reinforced concrete pipe into the embankment. All pipe shall be handled. unloaded, and stacked so as to prevent any damage to the

The Contractor's superintendent and/or engineer experienced in pipe jacking techniques, shall be present at all times while work is in progress and shall be responsible for checking the line and grade.

The thrust wall shall be adequate for installation of the jacked pipe. It shall be constructed normal to the proposed

ensure distribution of the load without creating point

of the excavation shall be adequately bulkheaded when work is shut down at the end of the working day.

- Jacking Steel Pipe

Pipe joints shall be welded in accordance with the relevant

required, additional reinforcement at the ends of the pipe.

cutting head shall not exceed the outside diameter of the pipe

The use of water or liquids to soften or wash the face will not be permitted. Water may be used in sticky clays to facilitate spoil removal providing water is introduced behind the cutting head. Lubricating agents, such as bentonite, may be used to lubricate the casing and reduce friction between casing and

Bored or jacked installations shall have a bored hole essentially the same size as the outside diameter of the pipe. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than one) inch, grouting or other approved methods shall be employed to fill such voids at the expense of the Contractor.

The Internal Diameter (I.D.) of the mains or services shall be equal to the mains or services being connected to at the ends of the steel casing.

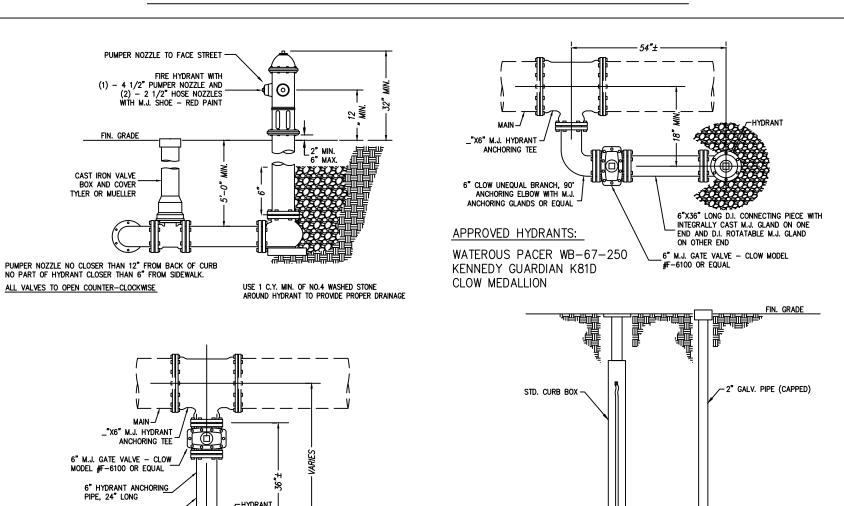
After installation of the carrier pipe, the casing ends shall be

Install casing spacers every 6'-8'.

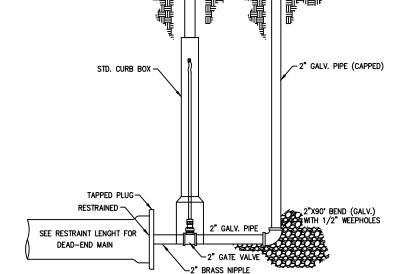
- End of Section -

sealed using pre-manufactured casing sealers

- MINIMUM RESTRAINED LENGTH, FROM TABLE —— -MINIMUM RESTRAINED LENGTH, FROM TABLE -BOTH DIRECTIONS FROM **ELBOW** TYPICAL RESTRAINED JOINT LAYOUT EBAA IRON SERIES 1100 MECHANICAL JOINT RESTRAINING GLAND, U.S. PIPE MECHANICAL JOINT "GRIPPER" GLAND OR APPROVED EQUAL RESTRAINED MECHANICAL JOINTS FOR VC PIPE SHALL BE MEGALUG, SERIES 2000PV _restraining gasket — U.S. Pipe "Field lok" or approved equal BY EBBA IRON OR APPROVED EQUAL Mechanical Joint Bolt Torques From AWWA C600-10 Range of Torque 45–60 ft*lb 4-24 in. 75-90 ft*lb 30–36 in. 100-120 ft*lb DUCT. IRON MAIN 1-1/4" MECHANICAL JOINT RESTRAINT D.I. PUSH-ON JOINT RESTRAINT 4" TO 12" DIA. PIPE - | -SERVICE LINE VALVE MFTFR BACKFLOW PREVENTOR TESTABLE DOUBLE CHECK VALVE TYPE 12"-60" A.F.F. FIN. FL. **LEGEND** └ ELBOW WATER METER ₩ VALVE CHECK VALVE



TYP. WATER METER AND BACKFLOW ASSEMBLY



TEMPORARY BLOW-OFF ASSEMBL

**MINIMUM REQ'D. RESTRAINED LENGTH (ft.) FITTING TYPF 11 1/4° EL. 22 1/2° EL. 45° ELBOW 90° ELBOW DEAD ENDS VALVES, TEES 16 18 26 29 12 30 34 6 7 15 *3*5 40 8 16

* RESTRAINED LENGTHS FOR TEE BRANCHES MAY BE REDUCED DEPENDENT UPON THE DISTANCE OF THE JOINTS ON THE THROUGH RUN FROM THE TEE. THE CONTRACTOR SHALL CONSULT WITH THE ENGINEER IF VARIATIONS FROM THE TABLE ARE REQUIRED. * WHEN A GATE VALVE IS INSTALLED ON THE MAIN, THE MAIN SHALL BE RESTRAINED ON BOTH SIDES OF THE VALVE OVER THE LENGTHS SPECIFIED ABOVE FOR DEAD ENDS. ** A MINIMUM OF THE SPECIFIED LENGTHS FROM THE FITTINGS MUST BE RESTRAINED. FOR EXAMPLE, IF THE TABLE REQUIRES 9 FEET OF RESTRAINED PIPE FROM A 45 ELBOW, AND THE JOINT DOES NOT FALL ON THE 9 FOOT MARK, THE FIRST JOINT PAST THE 9 FOOT MARK MUST

** RESTRAINED LENGTHS AS SHOWN IN THE TABLE AS BASED UPON AWWA LAYING CONDITION TYPE 4, A SOIL BEARING STRENGTH OF 3,000 PSF, AND A DESIGN WATER PRESSURE OF 170 PSI.

MATERIAL SPECIFICATIONS FOR INSTALLATION OF WATER MAINS AND SERVICE LATERALS WATER MAIN MATERIAL:

1.) Water main: 6" and larger — pressure class 350 type water main installed as per AWWA Standard C600 latest issue installation of Zinc coated Ductile—Iron Water Mains and Their Appurtenances.

PVC pipe shall meet all the requirements of the latest revision of ANSI/AWWA C900. a.) All water main extensions shall have bacteria samples taken at every 1200 ft. intervals and at all dead-ends. b.) Depth of the water main shall not be less than 5 ft. nor more than 6 ft. bury unless otherwise approved

by the Water Superintendent. c.) Note: Pipe bedding or Ductile-iron laying conditions specified in AWWA Standard C600 and in accordance

with AWWA C150. PVC pipe laying conditions specified in AWWA Standard C605-05 and ASTM F645-15a. d.) Note: Max. joint deflection as in AWWA Standard C600 covering 4"-12" Push-On Type Joint Pipe.

Max. deflection angle = 5 deg. 18 ft. length section = 19" offset. 20 ft. length section = 21" offset. PVC Pipe Max. deflection angle = 3 deg. 20 ft. length section = 12.5" offset. 2.) Gate valves: Shall conform to AWWA Standard C-515 latest issue on Resilient-Wedge Gate Valves. Waterous, Clow, Mueller, U.S. Pipe or Kennedy type valves.

a.) All resilient wedge gate valves are to open left (CCW) and close right (CW). b.) All valve bonnet and body and stuffing box nuts and bolts shall be type 18-8 stainless steel and must be

installed by the manufacturer. 3.) Valve Boxes (5 ¼") C.I.: Tyler or Mueller brand only. 4.) Fire Hydrants: Shall be Waterous WB-67-250 UL/FM, Kennedy K81D or Clow Medallion traffic model type fire hydrants and shall be painted the color red by the manufacture.

nozzels and one 4 ½" pumper nozzel). b.) Fire hydrant installation is covered in the AWWA Standard C600, note in this standard hydrants shall be set to the established grade, with the centerline of the lowest nozzel at least 12 in. above the ground. Traffic model hydrants shall be installed such that the breakaway flange shall be installed not less than 2 in., nor more than 6 in., above established grade.

a.) Fire hydrants to be 5 ½' Bury and have a 5 ¼" main valve opening with three way outlets (two 2 ½" hose

c.) Note: Installation of fire hydrants included in AWWA Standard C600 requiring proper drainage pit for drybarrel hydrants. Use 1 C.Y. Min. of No.4 washed stone around hydrant for proper drainage. d.) All fire hydrants are to open CCW (left).

5.) All crossing that require casing pipe: The casing pipe should be 6-8 in. larger than the outside diameter

of the pipe bells. Casing Spacers will be required on all carrier pipe (as approved by the Water Superintendent) to ensure approximate centering within the casing pipe and to prevent damage during installation. No metel-to-metal contact will be allowed 6.) Restrained joints: Restraining mechanisms for push-on or mechanical joints will be used (as approved by the

Water Superintendent) instead of concrete thrust blocking. a.) Hydrants: The bowl of each hydrant shall be anchored from main to aux. valve then valve to hydrant. Hydrants will be installed with No. 4 washed stone for proper drainage

b.) Fittings: All plugs, caps, tees, reducers, and bends unless otherwise specified, shall be provided with suitable restrained joints as specified. 7.) All service laterals > 2" will have gate valves anchored to the tee or tap sleeve. 8.) Serrated silicon bronze wedges to be installed on D.I. pipe push—on joints for continuity purpose. Two per joint, for

and the bell until snug. When four wedges are used, they are inserted side by side, in pairs. SERVICE LATERAL MATERIAL: 1.) Service laterals: a.) Service laterals 3/4" through 2" shall have a cc thread type corporation stop at the main.

3" through 12" pipe; four for larger diameter pipe.. Each wedge is driven into the opening between the plain end

b.) Service laterals 3/4" and 1" will have the corporation stop tapped direct to D.I. water main. PVC C900 will use tap saddle Smith—Blair Model 372 or Powerseal 3412AS. A curb valve located in the right—of way as directed by a representative of the water dep c.) Service laterals 1 ¼". 1 ½" or 2" will have a corporation stop with cc thread screwed into a epoxy coated

double strapped or banded tap saddle with stainless band and a curb valve located approximately 1' from the 2.) Service brass: Shall be Mueller, Ford or McDonald brand being of the flare or compression type.

a.) Mueller compression fittings shall be Mueller 110 conductive compression connection. b.) Ford compression fitting shall be Ford grip joint for CTS. 3.) Curb valves: Shall be full-port ball valves. 4.) Curb Valve Boxes: Shall be either a 1" slide type curb box (steel) with a adjustable range of 4 ½' - 5 ½' bury and

shall have a ½" stainless steel box rod 30" in length. a brass or stainless steel cotter pin is required to attach the rod to the curb valve or a 94E Buffalo Box with a Vadle Curb Box Lock. The style curb box lid (c.i.) shall be a brass (quick thread) pentagon screw plug type lid.

Curb boxes for 1 1/4" - 2" curb valves will utilize the 94E Buffalo Box with an enlarged base. All 1" curb boxes located in the asphalt shall have a 5 1/4" valve box top section with lid adjusted to grade over

5.) All service laterals > 2 inch in size will have two consecutive satisfactory bacteria samples before water is turned 6.) Irrigation Systems that utilize a separate water meter will have a separate curb valve and curb box installed outside

of the building. 7.) Three inch diameter HDPE water services shall be Iron Pipe Size (IPS) having a minimum dimension ratio of DR 11 (200 psi). HDPE water services that are four inches in diameter and larger shall be Ductile Iron Pipe Size (DIPS) having a minimum dimension ratio of DR 11 (200 psi). An insulated #10 solid copper tracing wire is required on all

HDPE water service pipes. SEE CITY ORDINANCE 1553-2017 on City Web Site WWW.ANGOLAIN.ORG

CITY OF ANGOLA

WATER SPECIFICATIONS

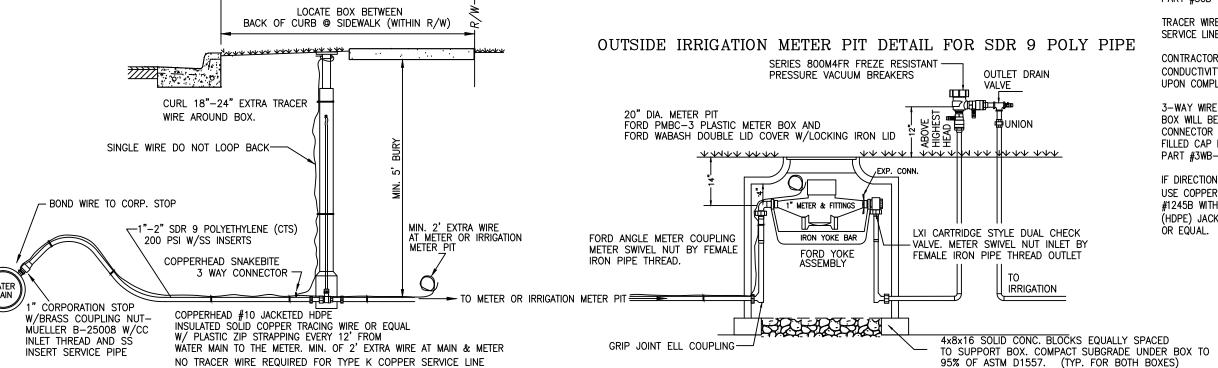
Angola City Utilities: Engineering - Amanda Cope - 260/665-6748 Water Dept. - Tom Selman - 260/665-9363 Street Dept. - Doug Anderson - 260/665-7656 Wastewater Dept. - Craig Williams - 260/665-6806

MS4 Coordinator - Kris Thomas - 260/624-2663

210 NORTH PUBLIC SQUARE ANGOLA, INDIANA 46703-1960 260-665-2514 FAX 260-665-9164

City Planner - Vivian Likes - 260/665-7465 Building Commissioner / Fire Marshall - Scott Lehman - 260/665-6683

SDR 9 POLY PIPE DETAIL - FOR SERVICE LINES CURB VALVE BOXES: SHALL BE EITHER A 1" SLIDE TYPE CURB BOX (STEEL) WITH A ADJUSTABLE RANGE OF 4 1/2 - 5 1/2 BURY AND SHALL HAVE A ½" STAINLESS STEEL BOX ROD 30" IN LENGTH. A BRASS OR STAINLESS STEEL COTTER PIN IS REQUIRED TO ATTACH THE ROD TO THE _RUBBER END SEAL WITH STAINLESS STEEL BANDS CURB VALVE. OR A 94E BUFFALO BOX WITH A VADLE CURB BOX LOCK. HE STYLE CURB BOX LID (C.I.) SHALL BE A BRASS (QUICK THREAD) PENTAGON SCREW PLUG TYPE LID. CURB BOXES FOR 11/4" - 2" CURB VALVES WILL UTILIZE THE 94E BUFFALO BOX CURB BOX WITH AN ENLARGED BASE. CASING SPACER DETAIL ALL 1" CURB BOXES LOCATED IN THE ASPHALT SHALL HAVE A 5 1/4" VALVE BOX TOP SECTION WITH LID ADJUSTED TO GRADE OVER THE 1" CURB BOX.



TRACER MATERIAL: TRACER WIRE TO BE COPPERHEAD STEEL CORE COPPER WIRE #10 WITH HIGH DENSITY POLYETHYLENE COATING OR EQUAL.

TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AND WRAPPED AROUND THE TOP OF THE BOX A MINIMUM OF THREE TIMES. TRACER WIRE TO BE #10 CONTINUOUS STRAND WIRE, IF SPLICING IS NECESSARY USE COPPERHEAD SNAKEBITE SPLICER FILLED MOISTURE DISPLACEMENT

SILICONE FOR CORROSION RESISTANT PROTECTION, PART #SCB-01 OR EQUAL. TRACER WIRE SHALL BE INSTALLED OVER ALL POLY SERVICE LINES, MAIN TO METER.

CONTRACTOR SHALL SCHEDULE A CONDUCTIVITY/LOCATE TEST (CONDUCTED BY CITY) UPON COMPLETION. 3-WAY WIRE CONNECTIONS FROM MAIN TO VALVE

BOX WILL BE MADE WITH SNAKEBITE DIRECT BURY

(HDPE) JACKET WITH MINIMUM 1150# BREAK LOAD

ÒR EQUAL.

CONNECTOR WITH MOISTURE DISPLACEMENT SILICONE FILLED CAP FOR CORROSION RESISTANT PROTECTION PART #3WB-01 OR EQUAL. IF DIRECTIONAL DRILLING OR BORING IS REQUIRED USE COPPERHEAD EXTRA HIGH STRENGTH (EHS) #1245B WITH 45 MIL HIGH DENSITY POLYETHYLÉNE

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End of Section -

to endanger either the traveling public or the integrity of the road surface. When around water is known or anticipated, a dewatering system of sufficient capacity to handle the flow shall be maintained at the site until its operation can be safely halted. The dewatering system shall be equipped with screens or filter

Excavation shall be undertaken within a steel cutting edge or shield attached to the front section of pipe to form and to cut the required opening for the pipe. Excavation shall be undertaken with the shield and shall not be carried ahead of the pipe far enough to cause loss of soil. When jacking in loose, granular, or running soils, the shield shall have means for inserting sheet baffle plates and shelves for the purpose

line of thrust A suitable lubricant, such as bentonite, may be applied to the outside surface of the jacked pipe to reduce frictional forces. This shall be accomplished by the use of pressure equipment which pumps the lubricant to the outside of the shield on the lead pipe or the lubricant may be pumped to the

When necessary to prevent loss of soil at the heading, the face

- Jacking Concrete Pipe Only reinforced concrete pipe sized 30 inches inside diameter and over may be jacked, and shall be class IV or better with tongue and groove joints. All pipes shall have steel reinforcement concentric with the pipe wall, and where

To avoid concentrated loads at the joints from pipe to pipe, strips of plywood, asphalt roofing paper, or other similar resilient materials shall be inserted around the circumference in the joints as each pipe is placed ahead o the thrust ring Resilient material must also be used

WATER METER INSTALLATION SPECIFICATIONS

downstream of the bypass meter.

Meter Strainers:

1. All meters to be installed in the horizontal position with an upstream shut—off valve. Preferably a full—port ball valve.

to be installed in accordance with IEBM (Indiana Environmental Management Board) 320 IAC 3-9.1.

the meter. e. A meter strainer included with or attached just before the meter is required.

diameters upstream of the meter. Strainers are not necessary with maa type meters

Electrical Code and all service and installation personnel should be advised.

2. All meter brands and styles to be approved by water superintendent and to read in 1000 gals. The meter will also include a electronic communications

register. 5/8" residential meters are provided by the city at no charge. The total cost of all meters larger than 5/8" is at the customer's expense.

. Backflow preventer assemblies are to be installed downstream of the meter a minimum of five pipe diameters. All backflow devices are

4. On all indoor settings an electrical bonding around meters is required to prevent accidental electrocution of a serviceman changing

meters. A permanently bonded electrical grounding strap to be provided. Electrical grounding is a requirement specified by the National

5. 2" or larger meters will be Octave Magnetic meters: a. All meters to be installed in the horizontal position valved on each side of the

meter. It is preferable to use full-opening ball or gate valves for the meter set isolation valves. Butterfly or plug valves may also be used

crosses to be no closer than ten pipe diameters of straight pipe of the same nominal diameter on the meter upstream and five diameters

valves, pressure-regulating devices, or throttling valves are needed, it is to be installed a minimum of five pipe diameters downstream of

a. On all strainers installed before the meter a ridged flat plate or ridged expanded metal-element strainer is recommended to protect the

metering element from debris carried in the flow stream. The effective open area of the strainer element should be at least twice the open

pipe area of the meter inlet. When anale-type or regular basket-type strainers are used, they should be installed a minimum of five pipe

as isolation valves, if they are located a minimum of five pipe diameters upstream and downstream of the meter, b. Elbows, tees, and

downstream. c. Backflow prevention devices to be installed downstream of the meter a minimum of five pipe diameters. d. When check

6. Bypass Regulations: a. If the customer requires a bypass, the bypass is also required to have a meter. b. If the bypass outlet is

installed downstream of the backflow device the bypass will also require a backflow device. c. Bypass to be valved upstream and

This method shall consist of pushing the pipe into the soil with a boring auger rotating within the pipe to remove the soil. Advancement of the cutting head ahead of the pipe will not be permitted except for that distance to permit the cutting head teeth to cut clearance for the pipe. In the event granular, loose, or unstable soil is encountered during the boring operation, the cutting head shall be retracted into the casing a distance that permits a balance between pushing pressure and the ratio of pipe advancement to quality of soil to assure no voiding is taking place. The excavation by the

soft or porous material.

shall be submitted to the Engineer for approval. No work shall proceed until such approval is obtained.

larger than the outside dia. of the carrier pipe. CASING SPACERS will be required on all carrier pipe (as approved by the Water Superintendent) to ensure approximate centering within the casing pipe and to prevent damage during installation.

exploratory investigations and/or excavations required to determine depths and locations of existing underground utilities or structures that may conflict with the alignment of the pipe shall be included in this work.

An approach trench shall be dug at the forward end of the proposed pipe to a depth sufficient to form a vertical face at least one foot higher than the top of the pipe and large enough to provide ample working room. The size and height of this vertical face may be varied, but in all cases the roadbed and shoulders shall be adequately protected. After the pipe is installed, the excavated area not occupied by the pipe shall be backfilled with suitable material and thoroughly compacted into place. Sheeting and bracing shall be provided if the nature and conditions of the soil or height of exposed faces is such as

medial sufficient to prevent the displacement of fines. joints of the pipe.

outside surfaces of the pipe through grout holes. The Contractor shall use jacking equipment which is designed to provide the forces necessary for installation of the pipe. The thrust load shall be imparted to the pipe through a suitable thrust ring which shall be sufficiently rigid to

Bracing and backdrops shall be so designed and jacks of sufficient rating used so that jacking can be progressed without stoppage (except for adding lengths of pipe) until the leading edge of the pipe is the specified distance beyond the inside edge of the pavement.

I.D.O.T. Standard Specification. Pipe joints shall be watertight. Minimum wall thickness of the pipe shall be as Thickness (in.) Casing O.D. Casing Contains Carrier Casing Is Carrier

The pipe shall be in accordance with ASTM C 76.

between the pipe end and the thrust ring.

by more than 1/2 inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of

Plans and descriptions of the boring arrangement to be used

All crossings that require casing pipe: The casing pipe should be 6-8 in

27-30

.31 - 42