ALL NEW ADDITIONS, AND EXTENSIONS TO THE CITY OF ANGOLA WATER SYSTEM WILL REQUIRE AN APPROVED CONSTRUCTION PERMITT FROM IDEM.

Section – ZINC COATED Ductile Iron Water Mains

In Accordance With: Installation of Zinc coated Ductile—Iron Water Mains And Their 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 furnishina 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 a/m^2 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 centrifugally 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 appurtenances.

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 aaskets. - Ductile Iron Pipe with Push-On Joints

Zinc coated ductile iron pipe with push-on (slip) joints shall be complete with appropriate rubber gasket 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.

Fittings

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 auipped with mechanical or push-on joints in accordance with Sections 1.1.2 and 1.1.3 of this specification, and cement-lined according to the latest revisions of ANSI/AWWA C104/A21.4.

PVC PRESSURE PIPE:

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

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 $(\pm 1^n)$ fo all sizes. An insulated #10 solid copper tracing wire will be required on

all water mains and service lines.

Installation

– General

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. Excavation

The excavation shall be at the locations as shown on the plans. The trench shall be excavated so that the pipe can be 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. renches for water mains shall be excavated such that the walls of the trench are vertical from the bottom of the rench 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 b 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 rammina, or otherwise as directed. Whenever the sheetina 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 in there is danaer of floatation or of setting up unequal pressures in the concrete, until the concrete has set at east 24 hours and any danger of floatation has been

In order to provide a dry foundation, the Contractor, if required by the Engineer, shall pre-drain all wet material (except hard pap 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 around 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 under construction unless the consent of the Engineer is first obtained.

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

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 or four (4) inches, whichever is greater

If soil conditions permit, and approved by the Water Superintendent, pipe may be installed using a flat bottom trench on undisturbed earth, bell holes are required in this type of installation.

The Contractor shall be responsible for informina 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 rench 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 otherwise noted.

All trenches or excavations shall be backfilled to the original surface of the ground or such other grades as 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 trench 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 Contracto 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 obtained.

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 service.

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, gas 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 no exceed the maximum allowable amounts as shown in the



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

- Thrust Restraint

All plugs, caps, tees, reducers, and bends, unless otherwise specified, shall be provide with restrained

joints 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

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:

a. The main is laid in a separate trench, or b. The main is laid in the same trench with the sewer 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 or below the sewer. 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.

– Testina

Temporary Test Riser: Test riser installations shall be approved by the Water Superintendent. Test risers shall be installed and removed by the contractor unless noted otherwise. Test riser removal shall consist of closing lower corporation and

removina 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 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 <u>Angola Water Works</u> 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 areater 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. Th valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

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 valves.

Pressurization.

After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least two (2) times the working pressure at 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 leakage test.

– Air Removal.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. Supervised by City of Anaola Water Department personne 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 must 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] / 133,200

Where: L = allowable leakage, in gallons per hour = length of pipe tested (ft.) 0 = nominal diameter of the pipe (in.)P = average test pressure during the leakage test

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 following Table.

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

Nominal Pipe Diameter (inches)

Pressure				·			
(psi)	4	6	8	10	12	14	16
100	.30	.45	.60	.75	.90	1.05	1.20
150	.37	.55	.74	.92	1.10	1.29	1.47
200	.43	.64	.85	1.06	1.28	1.48	1.70
250	.47	.71	.95	1.19	1.42	1.66	1.90
300	.52	.78	1.04	1.30	1.56	1.82	2.08

When testing against closed metal-seated valves, an 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 of leakage

Disinfection of Water Mains

– General

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 grid.

- 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 physioloaical, 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 alass. rubber-lined, or plastic containers typically ranging in size from 1 at. to 5 aal. Sodium hypochlorite contains approximately 5-percent to 15-percent available chlorine. 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 tha 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 disinfection

- Preventative Measures During Construction

Heavy particulates aenerally 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 periods.

Joints of all pipe in the trench shall be completed before 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 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 clean

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 fittinas 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 before it is lowered into a wet trench, or by treating 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 method.

- 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 shown in Table 1.

Table 1 Calcium Hypochlorite Pipe Diameter Granules (oz.) (in.)



– 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 discharae 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 gaencies should be contacted to determine special provisions for

– Bacteriological Tests

the disposal of heavily chlorinated water.

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 @

– End of Section –

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

– General

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 to endanger either the traveling public or the integrity of the road surface.

When ground 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 medial sufficient to prevent the displacement of fines

– Jacking

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 joints of the pipe.

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 of preventing voids.

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 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 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 ensure distribution of the load without creating point

When necessary to prevent loss of soil at the heading, the face of the excavation shall be adequately bulkheaded when work is shut down at the end of the working day.

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.

– Jacking Steel Pipe

Pipe joints shall be welded in accordance with the relevant I.D.O.T. Standard Specification. Pipe joints shall be watertight. Minimum wall thickness of the pipe shall be as



- 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 required additional reinforcement at the ends of the pipe. The pipe shall be in accordance with ASTM C 76.

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 of the thrust rina. Resilient material must also be used between the pipe end and the thrust ring.

– Borina

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 aranular. 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 cutting head shall not exceed the outside diameter of the pipe by more than 1/2 inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or porous material.

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 t lubricate the casing and reduce friction between casing and embankment.

Plans and descriptions of the boring arrangement to be used shall be submitted to the Engineer for approval. No work shall proceed until such approval is obtained.

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.

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

WATER

NO TRACER WIRE REQUIRED FOR TYPE K COPPER SERVICE LINE

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

Install casing spacers every 6'-8'. After installation of the carrier pipe, the casing ends shall be sealed using pre-manufactured casing sealers

– End of Section -



1-800-428-5200

95% OF ASTM D1557. (TYP. FOR BOTH BOXES)