HIXSON UTILITY DISTRICT

WATERLINE

STANDARDS

AND

SPECIFICATIONS

Revised April 27, 2004
Revised May 5, 2004 (Drawing TSA-1)
Revised September 12, 2006 (Drawing WSA-1)
& pages 8, 9, 45-47 & 49-50
Revised March 3, 2008 (Drawing FHA-2) & pages 51 & 52
Revised April 23, 2008 (All Drawings)
Revised September 9th, 2009 (Drawing FHA 2.1)
Revised March 15th, 2019 (All pages)

HIXSON UTILITY DISTRICT

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GENERAL

The Design Criteria and Construction Specifications adopted by the Hixson Utility District are from the Tennessee Public Works Construction Standards, published by The University of Tennessee Municipal Technical Advisory Service with modifications for local conditions and District preference.

The section numbering used conforms to the format followed by the Construction Specifications Institute (CSI).

Developers planning improvements to property within the Hixson Utility District service area that will affect water demand from the District or which will involve waterlines that will become District responsibility, will have to follow exactly the Hixson Utility District Waterline Construction Policy, for necessary reviews and approvals prior to starting waterline planning.

Developer needs to contact Utility when construction begins for the purpose of advising on location of water main and inspection during installation.

DESIGN CRITERIA SECTION

DESIGN CRITERIA

SECTION 100 - WATER DISTRIBUTION SYSTEMS

101 SCOPE

The design criteria for water distribution systems presented hereafter offer basic standards for use in the design process. Much of the information contained herein, as well as additional information may be obtained from the Rules of Tennessee Department of Environment and Conservation – Division of Water Supply, Chapter 1200-5-7, Design Criteria for Public Water.

102 ENGINEER'S REPORT

Not Applicable

103 DESIGN FACTORS

103.1 Source of Water Supply

The source of water supply for the distribution system under design shall be thoroughly investigated to ascertain that it can supply the average and peak daily demands imposed upon it by the proposed system without loss or burden to the existing customers supplied by it.

103.2 Water Consumption

In addition to fire flow requirements, water mains and distribution systems shall be sized for normal consumption demands of 2 gallons per minute per domestic customer or as per Illustration I.

103.3 Fire Flow Requirements

A minimum fire flow of 500 gallons per minute and 30 pounds per square[1] inch residual pressure must be available in all distribution systems containing fire hydrants. The requirements of the Insurance Services Office and related agencies shall be investigated and complied with if more stringent than the minimum flow set forth above.

103.4 Minimum Size and Cross Country Main Prohibition

All new water main construction must be with 8 inch ductile iron Class 350. The minimum size of water distribution mains shall be that which is required to provide the instantaneous peak demand plus fire flow while maintaining adequate residual pressure. There will be no cross-country main construction unless public right-of-way is unavailable and the cross-country main is in the best interest of Hixson Utility and is approved by the General Manager and the Board of Commissioners.

103.5 Sizing Water Mains

Water mains shall be sized to provide the instantaneous peak demand plus anticipated fire flow plus any foreseeable future demand while maintaining a minimum of 30 pounds per square inch[2] residual pressure at all points in the system. The pressures losses due to friction must be calculated from the storage or pumping facilities using typical system flows as well as the flows required by the distribution mains being added. From this Information, a hydraulic profile is plotted for submittal to the TDEC-WQC. The plotting shall show the water system hydraulic gradient in relationship to the ground line at all points for the planned extensions and any pertinent points in the existing system. If advantageous, loop analysis may be performed to reduce the losses. If loop analysis is used, a Hardy-Cross or other loop analysis program shall be used. Single path friction loss is readily available from many published tables and monographs or it may be calculated from the Hazen-Williams equation:

$$H_f = 0.002083\, L \left(\frac{100}{C}\right)^{1.85} \times \frac{gpm^{1.85}}{d^{4.8655}}$$

This equation is based on water at 60 degrees F. and the symbols used are as follows:

H_f = head loss due to friction, feet of water

L = length of pipe including equivalent length for losses through fittings, feet

C =roughness coefficient

gpm = flow of water, gallons per minute

d = inside diameter of circular pipe, inches

The C value varies widely depending on type and age of pipe. For new pipe, the maximum value allowed by the TDEC-WQC is 130.

All calculations and the hydraulic profile shall be submitted to the TDEC-WQC for consideration during their review of the plans and specifications.

[1]On all new waterlines approved beginning April 27,2004

[2] On all new waterlines approved beginning April 27,2004

104 SELECTION OF PRESSURE CLASS FOR WATER MAINS

104.1 Determination of Maximum and Minimum Pressures Within the System

In the determination of the proper pressure class of pipe materials for use in the system, consideration must be given to the maximum and minimum pressures that will be encountered. The following factors must be considered when determining pressure within a system:

1) Highest and lowest elevation of pipelines;
2) High and low levels in the water storage reservoirs;
3) Booster pumping stations - suction and discharge pressures;
4) Fire flow requirements;
5) Special control valves, i.e., pressure reducing valves in the system;
6) Surge allowance and water hammer; and
7) Customer water usage (present and future).

Care must be exercised in evaluating all the parameters involved in the project to insure the customer adequate pressures even under very demanding flow situations.

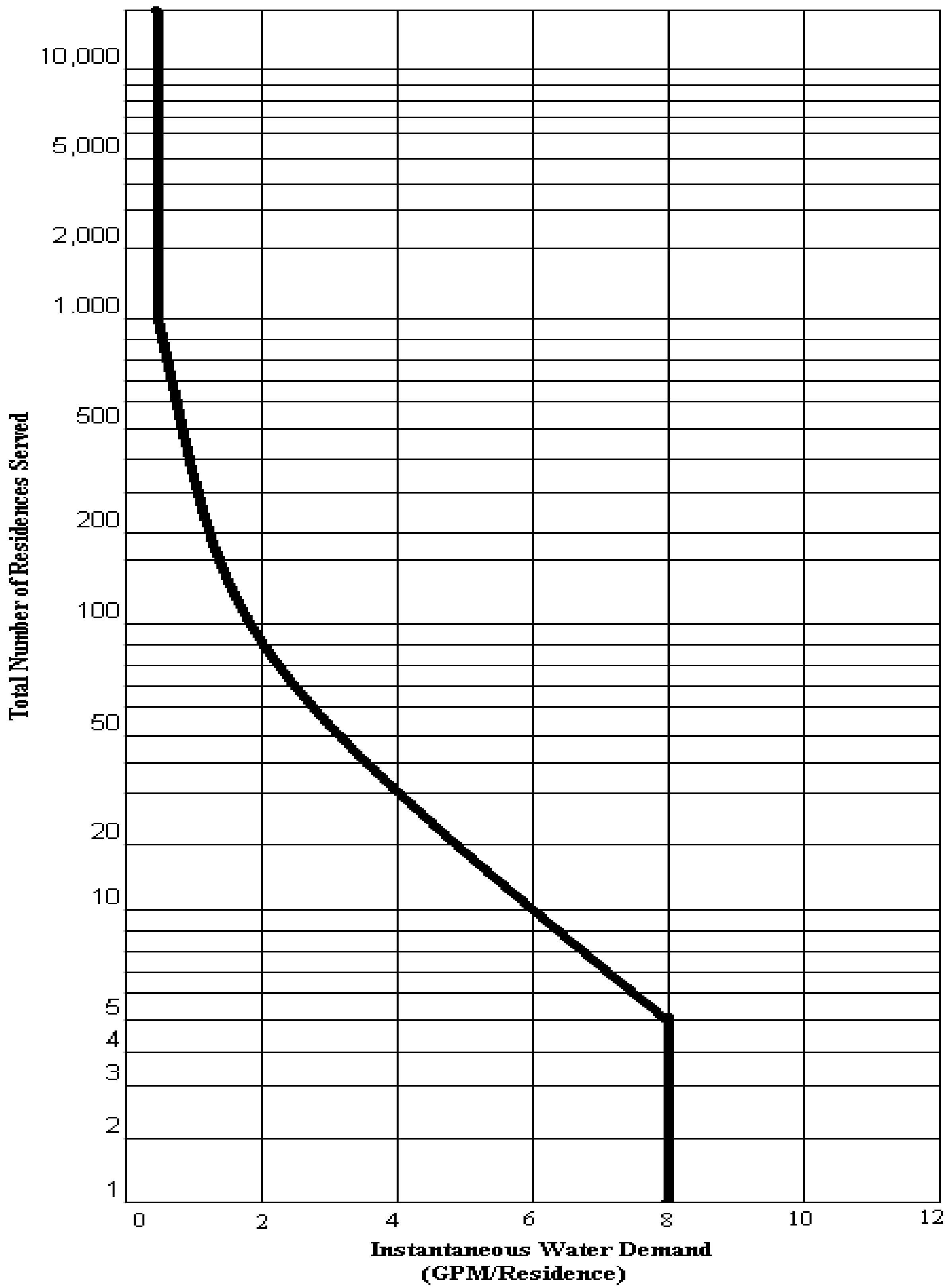
104.2 Ductile Iron Pipe

Ductile iron pipe is manufactured in seven (7) standard thickness classes, Class 50 through Class 56 and five (5) standard pressure classes, class 100 through class 350. For new water lines less than or equal to 12" diameter pressure class 350 is to be used. Water mains greater than 12" diameter pressure class 250 is to be used

104.3 Polyvinyl Chloride Pipe

NOT ACCEPTED

ILLUSTRATION 1
TDEC-WQC DESIGN CRITERIA



104.4 Other water Pipe Materials

Not Accepted

105 LOCATION OF APPURTENANCES

105.1 Control Valves

Control valves (gate valves) shall be placed at all intersections of water mains but at no time greater than 4000 feet apart. Good practice is to limit spacing to 2500 feet.

105.2 Safety Valves

Safety valves (air release, pressure reducing etc.) shall be installed at such locations as deemed necessary for the safe, reliable operations of the distribution systems.

105.3 Fire Hydrants and Blow-Offs

Fire hydrants shall be spaced as recommended by local codes, subdivision regulations, insurance services office, or related for ease of access during fires to both the hydrant and the area served. A fire hydrant shall be located at the end of each extension even when the local fire department requires a hydrant within 1000 feet of the end of an extension. Under no conditions, will an extension end without a fire hydrant. Fire hydrants required at the end of water main extension serve as both flushing points and fire protection. The details for fire installations are given in standard drawings FHA-2.1.

105.4 Thrust Blocking

Thrust forces are created in a pipeline at changes in direction, tees, dead ends, or where changes in pipe size occur at reducers. Acceptable restraint methods include concrete thrust blocks, restrained, joints, and tie rods. The details and dimensional data for concrete thrust blocks given in Standard Drawings, TBD 1 and TBD 2 are for 100 pounds per square inch working water pressure and soil bearing loads of approximately 1000 pounds per square foot. For greater pressure or less soil bearing, the quantities required will have to be recalculated, but for pressures less than 100 psi and soil bearing greater than 1000 psi, the thrust blocks shown shall be adequate.

106 INSTALLATION AND ACCEPTANCE TESTING

As a minimum, the specifications shall require acceptance testing to include pressure and leakage testing. Detailed specification for acceptance testing is stipulated in the technical specification AWWA Standard C-600 current edition.

Pressure tests shall be performed at a pressure of 125% of the working pressure at the test point with 200 psi being the minimum test pressure and 250 psi being the maximum test pressure and shall be maintained for two (2) hours. The leakage test shall be conducted concurrently with the pressure test to check for excessive leakage.

All water pipes shall be cleaned and disinfected in accordance with the technical specification AWWA C651 current edition.

107 PREPARATION OF PLANS-WATER DISTRIBUTION SYSTEM

107.1 General

The following requirements for plans is from "Design Criteria For Community Public Water Systems" Published by the Division of Water Management, Tennessee Department of Health and Environment, Nashville, Tennessee, which applies for plan submittals to the State Health Department for the required review and approval.

1.2 Plans - Plans for water works improvement should, where pertinent, provide the following:

1.2.1 General layout, including

a. title

b. name of water system, and county in which located

c. area or institution to be served,

d. scale, in feet, not less than 1inch = 200 feet for urban areas, and not less than 1 inch = 400 feet for rural areas,

e. north direction,

f. datum used,

g. boundaries of the municipality or area to be served,

h. date, address, name, arid phone number of the designing engineer,

i. signed and dated imprint of professional engineer's seal,

j. legible prints suitable for reproduction, preferably all sheets same size,

k. location and size of existing water mains, adjacent to proposed construction,

1. location and nature of existing water works structures and appurtenances affecting the proposed improvements, noted on one sheet,

1.2.3- Detailed plans for distribution systems, including

a. a vicinity map showing location of project, if system map is not included,

b. key map, showing location of detailed drawings, when project is comprehensive,

c. location of proposed water lines in relation to roads, bridges, and other identifiable objects,

d. location of valves, fire hydrants, tees, and reducers/ enlargers,

e. hydraulic profile or data and computations showing hydraulics of proposed additions to the distribution system.

1.3 <u>SPECIFICATIONS</u>

1.3.1. NOT APPLICABLE

1.3.2. The following alternate specifications may be referenced in lieu of submitting new specifications as long as these are applicable to the project:

a. current, approved standard specifications for the water system on file in our office, (current specifications for the Hixson Utility District).

107.6 <u>Record Drawings</u>

Following the end of construction of the water distribution mains, the tracings shall be revised to reflect any deviations from the plans and provide the precise field location of the water mains, valves, hydrants, services, and other appurtenances. Two copies of the record drawings shall be submitted to the Hixson Utility District.

<u>SECTION 108</u>

WATER DISTRIBUTION SYSTEM

STANDARD DRAWINGS

The following drawings supplement the criteria in Sections 100 through 107. Some are referenced in the criteria while others needed no discussion.

Thrust Blocking Dimensions

90 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	16"	16"	26"	33"	40"	50"	70"
B	16"	16"	24"	33"	40"	50"	70"
C	9"	9"	12"	12"	15"	16"	22"
D	8"	8"	12"	16"	20"	25"	24"

45 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	12"	12"	18"	24"	31"	37"	52"
B	12"	12"	18"	24"	31"	37"	52"
C	8"	8"	10"	12"	14"	16"	14"
D	6"	6"	9"	12"	15"	18"	18"

22 1/2 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	9"	9"	13"	18"	23"	26"	40"
B	9"	9"	13"	18"	23"	26"	40"
C	8"	8"	10"	12"	14"	16"	15"
D	4"	4"	6"	9"	11"	13"	16"

11 1/4 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	9"	9"	11"	13"	16"	18"	30"
B	9"	9"	11"	13"	16"	18"	30"
C	8"	8"	10"	12"	14"	16"	15"
D	4"	4"	5"	6"	8"	9"	16"

TEE							
MAIN	2" - 6"	8" - 12"	8" - 10"	12"	12"	12"	18"
BRANCH	2" - 6"	2" - 6"	8" - 10"	2" - 6"	8" - 10"	12"	16" - 18"
A	26"	26"	43"	26"	43"	52"	70"
B	26"	26"	43"	26"	43"	52"	70"
C	12"	12"	12"	12"	12"	12"	30"
D	13"	13"	21"	13"	21"	26"	24"

PLUG							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	26"	26"	26"	34"	43"	52"	70"
B	26"	26"	26"	34"	43"	52"	70"
C	12"	12"	12"	12"	12"	12"	30"
D	11"	11"	11"	15"	22"	32"	32"

DRAWING TBD2

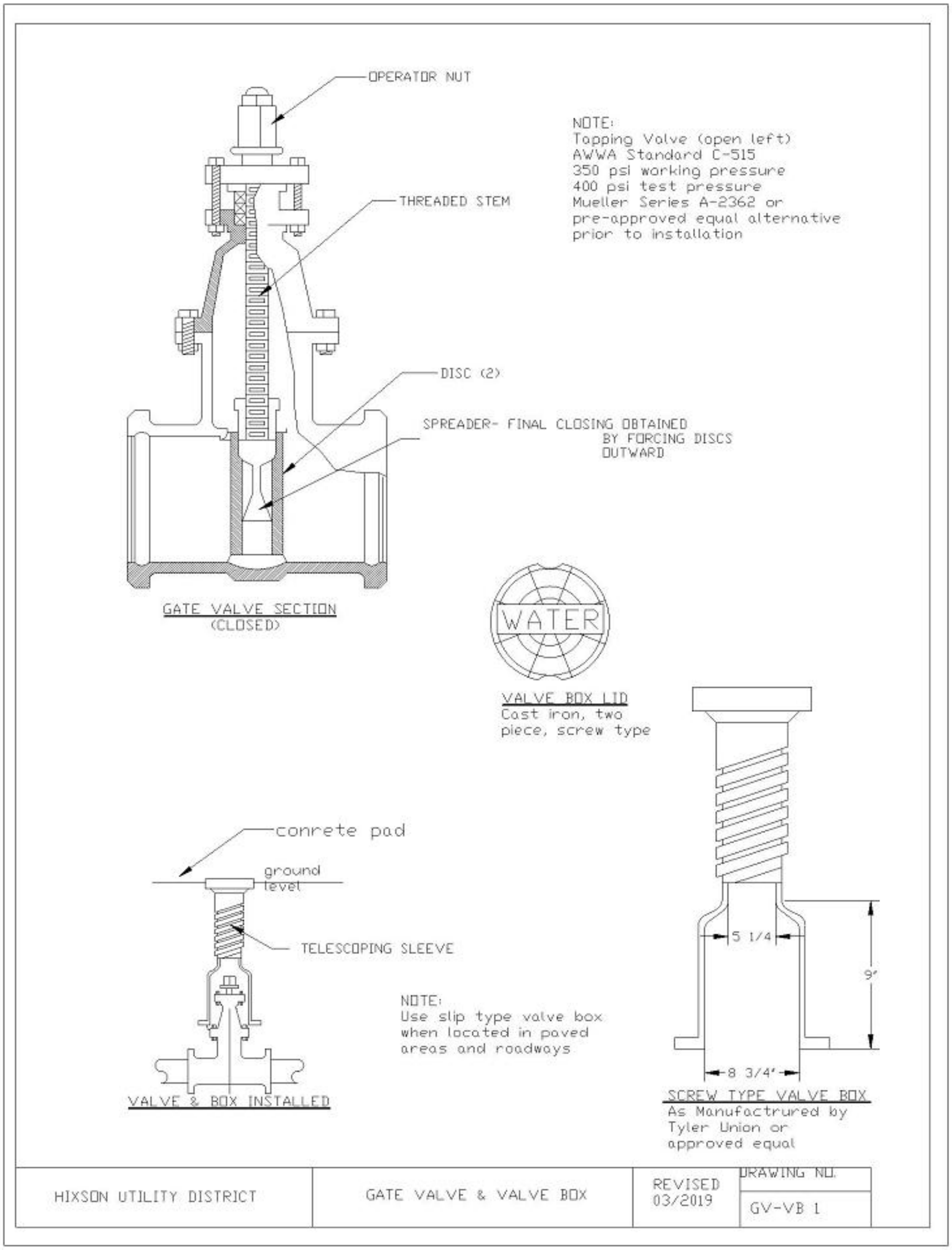
Table of Dimensions for Concrete Blockng
(inches)

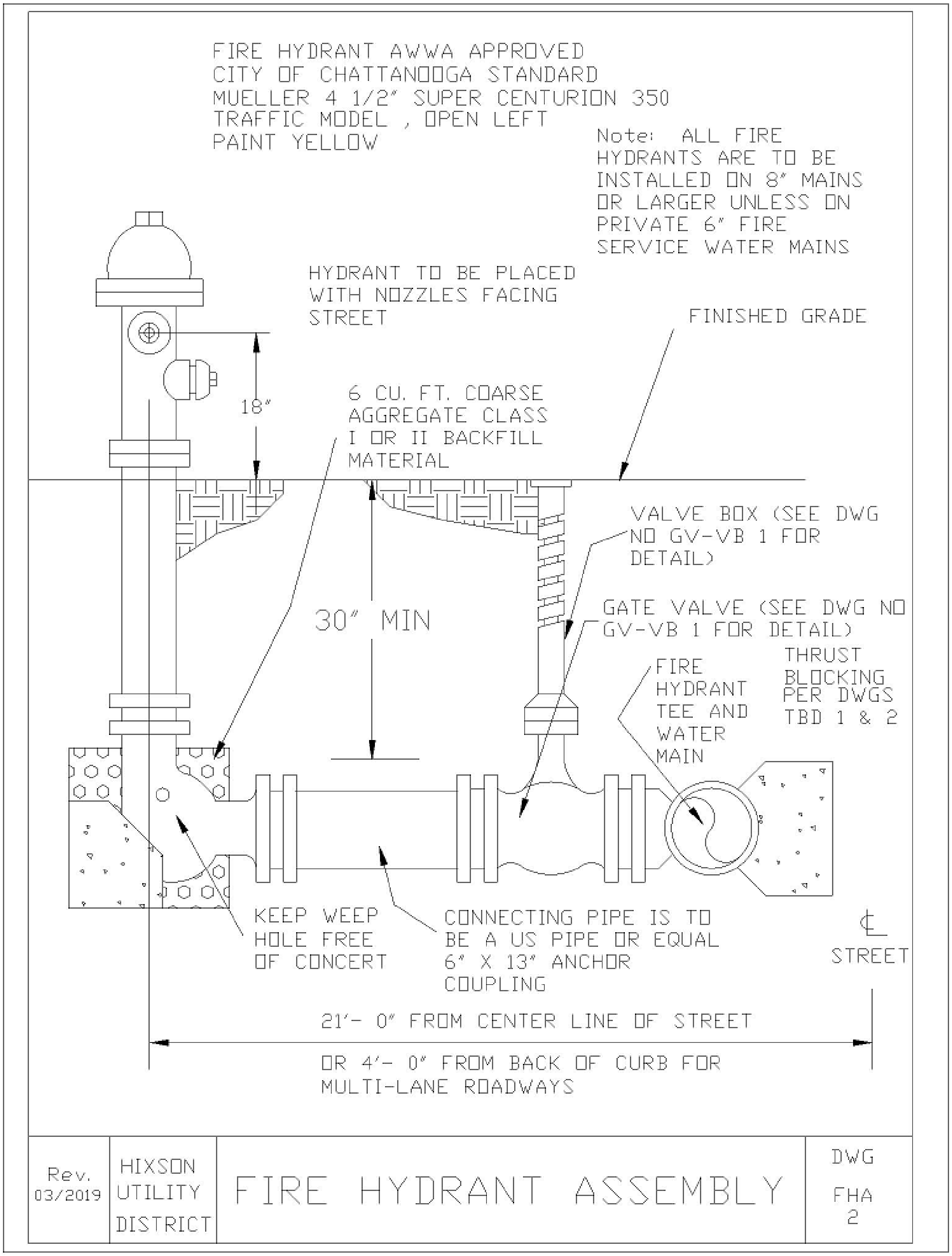
Pipe Size	Tees, Plugs Crosses					90 Bends				
	H1	H2	V	D	CU FT.	H1	H2	V	D	CU FT.
2 & 2 1/4	18	10	12	18	1.9	18	10	12	18	1.5
3 & 4	24	12	12	18	2.3	24	12	12	18	1.6
6	24	16	18	18	3.5	30	16	16	18	3.2
8	36	18	18	18	5.1	39	18	18	18	4.0
10	48	24	18	24	7.2	54	32	21	18	4.6
12	54	30	24	24	13.4	54	32	24	24	9.6
14	60	21	30	24	17.9	60	40	30	24	13.2
16	60	34	36	24	22.5	69	48	36	24	17.0
18	72	36	40	24	30.0	72	48	42	24	21.0
20	84	38	42	24	36.0	84	48	46	24	27.0

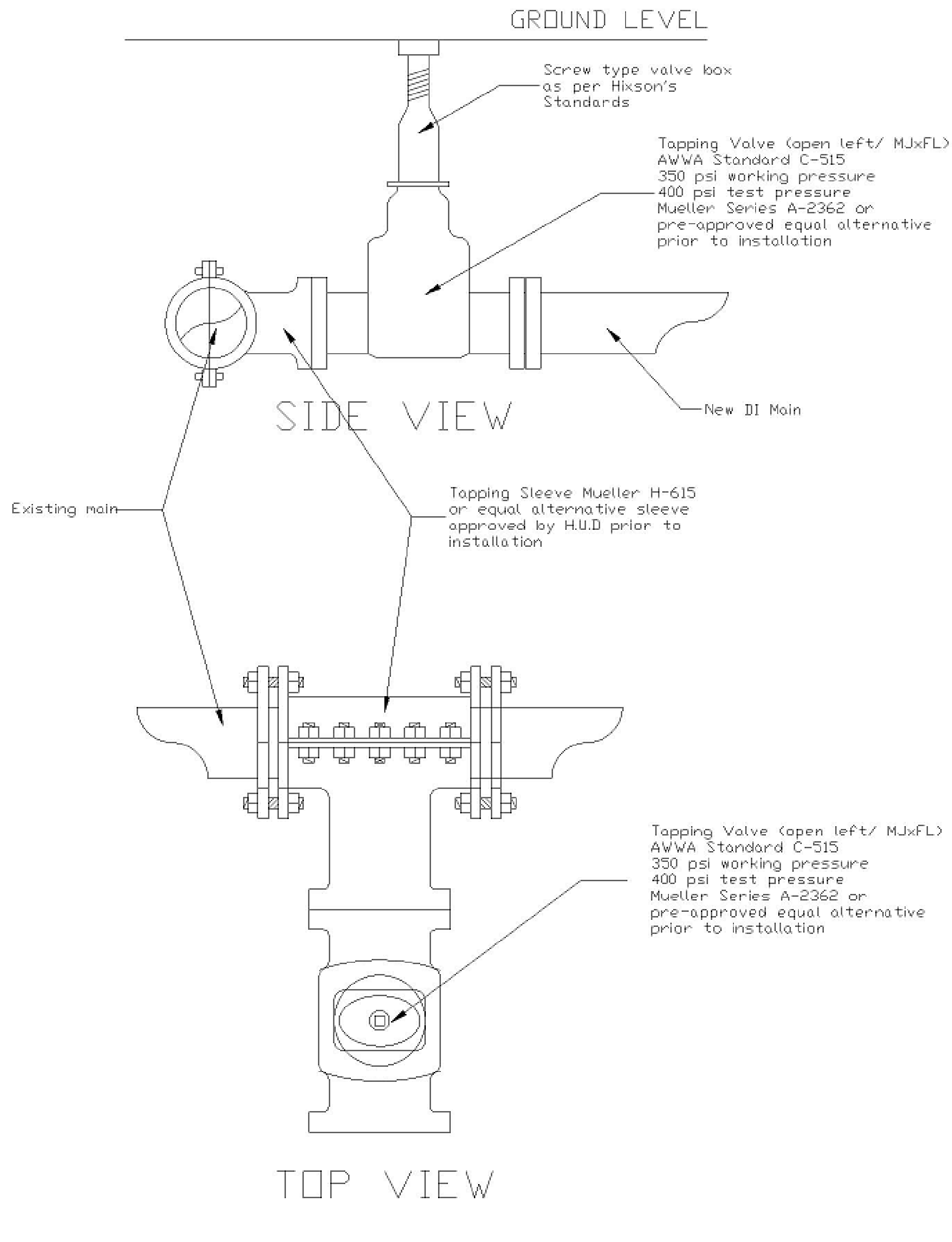
Pipe Size	45 Bends					22 1/2 Bends				
	H1	H2	V	D	CU FT.	H1	H2	V	D	CU FT.
2 & 2 1/4	18	6	12	18	1.5	18	6	12	18	1.5
3 & 4	18	8	12	18	1.6	18	8	12	18	1.6
6	24	10	16	18	3.2	24	10	16	18	3.2
8	24	11	18	18	3.5	24	11	16	18	3.4
10	24	18	21	18	4.6	24	18	21	18	4.6
12	24	18	24	24	6.6	24	18	21	24	6.1
14	30	24	24	24	9.2	27	21	24	24	7.9
16	36	30	27	24	11.8	27	24	27	24	9.1
18	42	30	30	24	15.0	30	30	36	24	13.0
20	48	36	36	24	19.0	42	40	36	24	18.0

Thurst blocks are designed for a working pressure of 350 psig
and an allowable soil bearing pressure of 2000 psf.

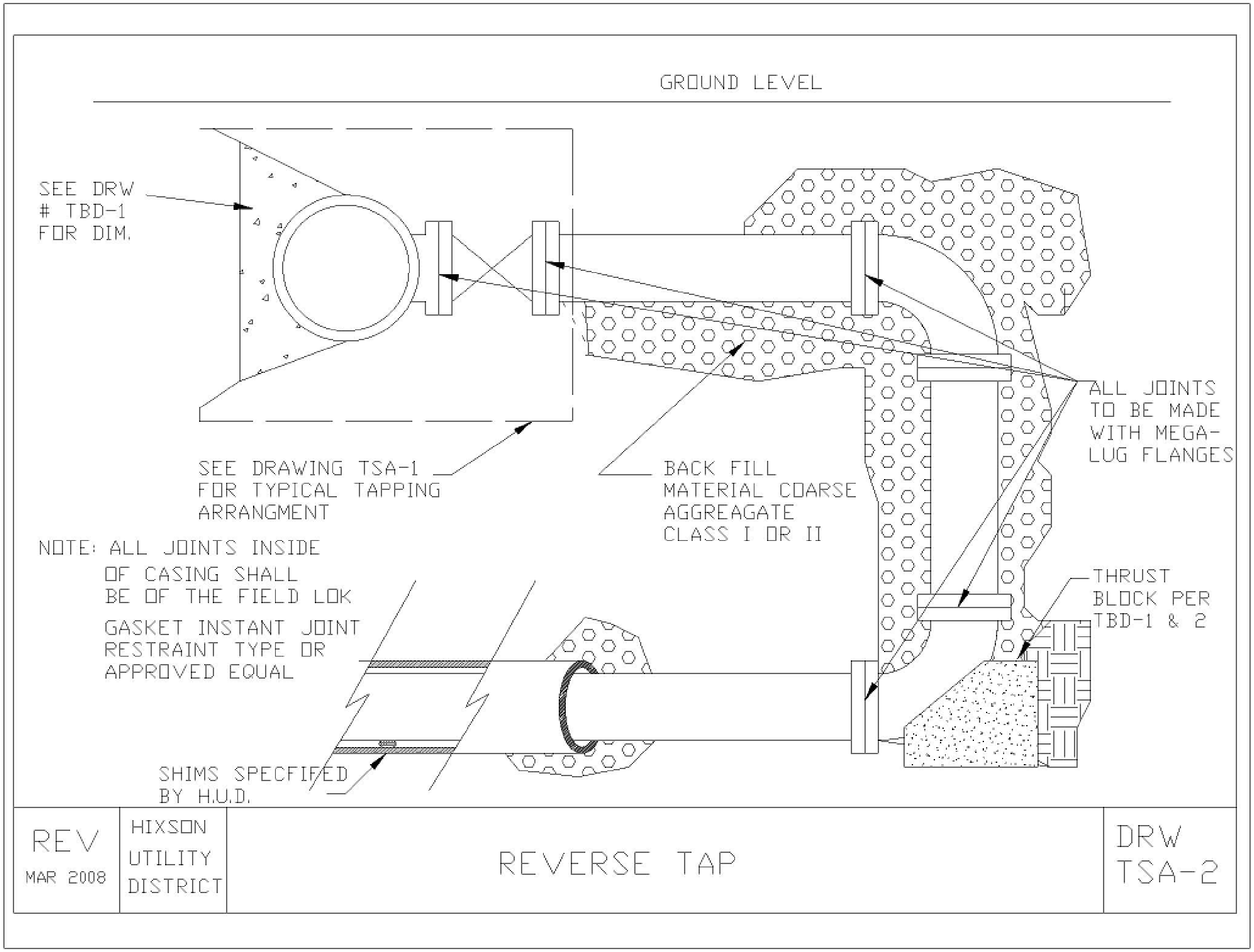
HIXSON UTILITY DISTRICT	THRUST BLOCKING DIMENSIONS	DRAWING NO. TBD3

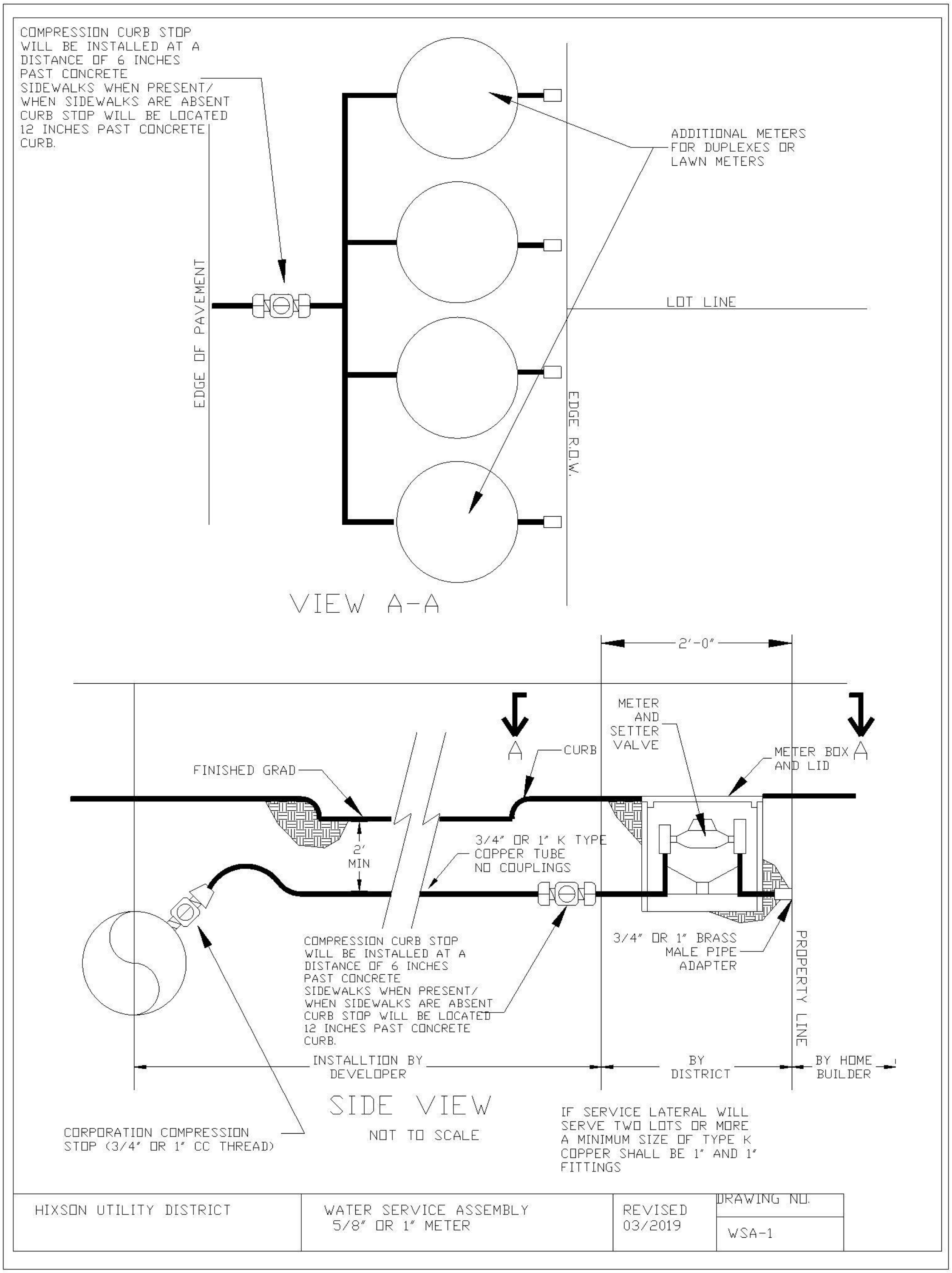

OPERATOR NUT
THREADED STEM
DISC (2)
SPREADER- FINAL CLOSING OBTAINED BY FORCING DISCS OUTWARD
NOTE:
Tapping Valve (open left)
AWWA Standard C-515
350 psi working pressure
400 psi test pressure
Mueller Series A-2362 or
pre-approved equal alternative
prior to installation
GATE VALVE SECTION
(CLOSED)
WATER
VALVE BOX LID
Cast iron, two
piece, screw type
conrete pad
ground
level
TELESCOPING SLEEVE
NOTE:
Use slip type valve box
when located in paved
areas and roadways
VALVE & BOX INSTALLED
5 1/4
9"
8 3/4"
SCREW TYPE VALVE BOX
As Manufactrured by
Tyler Union or
approved equal
HIXSON UTILITY DISTRICT
GATE VALVE & VALVE BOX
REVISED
03/2019
DRAWING NO.
GV-VB 1

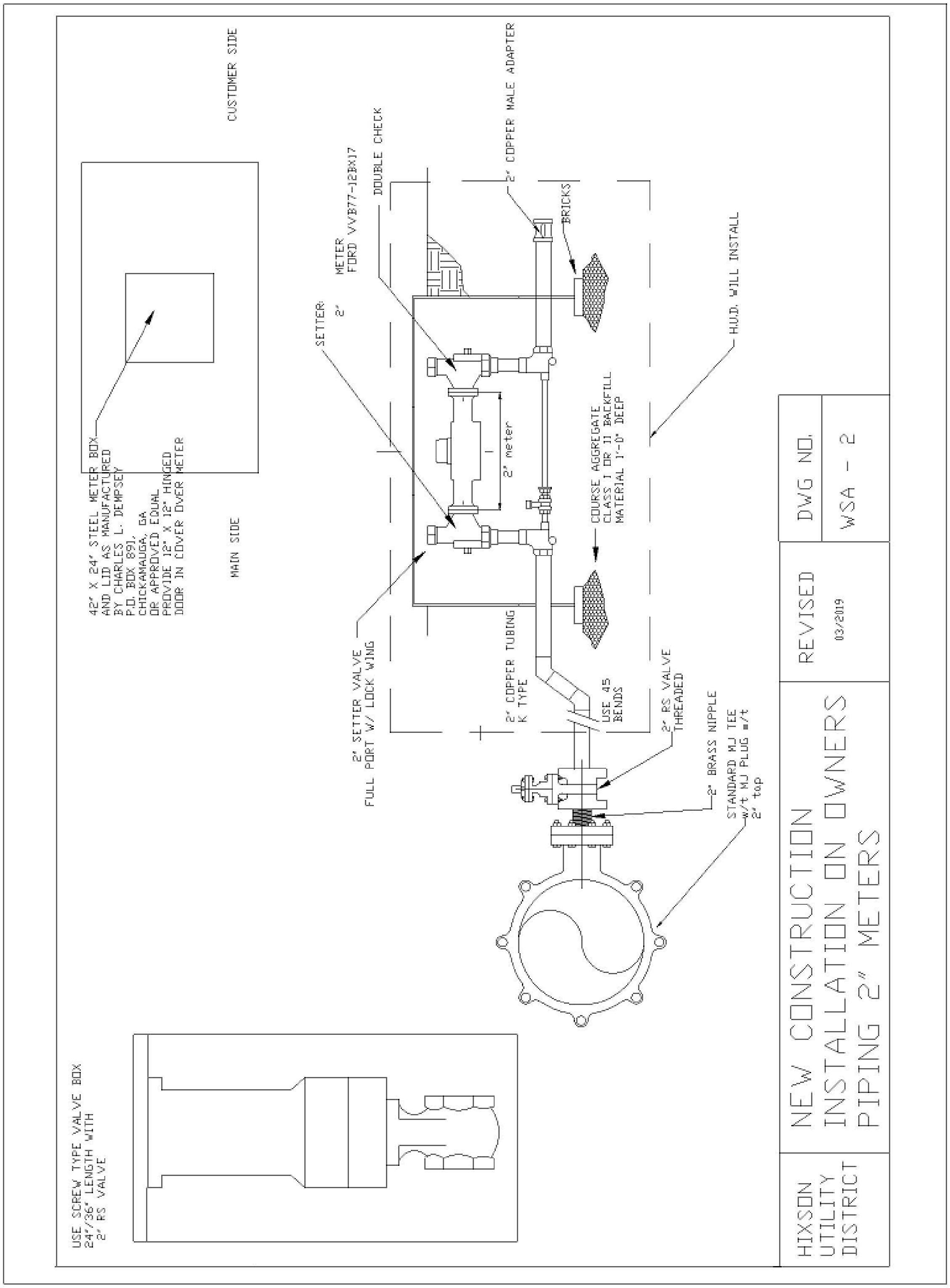

FIRE HYDRANT AWWA APPROVED
CITY OF CHATTANOOGA STANDARD
MUELLER 4 1/2" SUPER CENTURION 350
TRAFFIC MODEL , OPEN LEFT
PAINT YELLOW
Note: ALL FIRE HYDRANTS ARE TO BE INSTALLED ON 8" MAINS OR LARGER UNLESS ON PRIVATE 6" FIRE SERVICE WATER MAINS
HYDRANT TO BE PLACED WITH NOZZLES FACING STREET
FINISHED GRADE
18"
6 CU. FT. COARSE AGGREGATE CLASS I OR II BACKFILL MATERIAL
VALVE BOX (SEE DWG NO GV-VB 1 FOR DETAIL)
30" MIN
GATE VALVE (SEE DWG NO GV-VB 1 FOR DETAIL)
THRUST BLOCKING PER DWGS TBD 1 & 2
FIRE HYDRANT TEE AND WATER MAIN
KEEP WEEP HOLE FREE OF CONCERT
CONNECTING PIPE IS TO BE A US PIPE OR EQUAL 6" X 13" ANCHOR COUPLING
℄ STREET
21'- 0" FROM CENTER LINE OF STREET
OR 4'- 0" FROM BACK OF CURB FOR MULTI-LANE ROADWAYS
Rev. 03/2019
HIXSON UTILITY DISTRICT
FIRE HYDRANT ASSEMBLY
DWG FHA 2



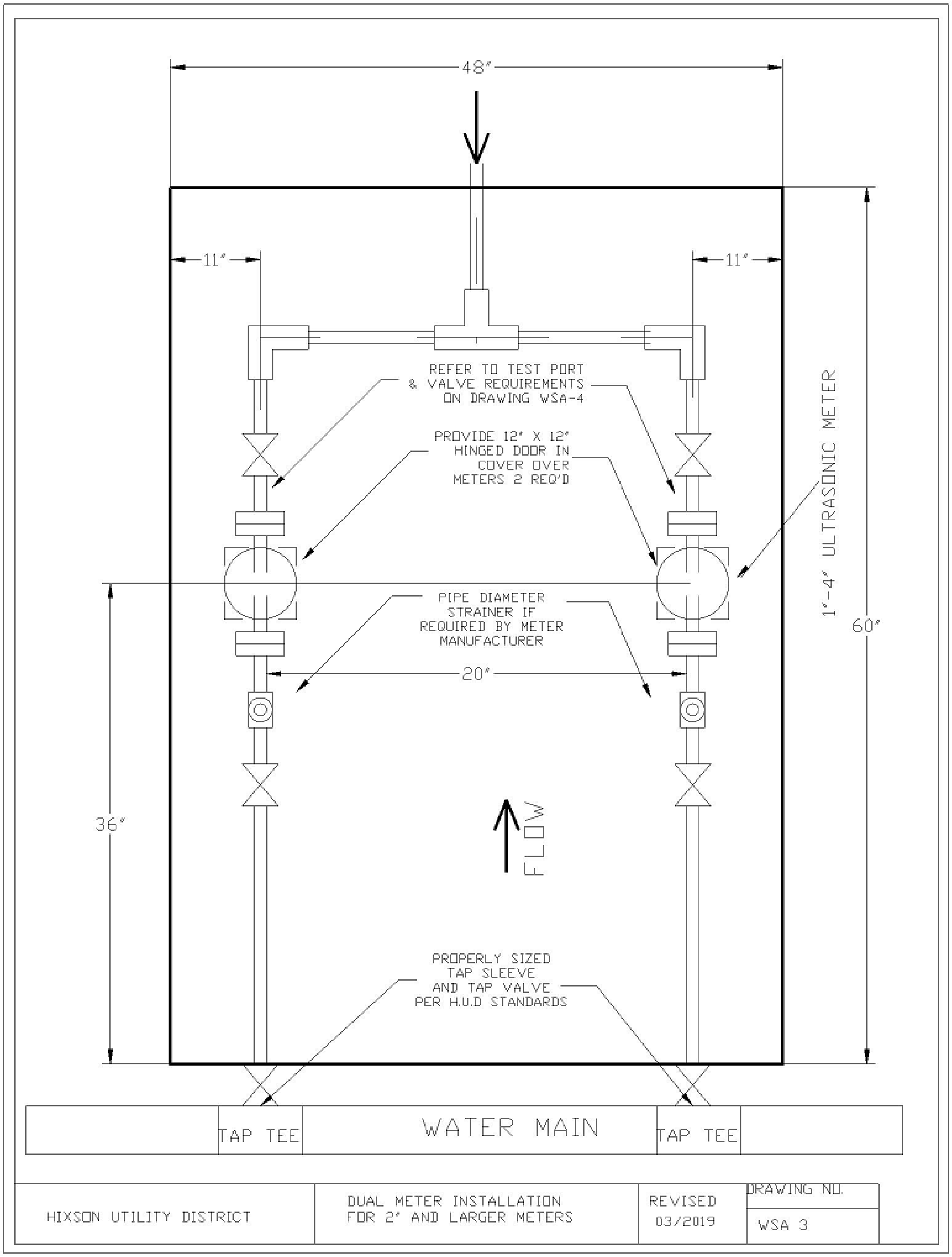
HIXSON UTILITY DISTRICT	TAPPING SLEEVE ASSEMBLY	REVISED 03/2019	DRAWING NO. TSA 1

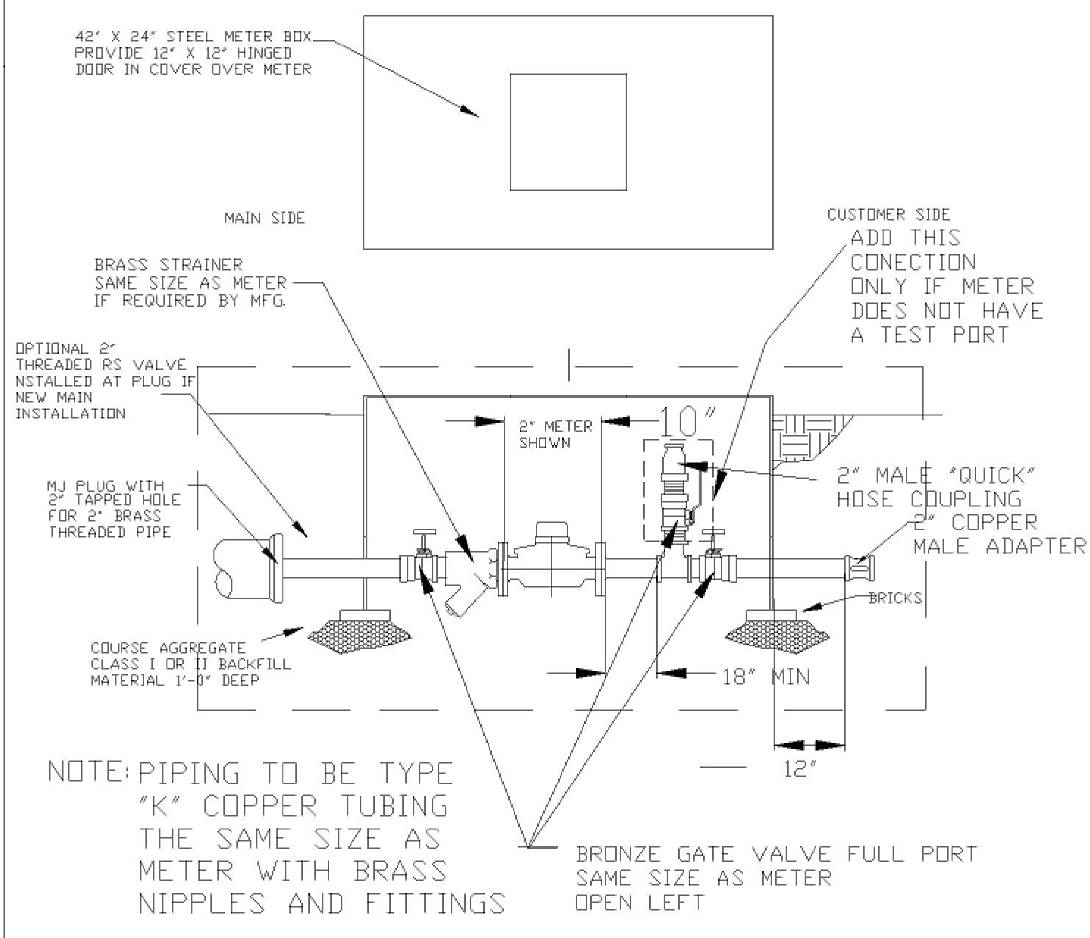

GROUND LEVEL
SEE DRW
TBD-1
FOR DIM.
SEE DRAWING TSA-1
FOR TYPICAL TAPPING
ARRANGMENT
BACK FILL
MATERIAL COARSE
AGGREAGATE
CLASS I OR II
ALL JOINTS
TO BE MADE
WITH MEGA-
LUG FLANGES
NOTE: ALL JOINTS INSIDE
OF CASING SHALL
BE OF THE FIELD LOK
GASKET INSTANT JOINT
RESTRAINT TYPE OR
APPROVED EQUAL
THRUST
BLOCK PER
TBD-1 & 2
SHIMS SPECFIFED
BY H.U.D.
REV
MAR 2008
HIXSON
UTILITY
DISTRICT
REVERSE TAP
DRW
TSA-2


COMPRESSION CURB STOP WILL BE INSTALLED AT A DISTANCE OF 6 INCHES PAST CONCRETE SIDEWALKS WHEN PRESENT/ WHEN SIDEWALKS ARE ABSENT CURB STOP WILL BE LOCATED 12 INCHES PAST CONCRETE CURB.
ADDITIONAL METERS FOR DUPLEXES OR LAWN METERS
EDGE OF PAVEMENT
LOT LINE
EDGE R.O.W.
VIEW A-A
2'-0"
METER AND SETTER VALVE
A
CURB
A
METER BOX AND LID
FINISHED GRAD
2' MIN
3/4" OR 1" K TYPE COPPER TUBE NO COUPLINGS
3/4" OR 1" BRASS MALE PIPE ADAPTER
PROPERTY LINE
COMPRESSION CURB STOP WILL BE INSTALLED AT A DISTANCE OF 6 INCHES PAST CONCRETE SIDEWALKS WHEN PRESENT/ WHEN SIDEWALKS ARE ABSENT CURB STOP WILL BE LOCATED 12 INCHES PAST CONCRETE CURB.
INSTALLTION BY DEVELOPER
BY DISTRICT
BY HOME BUILDER
SIDE VIEW
NOT TO SCALE
CORPORATION COMPRESSION STOP (3/4" OR 1" CC THREAD)
IF SERVICE LATERAL WILL SERVE TWO LOTS OR MORE A MINIMUM SIZE OF TYPE K COPPER SHALL BE 1" AND 1" FITTINGS
HIXSON UTILITY DISTRICT
WATER SERVICE ASSEMBLY 5/8" OR 1" METER
REVISED 03/2019
DRAWING NO.
WSA-1

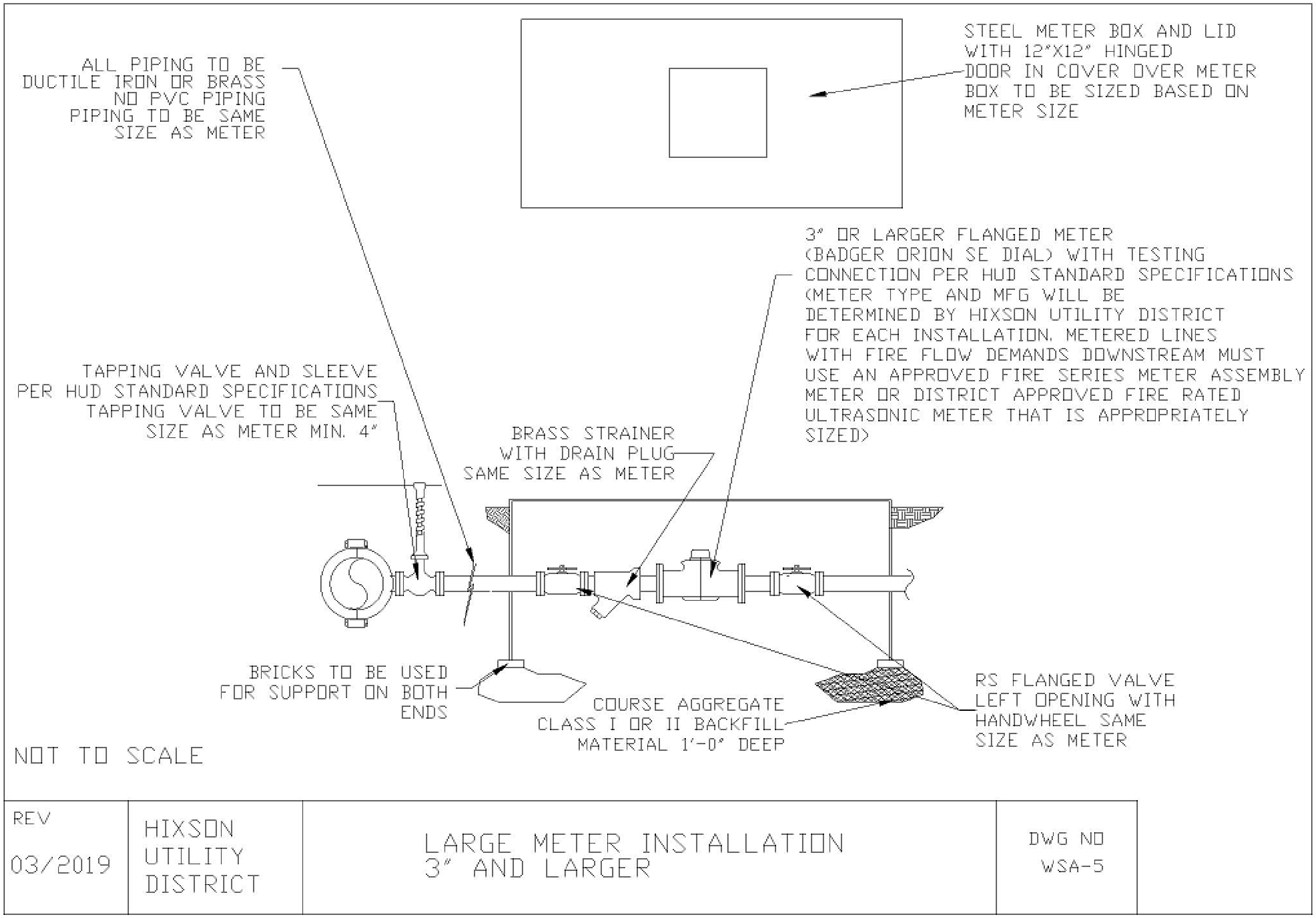


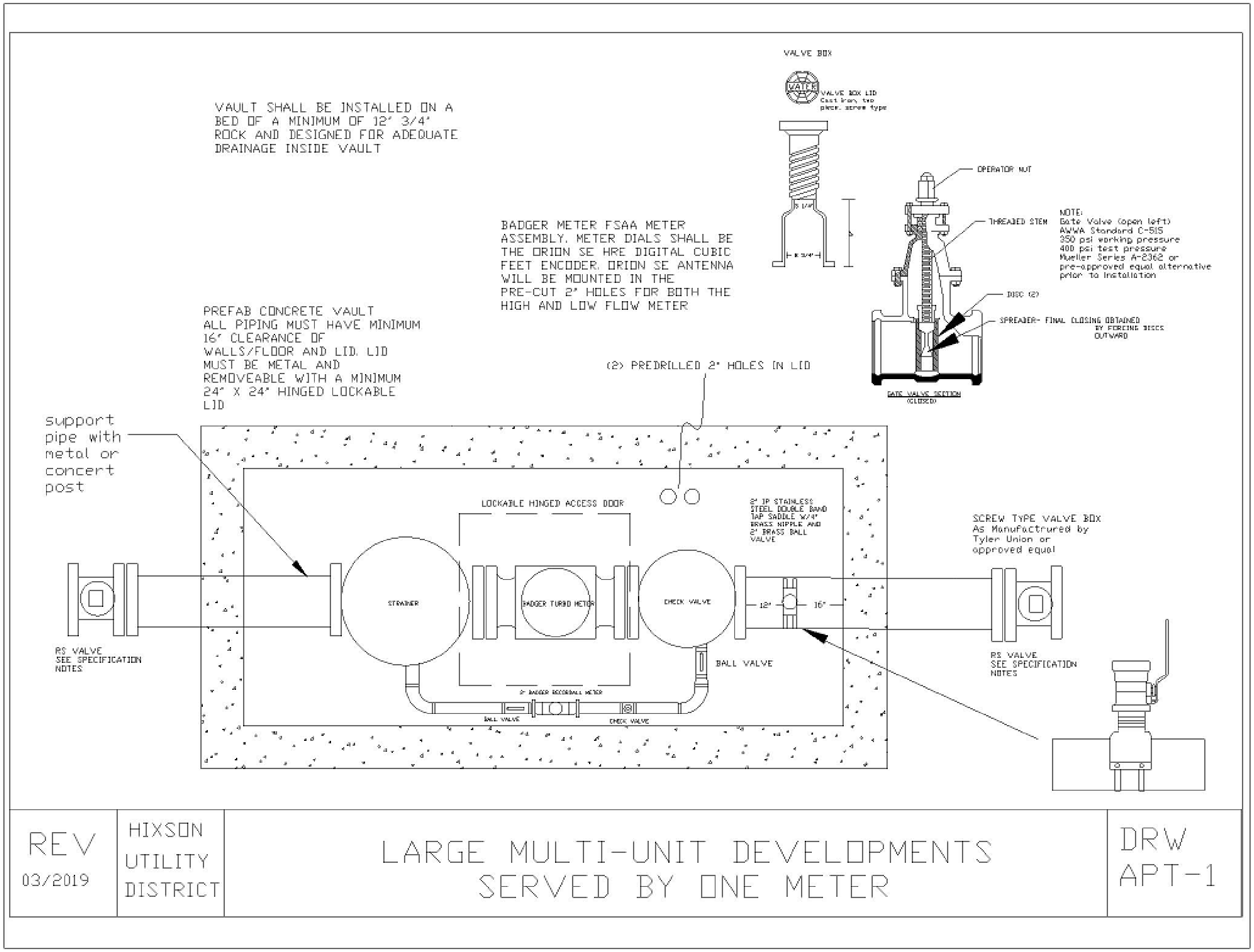
HIXSON UTILITY DISTRICT
NEW CONSTRUCTION INSTALLATION ON OWNERS PIPING 2" METERS
REVISED
03/2019
DWG NO.
WSA - 2
CUSTOMER SIDE
MAIN SIDE
42" X 24" STEEL METER BOX AND LID AS MANUFACTURED BY CHARLES L. DEMPSEY P.O. BOX 891, CHICKAMAUGA, GA OR APPROVED EQUAL PROVIDE 12" X 12" HINGED DOOR IN COVER OVER METER
USE SCREW TYPE VALVE BOX 24"/36" LENGTH WITH 2" RS VALVE
SETTER: 2"
METER FORD VVB77-12BX17
DOUBLE CHECK
2" COPPER MALE ADAPTER
BRICKS
H.U.D. WILL INSTALL
2" meter
COURSE AGGREGATE CLASS I OR II BACKFILL MATERIAL 1'-0" DEEP
2" SETTER VALVE FULL PORT W/ LOCK WING
2" COPPER TUBING K TYPE
USE 45 BENDS
2" RS VALVE THREADED
2" BRASS NIPPLE
STANDARD MJ TEE w/t MJ PLUG w/t 2" tap


48"
11"
11"
REFER TO TEST PORT
& VALVE REQUIREMENTS
ON DRAWING WSA-4
PROVIDE 12" X 12"
HINGED DOOR IN
COVER OVER
METERS 2 REQ'D
1'-4" ULTRASONIC METER
60"
PIPE DIAMETER
STRAINER IF
REQUIRED BY METER
MANUFACTURER
20"
36"
FLOW
PROPERLY SIZED
TAP SLEEVE
AND TAP VALVE
PER H.U.D STANDARDS
TAP TEE
WATER MAIN
TAP TEE
HIXSON UTILITY DISTRICT
DUAL METER INSTALLATION
FOR 2" AND LARGER METERS
REVISED
03/2019
DRAWING NO.
WSA 3



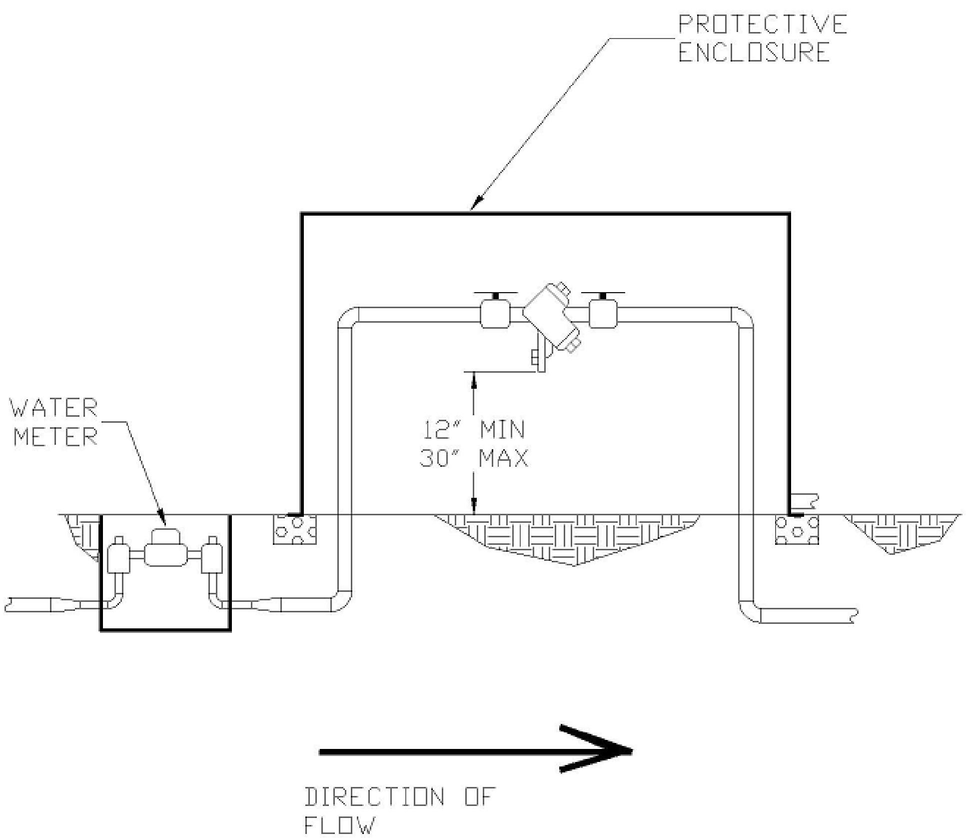
REV. 03/2019	HIXSON UTILITY DISTRICT	ULTRASONIC METER INSTALLATION	DWG NO. WSA-4


STEEL METER BOX AND LID WITH 12"X12" HINGED DOOR IN COVER OVER METER BOX TO BE SIZED BASED ON METER SIZE
ALL PIPING TO BE DUCTILE IRON OR BRASS NO PVC PIPING PIPING TO BE SAME SIZE AS METER
3" OR LARGER FLANGED METER (BADGER ORION SE DIAL) WITH TESTING CONNECTION PER HUD STANDARD SPECIFICATIONS (METER TYPE AND MFG WILL BE DETERMINED BY HIXSON UTILITY DISTRICT FOR EACH INSTALLATION. METERED LINES WITH FIRE FLOW DEMANDS DOWNSTREAM MUST USE AN APPROVED FIRE SERIES METER ASSEMBLY METER OR DISTRICT APPROVED FIRE RATED ULTRASONIC METER THAT IS APPROPRIATELY SIZED)
TAPPING VALVE AND SLEEVE PER HUD STANDARD SPECIFICATIONS TAPPING VALVE TO BE SAME SIZE AS METER MIN. 4"
BRASS STRAINER WITH DRAIN PLUG SAME SIZE AS METER
BRICKS TO BE USED FOR SUPPORT ON BOTH ENDS
COURSE AGGREGATE CLASS I OR II BACKFILL MATERIAL 1'-0" DEEP
RS FLANGED VALVE LEFT OPENING WITH HANDWHEEL SAME SIZE AS METER
NOT TO SCALE
REV
03/2019
HIXSON UTILITY DISTRICT
LARGE METER INSTALLATION 3" AND LARGER
DWG NO
WSA-5


VAULT SHALL BE INSTALLED ON A BED OF A MINIMUM OF 12" 3/4" ROCK AND DESIGNED FOR ADEQUATE DRAINAGE INSIDE VAULT
PREFAB CONCRETE VAULT ALL PIPING MUST HAVE MINIMUM 16" CLEARANCE OF WALLS/FLOOR AND LID. LID MUST BE METAL AND REMOVEABLE WITH A MINIMUM 24" X 24" HINGED LOCKABLE LID
BADGER METER FSAA METER ASSEMBLY. METER DIALS SHALL BE THE ORION SE HRE DIGITAL CUBIC FEET ENCODER. ORION SE ANTENNA WILL BE MOUNTED IN THE PRE-CUT 2" HOLES FOR BOTH THE HIGH AND LOW FLOW METER
(2) PREDRILLED 2" HOLES IN LID
VALVE BOX
VALVE BOX LID
Cast iron, two piece, screw type
OPERATOR NUT
THREADED STEM
DISC (2)
SPREADER- FINAL CLOSING OBTAINED BY FORCING DISCS OUTWARD
GATE VALVE SECTION (CLOSED)
NOTE:
Gate Valve (open left)
AWWA Standard C-515
350 psi working pressure
400 psi test pressure
Mueller Series A-2362 or pre-approved equal alternative prior to installation
support pipe with metal or concert post
LOCKABLE HINGED ACCESS DOOR
STRAINER
BADGER TURBO METER
CHECK VALVE
2" IP STAINLESS STEEL DOUBLE BAND TAP SADDLE W/4" BRASS NIPPLE AND 2" BRASS BALL VALVE
12"
16"
BALL VALVE
2" BADGER RECORDALL METER
BALL VALVE
CHECK VALVE
SCREW TYPE VALVE BOX As Manufactrured by Tyler Union or approved equal
RS VALVE SEE SPECIFICATION NOTES
RS VALVE SEE SPECIFICATION NOTES
REV
03/2019
HIXSON UTILITY DISTRICT
LARGE MULTI-UNIT DEVELOPMENTS SERVED BY ONE METER
DRW APT-1

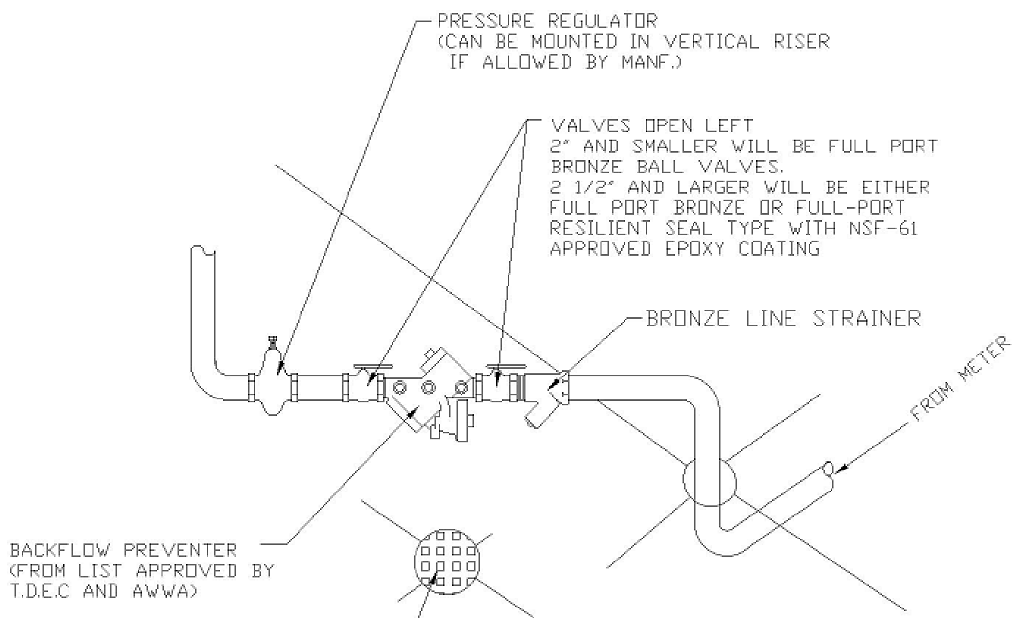
NOTES:

1. PRESSURE REGULATOR OPTIONAL
2. BACKFLOW PREVENT MUST BE FROM APPROVED LIST OF TDEC & AWWA.
3. VALVE OPEN LEFT
4. 2" AND SMALLER VALVE ARE TO BE FULL PORT BRONZE BALL VALVES.
5. VALVES LARGER THAN 2" ARE TO BE FULL PORT BRONZE BALL VALVES OR FULL PORT RS TYPE WITH NSF 60 APPROVED EPOXY COATING.



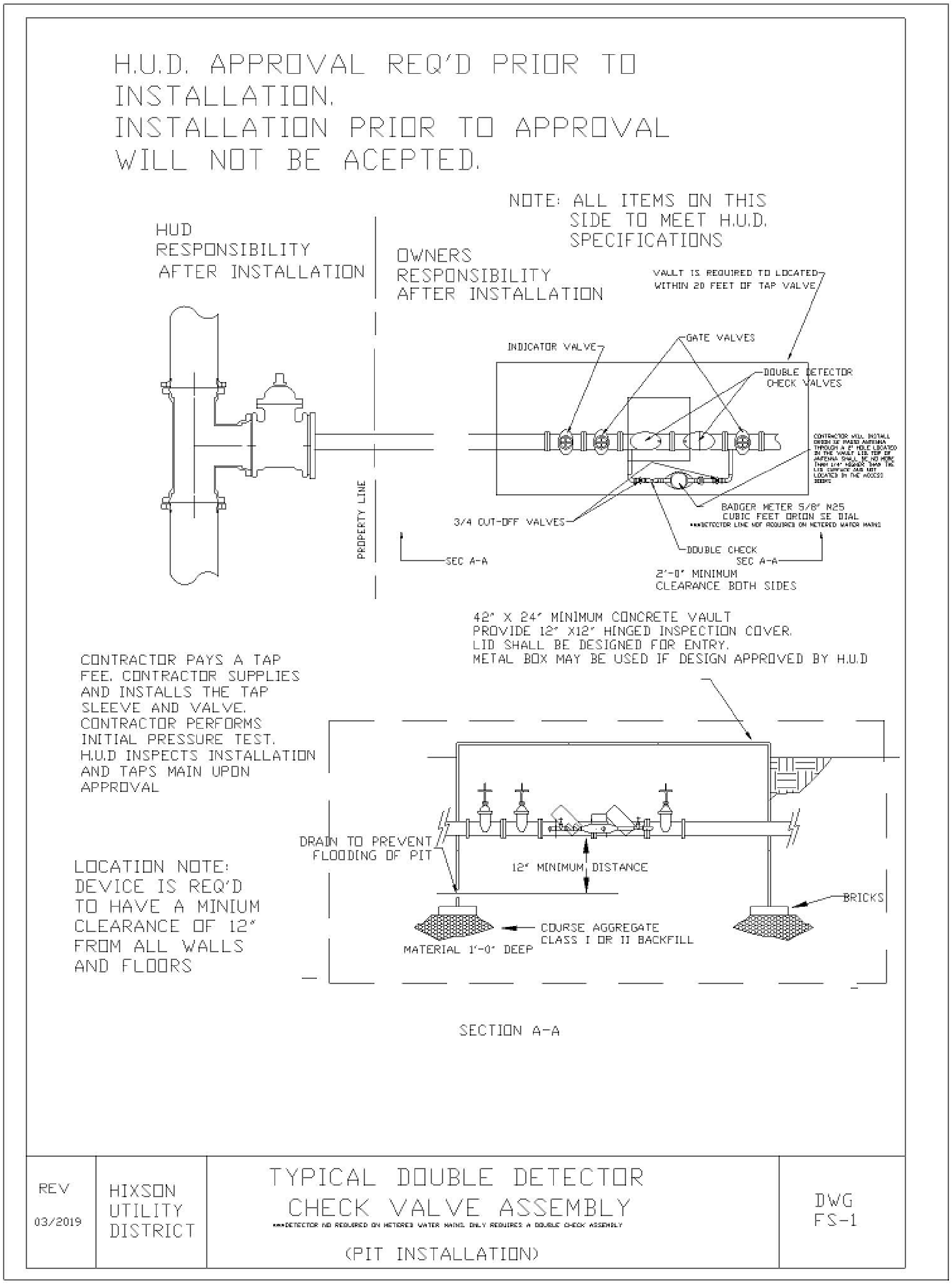
HIXSON UTILITY DISTRICT	TYPICAL BACKFLOW PREVENTER ASSEMBLY OUTSIDE BUILDING	REVISED 03/2019	DRAWING NO. BP 1

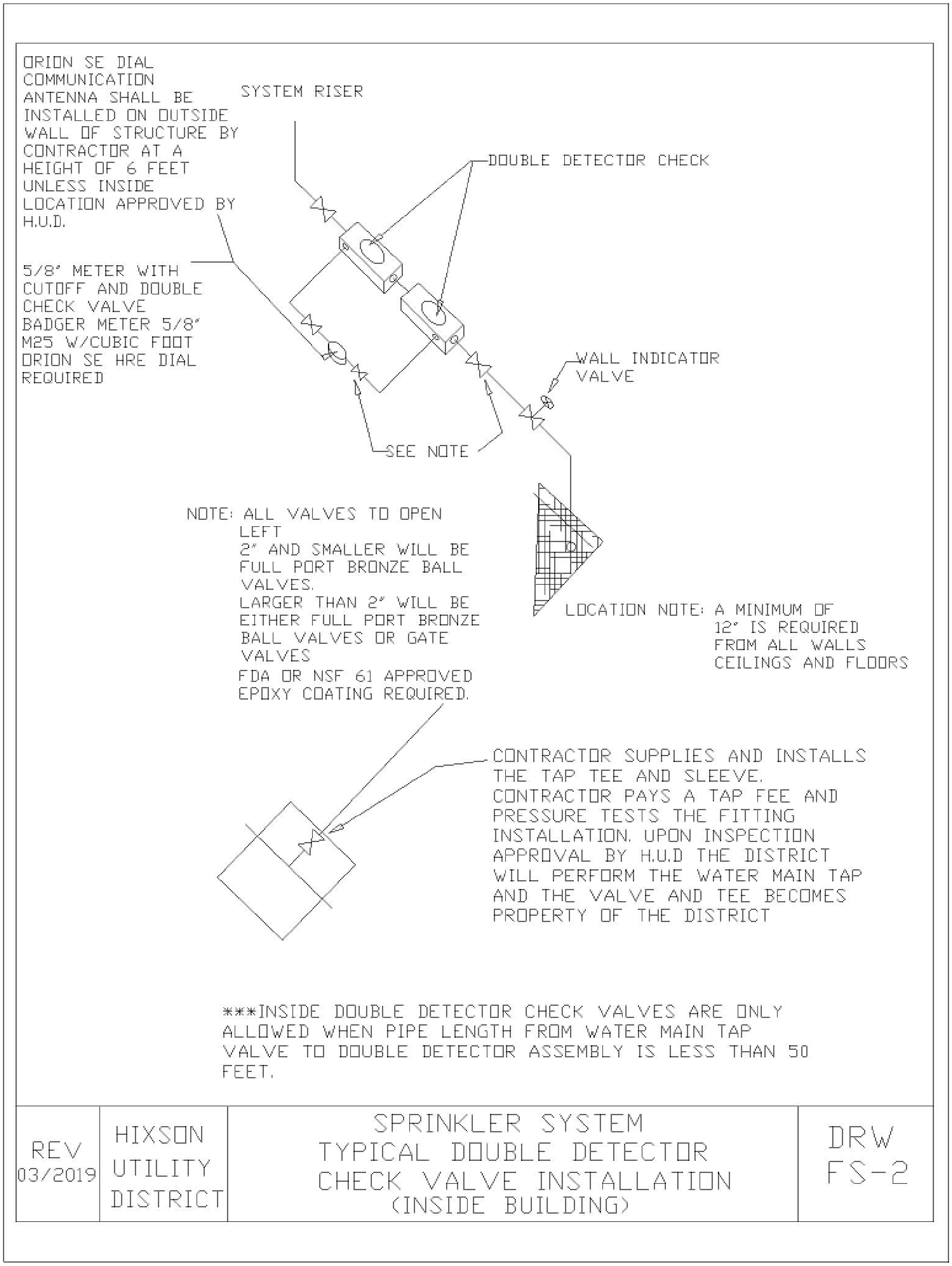
NOTE: A MINIMUM OF
12" MUST BE
MAINTAINED BETWEEN
THE DEVICE AND ALL
WALLS AND FLOORS.

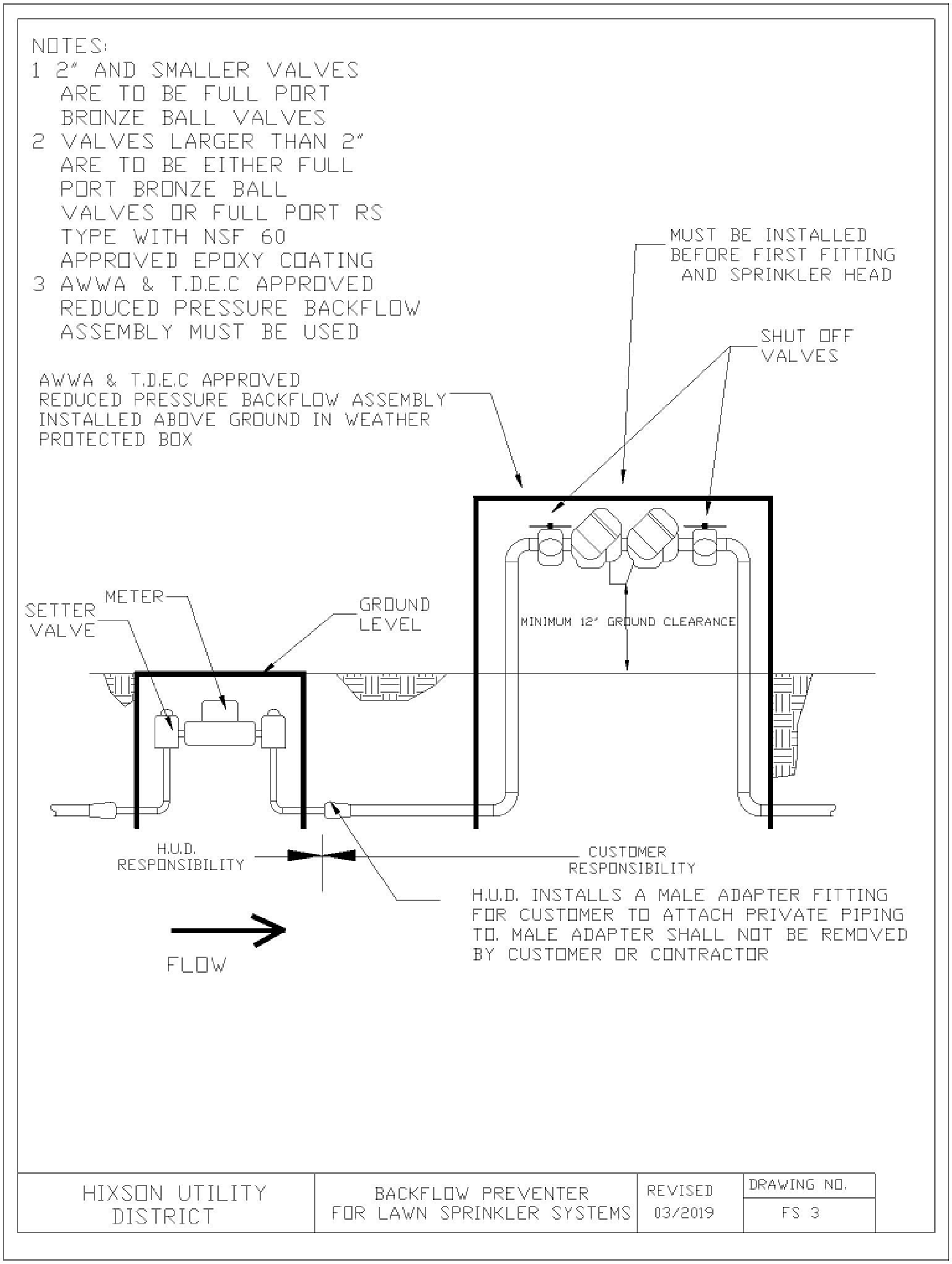


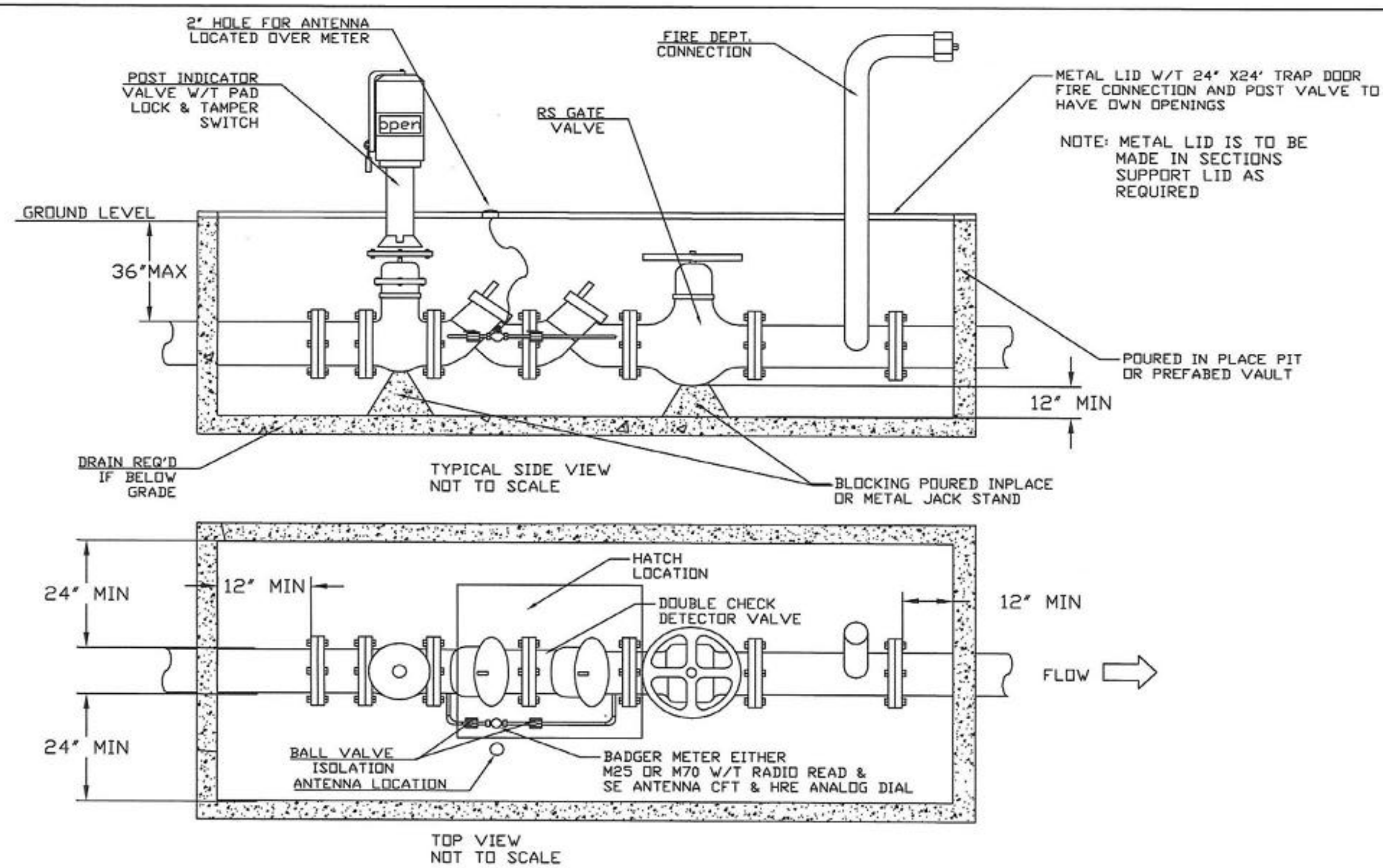
INSTALL IN HORIZONTAL POSITION
WITH MINIMUM OF 12 " CLEARANCE
FROM FLOOR TO BOTTOM OF DEVICE,
BUT NO HIGHER THAN 4 FEET ABOVE
THE FLOOR. MUST BE EASILY
ACCESSIBLE FOR TESTING AND
REPAIR.

HIXSON UTILITY DISTRICT	TYPICAL BACKFLOW PREVENTER ASSEMBLY INSIDE BUILDING	DWG. BP-2
		REVISED 03/2019


H.U.D. APPROVAL REQ'D PRIOR TO INSTALLATION.
INSTALLATION PRIOR TO APPROVAL WILL NOT BE ACEPTED.
NOTE: ALL ITEMS ON THIS SIDE TO MEET H.U.D. SPECIFICATIONS
HUD RESPONSIBILITY AFTER INSTALLATION
OWNERS RESPONSIBILITY AFTER INSTALLATION
VAULT IS REQUIRED TO LOCATED WITHIN 20 FEET OF TAP VALVE
INDICATOR VALVE
GATE VALVES
DOUBLE DETECTOR CHECK VALVES
PROPERTY LINE
3/4 CUT-OFF VALVES
BADGER METER 5/8" N25 CUBIC FEET ORION SE DIAL
DOUBLE CHECK
SEC A-A
SEC A-A
2'-0" MINIMUM CLEARANCE BOTH SIDES
42" X 24" MINIMUM CONCRETE VAULT
PROVIDE 12" X12" HINGED INSPECTION COVER.
LID SHALL BE DESIGNED FOR ENTRY.
METAL BOX MAY BE USED IF DESIGN APPROVED BY H.U.D
CONTRACTOR PAYS A TAP FEE. CONTRACTOR SUPPLIES AND INSTALLS THE TAP SLEEVE AND VALVE. CONTRACTOR PERFORMS INITIAL PRESSURE TEST. H.U.D INSPECTS INSTALLATION AND TAPS MAIN UPON APPROVAL
DRAIN TO PREVENT FLOODING OF PIT
12" MINIMUM DISTANCE
BRICKS
COURSE AGGREGATE CLASS I OR II BACKFILL
MATERIAL 1'-0" DEEP
LOCATION NOTE: DEVICE IS REQ'D TO HAVE A MINIUM CLEARANCE OF 12" FROM ALL WALLS AND FLOORS
SECTION A-A
REV
03/2019
HIXSON UTILITY DISTRICT
TYPICAL DOUBLE DETECTOR CHECK VALVE ASSEMBLY
***DETECTOR NO REQUIRED ON METERED WATER MAINS. ONLY REQUIRES A DOUBLE CHECK ASSEMBLY
(PIT INSTALLATION)
DWG FS-1


ORION SE DIAL COMMUNICATION ANTENNA SHALL BE INSTALLED ON OUTSIDE WALL OF STRUCTURE BY CONTRACTOR AT A HEIGHT OF 6 FEET UNLESS INSIDE LOCATION APPROVED BY H.U.D.
SYSTEM RISER
DOUBLE DETECTOR CHECK
5/8" METER WITH CUTOFF AND DOUBLE CHECK VALVE BADGER METER 5/8" M25 W/CUBIC FOOT ORION SE HRE DIAL REQUIRED
WALL INDICATOR VALVE
SEE NOTE
NOTE: ALL VALVES TO OPEN LEFT
2" AND SMALLER WILL BE FULL PORT BRONZE BALL VALVES.
LARGER THAN 2" WILL BE EITHER FULL PORT BRONZE BALL VALVES OR GATE VALVES
FDA OR NSF 61 APPROVED EPOXY COATING REQUIRED.
LOCATION NOTE: A MINIMUM OF 12" IS REQUIRED FROM ALL WALLS CEILINGS AND FLOORS
CONTRACTOR SUPPLIES AND INSTALLS THE TAP TEE AND SLEEVE. CONTRACTOR PAYS A TAP FEE AND PRESSURE TESTS THE FITTING INSTALLATION. UPON INSPECTION APPROVAL BY H.U.D THE DISTRICT WILL PERFORM THE WATER MAIN TAP AND THE VALVE AND TEE BECOMES PROPERTY OF THE DISTRICT
***INSIDE DOUBLE DETECTOR CHECK VALVES ARE ONLY ALLOWED WHEN PIPE LENGTH FROM WATER MAIN TAP VALVE TO DOUBLE DETECTOR ASSEMBLY IS LESS THAN 50 FEET.
REV 03/2019
HIXSON UTILITY DISTRICT
SPRINKLER SYSTEM TYPICAL DOUBLE DETECTOR CHECK VALVE INSTALLATION (INSIDE BUILDING)
DRW FS-2

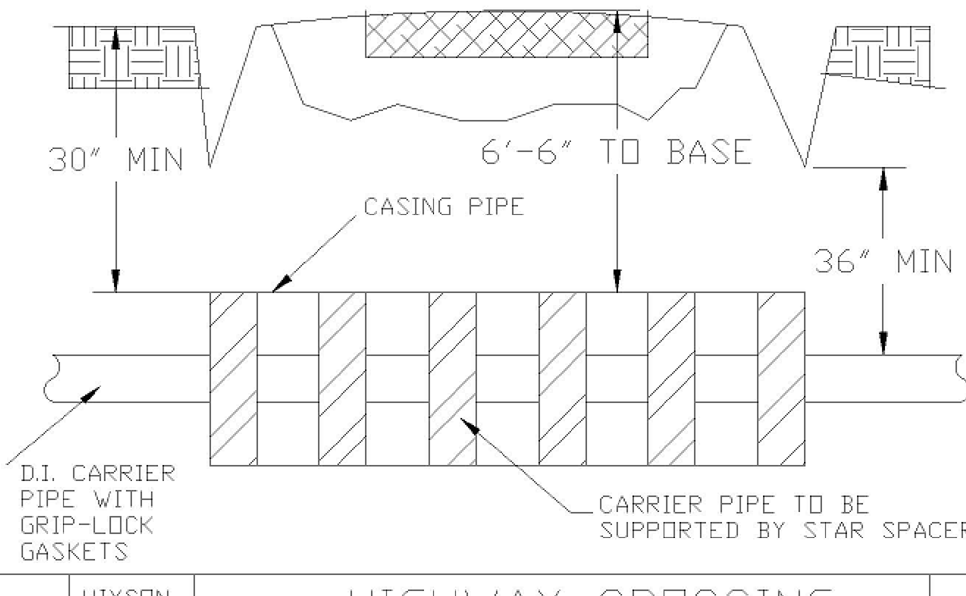

NOTES:
1 2" AND SMALLER VALVES ARE TO BE FULL PORT BRONZE BALL VALVES
2 VALVES LARGER THAN 2" ARE TO BE EITHER FULL PORT BRONZE BALL VALVES OR FULL PORT RS TYPE WITH NSF 60 APPROVED EPOXY COATING
3 AWWA & T.D.E.C APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY MUST BE USED
MUST BE INSTALLED BEFORE FIRST FITTING AND SPRINKLER HEAD
SHUT OFF VALVES
AWWA & T.D.E.C APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY INSTALLED ABOVE GROUND IN WEATHER PROTECTED BOX
METER
SETTER VALVE
GROUND LEVEL
MINIMUM 12" GROUND CLEARANCE
H.U.D. RESPONSIBILITY
CUSTOMER RESPONSIBILITY
H.U.D. INSTALLS A MALE ADAPTER FITTING FOR CUSTOMER TO ATTACH PRIVATE PIPING TO. MALE ADAPTER SHALL NOT BE REMOVED BY CUSTOMER OR CONTRACTOR
FLOW
HIXSON UTILITY DISTRICT
BACKFLOW PREVENTER FOR LAWN SPRINKLER SYSTEMS
REVISED 03/2019
DRAWING NO. FS 3



HIXSON UTILITY DISTRICT	FIRE HYDRANT VAULT WITH POST INDICATOR VALVE TYPICAL	REVISED	DRAWING NO. FH-4

CARRIER SIZE	SPIRAL WELDED STEEL	
	CASING SIZE	WALL THICKNESS OF CASING PIPE
2"	4"	1/4'
4"	8"	1/4"
6"	12"	1/4'
8"	16"	1/4"

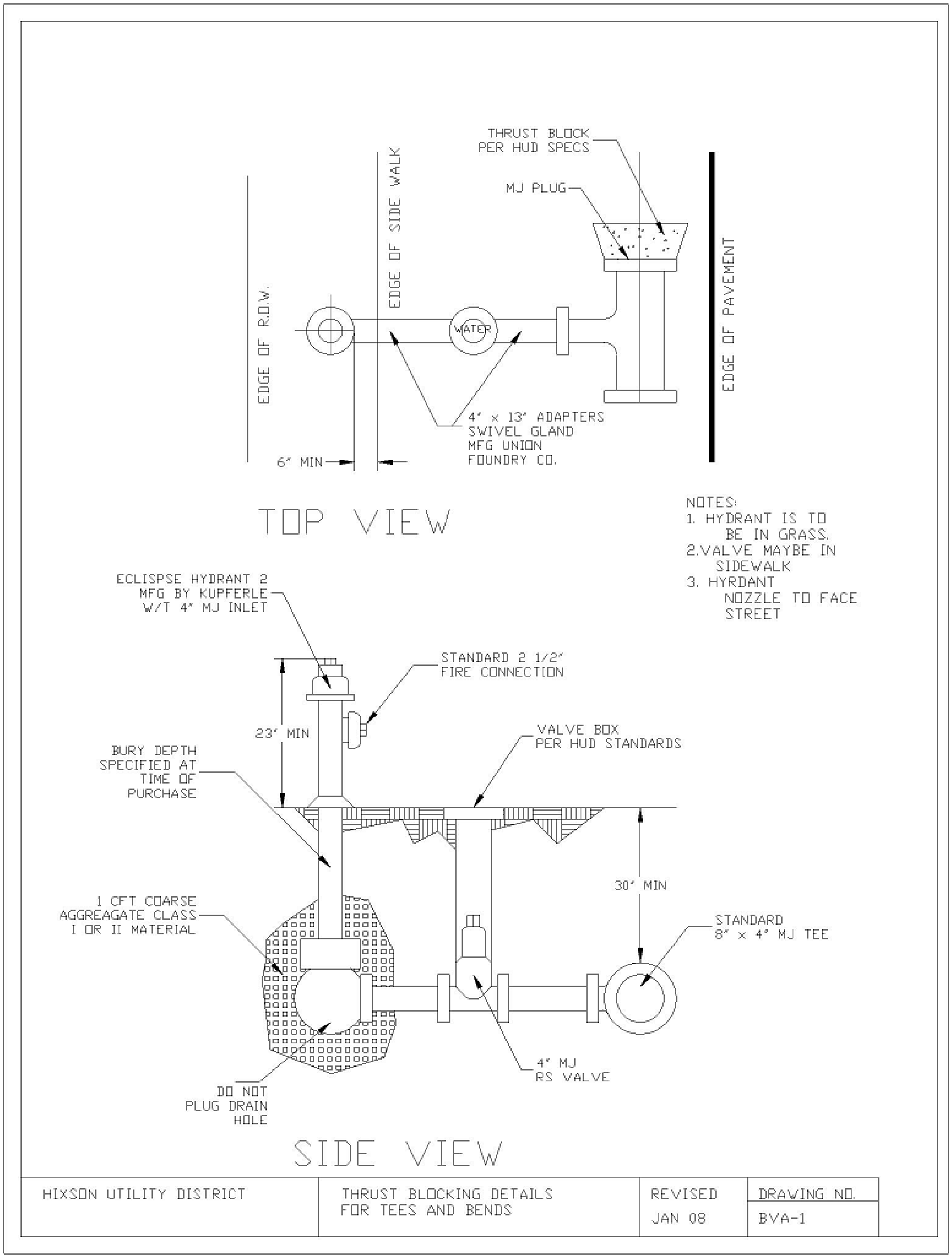
NOTE: T.D.O.T. OR RAILROAD MAY REQUIRE ADDITIONAL SPECIFICATIONS



HIXSON UTILITY DISTRICT

HIGHWAY CROSSING DETAIL

DWG # HC-1


THRUST BLOCK
PER HUD SPECS
MJ PLUG
EDGE OF SIDE WALK
EDGE OF R.O.W.
WATER
EDGE OF PAVEMENT
4" x 13" ADAPTERS
SWIVEL GLAND
MFG UNION
FOUNDRY CO.
6" MIN
TOP VIEW
NOTES:
1. HYDRANT IS TO
BE IN GRASS.
2.VALVE MAYBE IN
SIDEWALK
3. HYRDANT
NOZZLE TO FACE
STREET
ECLISPSE HYDRANT 2
MFG BY KUPFERLE
W/T 4" MJ INLET
STANDARD 2 1/2"
FIRE CONNECTION
23" MIN
VALVE BOX
PER HUD STANDARDS
BURY DEPTH
SPECIFIED AT
TIME OF
PURCHASE
30" MIN
1 CFT COARSE
AGGREAGATE CLASS
I OR II MATERIAL
STANDARD
8" x 4" MJ TEE
4" MJ
RS VALVE
DO NOT
PLUG DRAIN
HOLE
SIDE VIEW
HIXSON UTILITY DISTRICT
THRUST BLOCKING DETAILS
FOR TEES AND BENDS
REVISED
JAN 08
DRAWING NO.
BVA-1

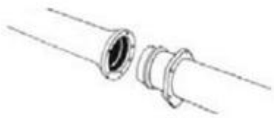
1. Thoroughly clean the groove and the bell socket of the pipe or fitting; also clean the plain end of the mating pipe or fitting. Using a gasket of the proper design for the joint to be assembled, make a small loop in the gasket and insert it in the socket. For pipe sizes larger than 20-inches it may be necessary to make two loops in the gasket (6 and 12 o'clock). Make sure the gasket faces the correct direction and that it is properly seated. *Note: In cold weather, it may be necessary to warm the gasket to facilitate insertion.*

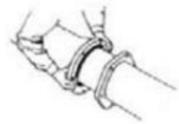
2. Apply lubricant to the exposed surface of the gasket and plain end of the pipe or fitting in accordance with the pipe manufacturer's recommendations. Do not apply lubricant to the bell socket or the surface of the gasket in contact with the bell socket. Lubricant is furnished in sterile containers and every effort should be made to keep it sterile. For underwater or very wet joint assemblies, relatively insoluble underwater joint lubricant is available and should be used.

3. Be sure that the shape/dimensions of the bevel on the plain end is per the manufacturer's recommendations; square or sharp edges may damage or dislodge the gasket and cause a leak. When pipe is cut in the field, bevel the plain end with a heavy file or grinder to remove all sharp edges. Do not use a saw blade to bevel the plain end. Push the plain end into the bell socket of the mating pipe or fitting, keeping the joint straight while pushing. Make deflection after the joint is assembled.

4. Small pipe can be pushed into the bell socket with a long bar. Large pipe requires additional power, such as a jack, lever puller, or backhoe. The supplier may provide a jack or lever puller on a rental basis. A timber header should be used between the pipe and the jack or backhoe bucket to avoid damage to the pipe.

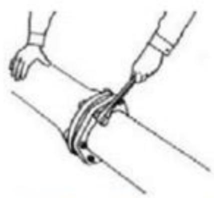
HIXSON UTILITY DISTRICT	PUSH ON JOINT ASSEMBLY	REVISED JAN 08	DRAWING NO. PJA-1





1. Wipe clean the bell recess and the plain end. Brush both the gasket and plain end with soapy water or an approved push-on joint lubricant meeting the requirements of ANSI/AWWA C111/A21.11 immediately before slipping the gasket onto the plain end for joint assembly. *Note: Lubrication is recommended for proper assembly of all mechanical joints.* Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end. *Note: In cold weather, it is preferable to warm the gasket to facilitate assembly of the*

2. Insert the plain end into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.



3. Push the gland toward the socket and center it around the plain end with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after joint assembly but before tightening bolts.

4. Tighten the bolts to the normal range of bolt torque (as indicated in the table below) while constantly maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This consistency can be accomplished by partially tightening the bottom bolt first, then the top bolt, then the bolts at either side, and finally the remaining bolts. This procedure is known as the "star pattern" for tightening bolts. Repeat the process until all bolts are within the appropriate range of torque. In large sizes (30-inch through 48-inch), five or more repetitions may be required. Joints that have been assembled without proper lubrication and/or inadequate bolt torque are susceptible to leakage.

Mechanical Joint Bolt Torque

Joint Size (inches)	Bolt Size (inches)	Range of Torque (ft. - lb.)
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1-1/4	120-150

Ductile Iron Pipe Research Association

HIXSON UTILITY DISTRICT	MECHANICAL JOINT ASSEMBLY	REVISED JAN 08	DRAWING NO. PJA-2

Maximum Deflection Full Length Pipe
Push-on Joint Pipe

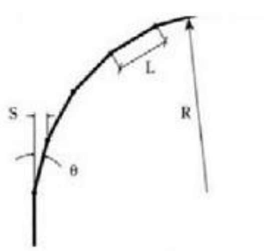
Nominal Pipe Size (inches)	Deflection Angle - Ø* (degrees)	Max. Offset - S* (inches)		Approximate Radius of Curve - R* Produced by Succession of Joints	
		L*= 18 ft.	L*= 20 ft.	L*= 18 ft.	L*= 20 ft.
3	5	19	21	205	230
4	5	19	21	205	230
6	5	19	21	205	230
8	5	19	21	205	230
10	5	19	21	205	230
12	5	19	21	205	230
14	3	11	12	340	380
16	3	11	12	340	380
18	3	11	12	340	380
20	3	11	12	340	380
24	3	11	12	340	380
30	3	11	12	340	380
36	3	11	12	340	380
42	3	11	12	340	380
48	3	-	12	-	380
54	3	-	12	-	380
60	3	-	12	-	380
64	3	-	12	-	380

Maximum Deflection Full Length Pipe
Mechanical Joint Pipe and Fittings*

Nominal Pipe Size (inches)	Deflection Angle† - Ø* (degrees)	Max. Offset - S* (inches)		Approximate Radius of Curve - R* Produced by Succession of Joints	
		L*= 18 ft.	L*= 20 ft.	L*= 18 ft.	L*= 20 ft.
3	8	31	35	125	140
4	8	31	35	125	140
6	7	27	30	145	160
8	5	20	22	195	220
10	5	20	22	195	220
12	5	20	22	195	220
14	3.5	13.5	15	285	320
16	3.5	13.5	15	285	320
18	3	11	12	340	380
20	3	11	12	340	380
24	2	9	10	450	500

θ = deflection angle
S = joint deflection offset
L = laying length
R = radius of curve

$$R = \frac{L}{2 \tan \theta/2}$$



Pipeline Curve Geometry

Ductile Iron Pipe Research Association

HIXSON UTILITY DISTRICT	JOINT DEFLECTIONS	REVISED JAN 08	DRAWING NO. JD-1

SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTION .

PART 1 GENERAL

1.01 WORK INCLUDED

A. Excavation for piped utility material.

B. Provide necessary sheeting, shoring and bracing.

C. Prepare trench bottom with appropriate materials,

D. Dewater excavation as required.

E. Place and compact granular beds, as required, and backfill.

1.02 BELATED WORK

A. Section 02110: Clearing and Grubbing

B. Section 02210: Grading and Excavation

C. Section 02513: Asphaltic Concrete Paving

D. Section 03001: Concrete Work

1.03 PRECAUTIONS

A. Notify utility companies when necessary to disturb existing facilities and abide by their requirements for repairing and replacing.

B. Protect all vegetation and other features to remain.

C. Protect all benchmarks and survey points.

PART 2 PRODUCTS

2.01 BEDDING AND BACKFILL MATERIALS

A. Class I Material: Angular, 1/4 to 1 inch graded stone Including a number of fill materials that have regional significance such as crushed stone, cinders, slag, and crushed shells.

B. Class II Material: Coarse sands and gravels with a maximum particle dimension of 1-1/2 inch including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry.

C. Class III Material: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures.

D. Class IV Material: Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits.

E. Class V Material: Organic soils, as well as, soil containing frozen earth, debris, rocks larger than 1-1/2 inches and other foreign material.

2.02 BEDDING AND BACKFILL MATERIALS - STORM SEWERS

NOT APPLICABLE

PART 3 EXECUTION

3.01 PREPARATION

A. Install barriers and other devices to protect areas adjacent to construction.

B. Protect and maintain all benchmark and other survey points.

C. Follow state, county and city requirements for site run off controls. File all applicable state, county and city permits as required.

3.02 EXCAVATION TRENCHES

A. Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public. Minimum trench width shall be 1 foot plus the normal diameter of the pipe.

B. Maximum width at the crown of the pipe - 2 feet plus the nominal diameter of the pipe.

C. Cut pavement along neat, straight lines with either a pavement breaker or pavement saw.

D. Trench depth: for water lines - sufficient to provide minimum cover of 30 Inches over the top of the pipe; maximum depth will not exceed 42" over top of pips unless there is prior approval from District.

E. Align trench as shown on the Plans unless a change is necessary to miss an unforeseen obstruction.

F. For water pipe, shape the bottom of the trench to provide uniform bearing of the pipe on undisturbed earth throughout its entire length. Dig bell holes to aid in securing uniform support of the pipe.

G. Waterline location will be 21 feet from the center line of the street or 4 feet in back of curb for multi-lane roadways. Waterlines will be located on the South and West sides of the streets.

H. When unstable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with coarse aggregate AASHTO M-43, Size No. 2 or 3.

I. Remove rock encountered in trench excavation to a depth of 6 inches below the bottom of the pipe barrel, backfill with an approved material, and compact to uniformly support the pipe. In no case shall solid rock exist within six (6) inches of the finished pipeline.

J. When rock borings or soundings are provided, they are for information only and do not guarantee existing conditions. Make such investigations as deemed necessary to determine existing conditions.

3.03 SHEETING, SHORING, AND BRACING

A. When necessary or when directed by the Engineer, furnish, put in place, and maintain such sheeting, bracing, etc., as may be required to support the sides of the excavation and to prevent movement.

B. Take care to prevent voids outside the sheeting.

C. If voids are formed, immediately fill and ram to the satisfaction of the Engineer.

D. Devise plans for performing this work subject to the approval of the Engineer.

E. Unless adjacent facilities will be injured, remove all sheeting shoring, and bracing after backfill has been placed to a depth of 18 inches over the pipeline.

F. Cut shoring off at the top of the pipe and leave the lower section in the trench.

3.04 USE OF EXPLOSIVES

A. Conduct all blasting operations in accordance with prevailing municipal, state or other agency regulations, codes, ordinances or laws.

B. Exercise due caution when blasting adjacent to existing structures and pipelines.

C. If structures or pipelines are damaged, promptly replace or repair them at no expense to Owner.

D. Do not conduct blasting operations within 25 feet of water, sewer, gas or other utility lines, unless otherwise directed by the Engineer.

E. Cover all shots with blasting mats to prevent flying material.

3.05 DISPOSAL OF EXCAVATED MATERIAL

A. Satisfactorily dispose of all excess excavated material that cannot be used for or is not suitable for embankments

3.06 UNAUTHORIZED EXCAVATION

A. All excavation outside or below the proposed lines and grades shown on the Plans or directed by the Engineer.

B. Backfill areas of unauthorized excavation with the type material necessary (earth, rock or concrete) .to insure the stability of the structure of construction involved.

C. NOT APPLICABLE

3.07 REMOVAL OF WATER

A. Keep excavated areas free of water while work is in progress.

B. Well-pointing shall be performed if required.

C. Take particular precautions to prevent the displacement of structures or pipelines as a result of accumulated water.

3.08 OBSTRUCTIONS

A. Obstructions shown on the Plans are for information only and do not neither guarantees their exact locations nor that of other obstructions are not present.

B. When utilities or obstructions are not shown on the plans but are present off the roadway at the location of the proposed pipeline route, the Contractor may request to relocate the pipeline in the roadway if necessary to avoid disturbing the utility or obstructions.

C. NOT APPLICABLE

D. Exercise due care in excavating adjacent to existing obstructions and do not disturb same unless absolutely necessary.

E. In the event obstructions are disturbed, repair or replace as quickly as possible to the condition existing prior to their disturbance.

F. If desired by the utility company, pay for the repair or replacement work performed by the forces of the utility company or other appropriate party.

G. If replacement or repair of disturbed obstructions is not performed after a reasonable period of time the Owner may have the necessary work done and deduct the cost of same from payments to the Contractor.

3.09 STORM SEWER BEDDING

NOT APPLICABLE

3.10 GRAVITY SANITARY SEWER BEDDING

NOT APPLICABLE

3.11 BEDDING FOR WATERLINES

A. Bed in a trench cut in natural ground.

B. Dig bell holes to assure uniform support throughout the entire length of pipe.

C. Excavate the trench in such a manner as to form a suitable bed on which to place the pipe. .

3.12 INITIAL BACKFILLING

A. Do not begin backfilling before the Engineer has inspected the grade and alignment of the pipe, the bedding of the pipe, and the joints between the pipes. If backfill material is placed over the pipe before an inspection is made, reopen the trench in order for an inspection to be made.

B. Perform backfilling by hand, together with tamping, until fill has progressed to 18" above the top of the pipe.

1) Deposit Class I granular material (where required) or loose soil free from lumps, clods, frozen material or stones in layers approximately 6" thick.
2) Compact by hand, or with manually operated machine tampers actuated by compressed air or other suitable means.
3) Use tamps and machines of a suitably type which do not crush or otherwise damage the pipe.

3.13 FINAL BACKFILLING

A. After the backfill has reached a point 18" or more above the top of the pipe, perform final backfilling depending upon the location of the work and danger from subsequent settlement.

B. Backfilling in Unimproved Areas:

1) Dispose of and replace all soft or yielding material which is unsuitable for trench backfill with suitable material.
2) Deposit backfill to the surface of the ground by dragline bulldozer, or other suitable equipment in such a manner so as not to disturb the pipe.
3) Neatly round sufficient surplus excavated material over the trench to compensate for after settlement.
4) Dispose of all surplus excavated material.
5) Prior to final acceptance, remove all mounds to the elevation of the surrounding terrain.

C. Backfilling Beneath Driveways and Streets where Non-Rigid and Rigid Type Surfacing is to be replaced:

1) Use Class I granular material of either crushed limestone or crushed gravel of high weight and density.
2) Carefully deposit in uniform layers, not to exceed 6" thick.
3) Compact each layer thoroughly by rolling, ramming and tamping with tools suitable for that purpose in such a manner so as to not disturb the pipe.

D. Backfilling of Shoulders Along Streets and Highways:

1) Backfilling methods and materials for shoulders along streets and highways shall be in accordance with the requirements of governing local, county, or state departments maintaining the particular roadway or highway.
2) Replace with similar materials, all shoulders which may be damaged or destroyed as a result of pipe trenching.
3) NOT APPLICABLE

4) Where shoulders along state highways have sealed coat surfaces, replace with double bituminous seal in accordance with Section 02550.
5) NOT APPLICABLE

E. Crushed Stone for Pavement Maintenance and Shoulder Replacement:

1) Where possible, salvage and reuse all base material that is removed during construction.
2) Wet and thoroughly compact crushed stone and blade to tie into the existing surface prior to final acceptance.
3) NOT APPLICABLE

3.14 MEASUREMENT AND PAYMENT - TRENCHING, BEDDING AND BACKFILLING

TO BE DETERMINED BY DEVELOPER

3.15 MEASUREMENT AND .PAYMENT'- UNDERCUT BEDDING

TO BE DETERMINED BY DEVELOPER

3.16 MEASUREMENT AND PAYMENT - CRUSHED STONE FOR PAVEMENT MAINTENANCE AND SHOULDER REPLACEMENT

TO BE DETERMINED BY DEVELOPER

END OF SECTION

SECTION 02223
SEPERATION OF WATER MAINS AND SEWERS

3.21 General - The following factors should be considered in providing adequate separation:

a. materials and type of joints for water and sewer pipes;

b. soil conditions;

c. service and branch connections into the water main and sewer line;

d. compensating variations in the horizontal and vertical separations;

e. space for repair and alterations of water and sewer pipes;

f. off-setting of pipes around manholes;

g. water mains and sanitary or storm sewers shall not be laid in the same trench.

3.22 Parallel Installation

a. Normal conditions - Water mains shall be laid at least 10 feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.

b. Unusual conditions - When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:

1. the bottom of the water main is at least 18 inches above the top of the sewer,

2. where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.

3.23 Crossings

a. Normal conditions - Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water .main and the top of the sewer, whenever possible.

b. Unusual conditions - when local conditions prevent a vertical separation as described in Section 3.22a, the following construction shall be used:

1. Sewers passing over or under water mains should be constructed of the materials described in Section 3.22b2.

2. Water mains passing under sewers shall, in addition, be protected by providing:

i. a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;

ii. adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains;

iii. that the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

iv. both the sewer and the water main shall be constructed of water pipe and tested in accordance with Section 9.1.5.

3.24 Sewer manholes - No water pipe shall pass through or come into contact with any pan of a sewer or sewer manhole.

3.3 <u>SURFACE WATER CROSSINGS</u> - Surface water crossings, both over and under water, present special problems which should be discussed with the Department before final plans are prepared.

3.31 Above-water crossings - The pipe shall be:

a. adequately supported;

b. protected from damage and freezing;

c. accessible for repair or replacement.

3.32 When crossing water courses which are greater than 15 feet in width:

a. The pipe shall be of special construction, having flexible, watertight joints:

b. Valves shall be provided at both ends of water crossing so that the section can be isolated for test or repair; the valves shall be easily accessible and not subject to flooding;

c. Sampling taps should be available at each end of the crossing;
d. Permanent taps should be made for testing and locating leaks.

3.4 <u>CROSS CONNECTIONS</u>

a. There shall be no physical connection between the distribution system and any pipes, pumps. hydrants, or tanks whereby unsafe water and other contaminating materials may be discharged or drawn into the system.

b. The approval of the Department shall be obtained for interconnections between potable water supplies.

c. Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

3.5 <u>WATER SERVICES AND</u> PLUMBING - Water services and plumbing shall conform to relevant local and/or state plumbing codes, or to the Standard Plumbing Code.

3.6 <u>MATERIALS - GENERAL</u>

a. Pipe selected shall have been manufactured in conformity with the latest standards issued by the American Water Works Association, if such standards exist, and be acceptable to the Department.

b. in the absence of such standards, pipe meeting applicable ASTM and ANSI criteria and acceptable to the Department may be selected.

c. Used water mains that meet these standards may be used again, after the pipe has been thoroughly cleaned and restored practically to its original condition.

d. Packing and jointing materials used in the joints of pipe shall meet the standards of the American Water Works Association or the Department.

e. Mechanical joints or slip-on joints with rubber gaskets are preferred.

SECTION 02305

BORING AND JACKING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Placing casing and carrier pipe by boring and jacking under highways and railroads.

1.02 RELATED WORK

A. Appropriate Piped Utility Sections (2700 Numbers)

1.03 REGULATIONS AND PERMITS

A. Permits for crossing highways or railroads will be obtained by the Developer.

B. For highway crossings, satisfy the Highway Department to the extent of the Developer's-posted surety bonds.

C. For railroad crossings, furnish certificates of insurance in amounts established by the railroad company, naming the railroad as the insured.

PART 2 PRODUCTS 2.01

STEEL CASING PIPE

A. Minimum yield strength of 35,000 psi.

B. Minimum thickness:

Nominal Diameter (Inches)	Minimum Thickness (Inches)
Under 14	0.188
14-16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28-30	0.406
32	0.438
34-36	0.469
38-42	0.500

C. Where casing pipes are to be installed under railroads, provide with a protective bituminous coating, cathodic protection; or an increased wall thickness one standard size greater than that shown above.
Increase a minimum of 0.063" except for diameters under 12-3/4".

D. Steel casing pipe shall be of continuous weld construction and installed with welded joints.

2.02 CARRIER PIPE

A. Carrier pipe installed in the casing pipe shall be as specified under the appropriate Piped Utility Section (section 2713) and as shown the drawings.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform all crossings according to the requirements of the governing highway department or Railroad Company.

B. Notify the appropriate authorities involved and request their supervisory services during construction.

C. Provide necessary safeguards to protect the crossing.

D. Not Applicable

3.02 INSTALLATION

A. Perform all crossings in the manner directed by the highway department or railroad company.

B. Dry bore an opening under the crossing.

C. Jack the casing pipe, of the type and size specified, into the bored opening.

D. Install the appropriate carrier pipe into the casing pipe. The pipe is to be connected with grip-lock gaskets and surrounded by metal spacers. Star Type Design

E. Test the carrier pipe according to the appropriate Piped Utility Sections (2700 number).

3.03 MEASUREMENT AND PAYMENT

TO BE DETERMINED BY DEVELOPER

END OF SECTION

SECTION 02713

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Installation, testing and disinfections of water lines and appurtenances.

1.02 RELATED WORK

A. Section 02221: Trenching, Backfilling and Compaction
B. Section 02223 Separation of Water Mains and Sewers
C. Section 02305: Boring and Jacking

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE (PVC) AND FITTING

NOT ACCEPTED

2.02 DUCTILE IRON PIPE AND FITTINGS

A. Pipe

1) Manufactured in accordance with AWWA C-151 (ANSI A21.51) and AWWA C-111 (ANSI A21.11).
2) A cement lining meeting the requirements of AWWA C-104 (ANSI 21.4).
3) A minimum of 1 mil thick bituminous coating on the outside surface.
4) Clearly marked with manufacturer’s name, D.I. or Ductile, weight, class or nominal thickness and casting period.

5) Unless otherwise specified or shown on the plans, ductile iron pipe shall be pressure class 350 for 12” diameter pipe and less and pressure class 250 for 14” diameter pipe and larger.

B. Fittings

1) Tapping sleeves M.J. Mueller H-615 or U.S. Pipe T-9 200 psi working pressure.

2) Fitting M.J. size 4” through 24” 350 psi.

a) Manufactured in accordance with AWWA C-153 (ANSI A-21.53).

b) All valves shall be fusion bonded epoxy coating meeting AWWA C-116 (ANSI A-21.16) applied to the interior and exterior of valves.

c) All other fitting shall have either a fusion bonded epoxy coating inside and out in accordance with AWWA C-116 (ANSI A21.16) or an inside cement lining seal coated with an asphaltic material meeting the requirements of AWWA C-104 (ANSI A-21.4) and an asphaltic outside coating in accordance with AWWA C-153 (ANSI A-21.53).

3) Fitting M.J. larger than 24” 250 psi.

a) Manufactured in accordance with AWWA C-153 (ANSI A-21.10).

b) All valves shall be fusion bonded epoxy coating meeting AWWA C-116 (ANSI A-21.16) applied to the interior and exterior of valves.

c) All other fitting shall have either a fusion bonded epoxy coating inside and out in accordance with AWWA C-116 (ANSI A-21.16) or an inside cement lining seal coated with an asphaltic material meeting the requirements of AWWA C-104 (ANSI A-21.4) and an asphaltic outside coating in accordance with AWWA C-153 (ANSI A-21.53).

2.03 SERVICE PIPE

A. To be furnished and installed by DEVELOPER.

B. To be installed at property corners only.

C. One continuous piece of K type copper, no couplings.

2.04 WATER SERVICE ASSEMBLIES

A. Water Meters

TO BE INSTALLED BY District (Meter Installation Fee by Developer or Owner)

B. Water Main Connections (see drawing WSA-1)

1) Direct tap water main for 1” corporation stop in the upper half of the pipe at a

45-degree angle toward the property.

2) Do not exceed the pipe manufacturers recommended maximum tap size.

C. Corporation stop to be 1” brass compression manufactured by one of the following:

1). Ford

2). Muller

3). A. Y. McDonald

D. Connecting piping is to be 1” K type copper tubing.

E. Curb Stop to be 1” brass compression manufactured by one of the following

1). Ford

2). Muller

3). A. Y. McDonald.

F. Meter Yokes

TO BE INSTALLED BY District

G. Meter Boxes

TO BE INSTALLED BY District

H. Pressure Reducing Valves for Service Assemblies

1). To be furnished and installed by home owner or builder

2). To be used on all services.

3). To be located where recommended by District and manufacturer.

2.05 VALVES AND VALVE BOXES

A. Gate Valves

1).AWWA C-509 Resilient Seal Gate Valves

a). Mueller Series A-2370-20

b). U.S. Pipe Metroseal 250 Gate Valves

2). Iron body, bronze mounted, resilient wedge gate, parallel seat, non-rising stem type.

3). Stuffing boxes: O-ring seal type with two (2) rings in stem located above the thrust collar.

4). 2” square wrench nut for operation of the valve.

5). Minimum design working water pressure of 200 psi test pressure of 400 psi for valves with diameter 2” to 12” and 150 psi with test otherwise specified or shown on plans.

6). Joints; Mechanical Joint, both ends in accordance with AWWA C-111

(ANSI A-21.11) with bolts, glands and rubber gaskets.

7). Bonnet of body markings: Manufacturers name, year or casting, size, pressure rating, and OPEN direction.

8). Open by counter-clockwise operation.

Butterfly Valves

NOT ACCEPTED

B. Water Main Connections:

1) Tap water mains in the upper half of the pipe at a 45 degree angle or provide brass tapped couplings with AWWA threads.

2) Do not exceed the pipe manufacturer's recommended maximum tap size.

3) NOT APPLICABLE

C. Corporation and Curb Stops;

TO BE FURNISHED AND INSTALLED BY DEVELOPER
(corporation & curb stops shall be as manufactured by Ford, Mueller, or A.Y. McDonald)

D. Meter Yokes:

TO BE INSTALLED BY DISTRICT

E. Meter Boxes:

TO BE INSTALLED BY DISTRICT

F. Pressure Reducing Valves for Service Assemblies:

To Be Furnished And Installed By Home Owner Or Customer Where The Static Pressure Is Greater Than 80 psi. Located Where Recommended By District.

2.05 VALVES AND VALVE BOXES

A. Gate Valves:

1) AWA C-509. Mueller Series A-2370-20, U. S. Pipe Metroseal 250 Gate Valves or approved equal.

2) Of iron body, bronze mounted, resilient wedge gate, parallel seat, non-rising stem type.

3) Stuffing boxes: 0-ring seal type with two (2) rings in the stem located above the thrust collar.

4) 2" square wrench nut for operation of the valve.

5) Minimum design working water pressure of 200 psi test pressure of 400 psi for valves with diameters 2"-12" and 150 psi with test otherwise specified or shown on the Plans.

6) Joints: Mechanical Joint, both end. ANSI A-21.11 (AWWA C-lll). With bolts, glands and rubber gaskets.

7) Bonnet of body markings: Manufacturer's name, year or casting, size, pressure rating, and OPEN with direction.

8) Open by counter-clockwise operation.

B.Butterfly Valve:

NOT ACCEPTED

C. Main Line Pressure Reducing Valves:

NOT APPLICABLE

D. Valve Boxes:

1. Cast iron, 2 or 3 piece, slip type when located in paved area or roadway, screw type other locations with shaft diameter of not less than 5". As manufactured by Acheson Foundry or equal.

2. Heavy roadway type equipped with a cover containing the word "Water" in raised letters on the top.

3. Base of such size as to permit its installation without allowing it to cone in contact with either the valve or the pipe.

2.06 AIR RELEASE ASSEMBLIES

If Required Submit Detail To District For Approval

2.07 FIRE HYDRANTS AND BLOW-OFF HYDRANTS

A. Fire Hydrants;

l) AWWA C-502. City of Chattanooga standard as manufactured by Mueller A-421 Centurion or U. S. Pipe Metropolitan "G" series.

2} Cast Iron bodies, fully bronze mounted, designed for operation at a working water pressure of 150 psi.

3) Furnish with two 2 1/2" threaded brass hose nozzles and one threaded brass pumper nozzle 4" diameter.

4) Compression type main valve 4 1/2" In diameter faced with a suitable yielding material such as rubber, leather, or balata.

5) So designed that, when it is installed, no excavation is required to remove the main valve or the movable parts of the drain valve.

6) Inside diameter of barrel: at least 120 percent of the hydrant valve size.

7) Inlet connection: minimum of 6" mechanical joint. on all lines, unless otherwise specified or shown on the plans.

8) Equipped with safety flange located not more than 2" above ground and a two piece shaft break-away assembly.

9) Open on counter-clockwise operation.

10) Shop paint and mark in accordance with AWWA C-502. Color yellow.

11) Cast markings: manufacturer's name, size of the main valve, year of manufacture, and direction of opening.

12) Field touch-up, if the surface has been marred, with paint supplied by the manufacturer of the same color and type as that used during shop painting.

13) Examination of material; prior to installation, all hydrants shall be inspected for direction of opening, nozzle threading, operating-nut and cap-nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage, and cracks. Defective hydrants shall be marked and held for final disposition as coaled for by the specifications.

14) All fire hydrants shall have a 6" rubber flapper check valve between the valve and the hydrant. The check valve shall have a ductile iron body and cover, stainless steel bolts, and ductile iron disk fully encapsulated in EPDM with nylon reinforced flex area. Valve shall be as manufactured by Milliken Valve Company or shall be Mueller Super Centurion 250 High Security hydrants.

15) Placement: All fire hydrants shall stand plumb and shall have their nozzles parallel with and or at right angles to the curb, blow-off hydrants will have the nozzle facing the street, with pumper nozzle facing the curb.

16) Hydrants shall be set to the established grade, with the lowest nozzle at least 12 inches (308 mm) above the ground or as required by the specifications. The lowest nozzle shall be installed awar from the curb line at a sufficient distance to avoid damage from or to vehicles. Traffic-model hydrants shall be installed so that the breakaway flange is not less than 2 inches (50 mm) or more than 6 inches (152 mm) above established grade.

17) Each hydrant shall be connected to the main with a 6-inch (152) or larger diameter branch controlled by an independent valve, unless otherwise specified. The valve shall be restrained to allow shut off when the hydrant is to be removed.

18) When a dry-barrel hydrant is set in soil that is impervious, drainage shall be provided at the base of the hydrant by placing coarse gravel from the bottom of the trench to at least 6 inches (152 mm) above the drain port opening in the hydrant and to a distance of 1 foot (300 mm) around the elbow. Where groundwater rises above the drain port or when the hydrant is

located within 8 feet (2.4 m) (or distance required by the applicable regulatory agency) of a sanitary sewer main, or where drainage is not permitted by the applicable regulatory agency, the drain port shall be lugged and water pumped from the hydrant when freezing may occur.

19) When a dry-barrel hydrant with an opening port is set in clay or other impervious soil, a drainage pit 2 feet by 2 feet by 2 feet (0.6m x 0.6m x 0.6m) shall be excavated below each hydrant. The drainage pit shall be filled with coarse gravel under and around the elbow of the hydrant and to a level of 6 inches (152 mm) above the drain port. To prevent possible contamination of the water supply, do not connect hydrant drains to a sanitary sewer or storm sewer.

20) Location: Hydrants shall be located as shown on the plans or as specified.

21) Protection: In the case of hydrants that are intended to fall at eh ground-line joint on vehicle impart (traffic hydrants) specific care must be taken to provide adequate soil resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load-bearing soil, this may be accomplished by pouring a concrete collar approximately 6 inches (152 mm) thick to a diameter of 2 feet (0.6 m) at or near the ground line around the hydrant barrel.

22) Additional Information: AWWA manual M17 provides information regarding installation of hydrants.

B. Blow-Off Hydrants

1) Location: Blow-Off hydrants are to be installed only where specified by local codes or plans.

2) Installation: Shall be in accordance with Standard Drawing BVA-1.

3) Manufacture: Acceptable blow-off hydrants are the Eclipse 2 manufactured by Kupferle Foundry Co. with 4” M.J. inlet and 2 ½” outlet or the A411 Post Type Hydrant manufactured by Muller Co. with a 4” M.J. inlet and 2 ½” outlet.

4) Protection: Same as standard fire hydrant.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to laying pipe, prepare suitable bedding according to Section 02221.
B. Before placing pipe in the trench, field inspect for cracks or other defects; remove defective pipe from the construction site.
C. Swab the interior of the pipe to remove all undesirable material.
D. Prepare the bell and remove undesirable material from the gasket and gasket recess.

3.02 INSTALLING WATERLINES

A. Lay all pipes in a straight line on a uniform grade. When alignment requires deflection greater than 5 degrees between full lengths of pipe, bends will be required. Short lengths of pipe in place of bends will not be permitted.

B. Push-on joints. Push-on joints shall be assembled as described and illustrated in drawing PJA 1 and PJA 2

C. Mechanical joints. Mechanical joints shall be assembled as described and illustrated in drawing PJA 1 and PJA 2.

D. Joint deflection. When it is necessary to deflect pipe from a straight line in either the horizontal or vertical plane, the amount of joint deflection shall not exceed that shown in drawing JD1. The deflections listed are maximum deflections and should not be exceeded. For design purposes, deflection should be limited to 80 percent of the values shown. Figure 4 illustrates the maximum offset S and approximate radius curve R. which are listed in drawing JD 1.

E. Pipe cutting. Cutting pipe for insertion of valves, fittings, or closure pieces shall be done in conformance with all safety recommendations of the manufacturer of the cutting equipment. Cutting shall be done in a safe, and proper manner without creating damage to the pipe or cement-mortar lining. Pipe shall not be cut in short lengths to avoid using bends. Bends must be used when pipe exceeds 5 degrees deflection.

F. Existing gray-iron pipe may be cut using a hydraulic squeeze cutter, abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, or milling wheel saw.

G. Ductile-iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch if recommended by the pipe manufacturer.

H. Cut ends and rough edges shall be ground smooth, and, for push-on joint connections, the cut end shall be beveled by methods recommended by the manufacturer.

I. ANSI/AWWA C151/A21.51 .requires factory gauging of the spigot end to ensure that the outside diameter of each spigot end falls within the tolerances stipulated in that standard. Accordingly, pipes selected for cutting should be field-gauged. A mechanical-joint (MJ) gland inserted over the barrel might serve as a convenient indicator for this purpose.

3.03 INSTALLING APPURTENANCES

A. Securely plug open ends of pipe at the close of each work day and during temporary discontinuance of pipe laying.

B. Set all valves, fittings, hydrants, and other specials in a neat workmanlike manner.

C. Use thrust blocks, as shown on the Plans, pipe anchors, or other approved means to prevent displacement or other fittings.

D. Erect hydrants to stand plumb with the pamper nozzle facing the road.

E. Effect drainage of hydrants by using 6 cubic feet of gravel.

F. After thorough flushing of all dirt and debris from pipe. Close dead ends with cast iron plugs or caps and equip with blow-off assemblies, where shown on the drawings. Temporary fittings, pipe or hoses should be installed to direct the flushing water away from the pipe end.

3.04 HIGHWAY AND RAILROAD CROSSINGS

A. Perform highway crossings by the open cut method, unless otherwise shown on the drawings or required by the appropriate authorities.

B. Boring and jacking of crossings, if necessary, will be performed in accordance with Section 02305

3.05 WATERLINE PRESSURE TESTS

A. After the pipe has been laid, subject all newly laid pipe or any valved section thereof to a hydrostatic pressure of at least 1.25 times the working pressure at the point of testing with 200 psi being the minimum test pressure and 250psi being the maximum test pressure acceptable.

B. Test pressures shall;

1) Not be less than 1.25 times the working pressure at the highest point along the test sect ion.
2) Not exceed the pipe or thrust restraint design pressures.
3) Be of at least 2-hour duration.
4) Not vary by more than +/- 5psi.
5) Not exceed twice the rated pressure of closed valves or hydrants.

C. Pressurization:

1) Slowly fill each valved section of pipe with water.

2) Apply the specified test pressure, based on the elevation of the lowest point of the line or section under test and correct to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the Owner.

D. Air Removal:

1) Before applying the specified test pressure, expel air completely from the pipe, valves, and hydrants.

2) If permanent air vents are not located at all high points, install corporation cocks at such points to expel air as the line is filled with water?

3) After all the air has been expelled, close the corporation cocks and apply the test pressure.

4) At the conclusion of the pressure test, remove the corporation cocks and plug or leave in place at the discretion of the Owner.

E. Examination:

1) Carefully examine all exposed pipe, fittings, valves, hydrants, and joints.

2) Repair or replace any damaged or defective pipe, fittings, valve, or hydrants that are discovered with sound material and repeat the test until it is satisfactory to the Owner.

3.06 WATERLINE LEAKAGE TESTS

A. Concurrently conduct a leakage test with the pressure test.

B. Leakage Defined: the quantity of water that must be supplied into the newly laid pipe to maintain the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

C. Allowable Leakage:

1) Determine allowable leakage by:

$$L = \frac{ND\sqrt{P}}{7400}$$

Where L is the allowable leakage, in gallons per hour; N is the number of joints in the tested pipeline; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in psig.

2) Allow leakage at various pressures:

Allowable Leakage Per 1000 ft of Pipeline*
(GALLONS PER HOUR)
NOMINAL PIPE DIAMETER - INCHES

Avg. Test Pressure PSI	**NOMINAL PIPE DIAMETER - INCHES**																
	2	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**49**	**54**
450	**032**	**0.48**	**0.64**	**0.95**	**1.27**	**1:59**	**1.91**	**2.23**	**2.55**	**2-87**	**3.18**	**3.82**	**4.78**	**5.73**	**6.69**	**7.64**	**8.60**
400	**030**	**0.45**	**0-60**	**0.90**	**1.20**	**1.50**	**1-80**	**2.10**	**2-40**	**2.70**	**3.00**	**3.60**	**4.50**	**5.41**	**6.31**	**7.21**	**8.11**
350	**0.28**	**0.42**	**0.56**	**0.84**	**1.12**	**1.40**	**1-69**	**1.97**	**2.25**	**2.53**	**2.81**	**337**	**4-21**	**5.06**	**.5.90**	**6.74**	**7.58**
300	**0.26**	**0.39**	**0.52**	**0.78**	**1.04**	**130**	**1-56**	**1.82**	**2.08**	**2.34**	**2.60**	**3.12**	**3.90**	**4.68**	**5.46**	**6.24**	**7.02**
275	**0.25**	**0.37**	**0.50**	**0.75**	**1.00**	**1-24**	**1.49**	**1.74**	**1-99**	**2.24**	**2.49**	**2.99**	**3.73**	**4.4fl**	**5.23**	**5.98**	**6.72**
250	**0.24**	**0.36**	**0.47**	**0.71**	**0.95**	**1.19**	**1.42**	**1.66**	**1.90**	**2-14**	**2.37**	**2.85**	**3.56**	**4.27**	**4.99**	**5-70**	**6.41**
225	***0.23***	**034**	**0.45**	**0.68**	**0.90**	**1.13**	**1.35**	**1.58**	**1.80**	**2.03**	**2.25**	**2.70**	**3.38**	**4.05**	**4.73**	**5.41**	**6.03**
200	**0.21**	**0.32**	**0.43**	**0.64**	**0.85**	**1.06**	**1.28**	**1.45**	**1.70**	**1-91**	**2.12**	**2.55**	**3.19**	**3.82**	**4.46**	**5.09**	**5.73**
175	**0.20**	**0.30**	**0.40**	**0.59**	**0-80**	**0.99**	**1.19**	**139**	**1.59**	**1.79**	**1.98**	**238**	**2.98**	**3.58**	**4.17**	**4.77**	**536**
150	**0.19**	**0.28**	**0.37**	**0.55**	**0.74**	**0.92**	**1.10**	**1.29**	**1.47**	**1.66**	**1.84**	**,2.21**	**2.76**	**3.31**	**3.86**	**4.41**	**4.97**
125	**0.17**	**0.25**	**0.34**	**0.50**	**0.67**	**0.84**	**1.01**	**1.18**	**1.34**	**1-51**	**1.68**	**2.01**	**2.52**	**3.02**	**3.53**	**4.03**	**4.S3**
100	**0.15**	**0.23**	**0.30**	**0.45**	**0.60**	**0-75**	**0.90**	**1.05**	**1.20**	**1.35**	**1.50**	**1.80**	**2.25**	**2.70**	**3.15**	**3.60**	**4.05**

•For Mechanical or push-on joint pipe with 18-ft nominal lengths. To obtain the recommended allowable leakage for pipe with 20-ft.nominal lengths multiply the leakage calculated from the above table by 0.9.

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

3) When testing against closed metal-seated valves, an additional leakage per closed valve of 0.078 gal/hr/in. of nominal valve size shall be allowed.

4) When hydrants are in the test section, test against the closed hydrant.

3.07 ACCEPTANCE OF INSTALLATION

A. If any test of pipe laid discloses leakage greater than that specified above, locate and repair the defective material until the leakage is within the specified allowance. ,

B. Repair all visible leaks regardless of the amount of leakage.

3.08 CLEANING AND DISINFECTION OF WATER LINES

A. Flush water lines clean prior to disinfections.
1) Contact District Office for complete disinfections actions

B. Thoroughly disinfect waterlines prior to placing in service.

1) Use chlorine disinfecting agent applied to produce a 50.0 ppm dosage.

2) Allow water to escape from the ends of all lines to cause dispersion of the chlorine solution into all parts of the system.

3) Operate all valves and hydrants during the time disinfection is occurring.

4) Retain the chlorine solution in the lines for a period of 24 hours.

5) At the end of the 24 hour period, the residual chlorine must be a minimum of 25 ppm. Otherwise, repeat the disinfection procedure again.

6) Upon refilling the lines, collect a sample, for bacteriological analysis. If the same is acceptable, the lines may be connected to the system. Otherwise repeat the disinfection procedure until acceptable samples are obtained.

3.09 MEASUREMENT AND PAYMENT - WATER PIPE

TO BE DETERMINED BY DEVELOPER

3.10 MEASUREMENT AND PAYMENT - VALVES, HYDRANTS & SERVICE ASSEMBLIES

TO BE DETERMINED BY DEVELOPER

3.11 MEASUREMENT AND PAYMENT - FITTINGS (SPECIALLY CALLED FOR ON BID FORM)

TO BE DETERMINED BY DEVELOPER

END OF SECTION

HIXSON UTILITY DISTRICT POLICY

For the

CONTROL OF BACKFLOW AND CROSS-CONNECTIONS

Section 1. CROSS-CONNECTION CONTROL - GENERAL POLICY

1.1 Purpose. The purpose of this Policy is:

1.1.1 To protect the public potable water supply of Hixson Utility District from the possibility of contamination or pollution by isolating within the customer's internal distribution system(s) or the consumer's private water system(s) such contaminants or pollutants which could backflow into the public water systems; and,

1.1.2 To promote the elimination or control of existing cross-connections, actual or potential, between the consumer's in-plant potable water system(s) and non-potable water system(s), plumbing fixtures and industrial piping systems; and,

1.1.3 To provide for the maintenance of a continuing Program of Cross-Connection Control which will systematically and, effectively prevent the contamination or pollution of all potable water systems by cross-connection.

1.2 AUTHORITY.

1.2.1 The Federal Safe Drinking Water Act of 1974 and Amendments thereto; and

1.2.2 The Tennessee Safe Drinking Water Act, codified at Tennessee Code Annotated, Section 68-13-701 through 68-13-719 whereby the water purveyor has the primary responsibility for preventing water from unapproved sources or any other substances from entering the public potable water system.

1.2.3 Hixson Utility District Board of Commissioners Resolution: and Cross-Connection Plan dated March 6, 1978 approved by the Tennessee Department of Health and Environment.

2.2.4 <u>FEDERAL AUTHORITY</u>

The Federal Safe Drinking Water Act and regulations adopted for its implementation have the same requirement as outlined above. The above mentioned state regulations merely repeat the requirements and language of the Federal Safe Drinking Water Act (and regulations) that applies to each public water supply in the USA. Therefore, these regulations can also be cited as authority for onsite visits of the customer's water distribution lines for the purpose of safeguarding against the degradation or contamination of water through cross-connections.

2.2.3

There is ample authority for the water purveyor to make investigations necessary to determine if the customer's water use practices endanger the purity and safety of the water being distributed and to require appropriate corrective measures, to protect the water system against the hazards of backflow. The following outlines the authority established on the state level for such activities.

Tennessee Code Annotated

Section 68-13-711 of the Tennessee Code Annotated specifically prohibits certain acts which may adversely affect a public water system- One of the prohibited acts is "the installation, allowing the installation, or maintenance of any cross-connection, auxiliary intake, or bypass, unless the source and quality of water from the auxiliary supply, the method of connection, and the use and operation of such cross-connection, auxiliary intake, or bypass has been 'approved by the department." Section 68-13-703 defines a cross-connection as follows: "Cross-connection means the physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain, contaminated water, sewage, other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel or changeover devices through which or because of which, backflow could occur are considered to be cross-connections."

This legislation prohibits all of the various hazardous connections or conditions that may allow the backflow of unsafe substances or liquids of unknown or questionable quality into potable water supply systems. Section 68-13-702 states "Recognizing that the waters of the state are the property of the state and are held in public trust for the benefit of its citizens, it is declared that 1^he people of the state are beneficiaries of this trust and have a right to both an adequate quantity and quality of drinking water."

The regulations for implementation of the Tennessee Safe Drinking Act of 1983 requires public water systems to demonstrate that the water they distribute meets certain health related standards of quality at the ultimate users free flowing outlet. This clearly implies that the water system has authority for on site surveys and for requiring protective measures.

2.2.5 AWWA POLICY STATEMENT ON CROSS-CONNECTIONS

The "American Water Works Association's Policy Statement on Cross Connections" (AWWA, 1981) emphasizes the responsibility of the water purveyor to furnish the customer with a safe and potable water under all foreseeable circumstances. This statement points out that lack of enforcement of plumbing regulations to control hazards within the customers plumbing system does not relieve the water purveyor of the responsibility for knowing how water is used within a premises and to require positive protection on the service line where the need exists or, if necessary, to discontinue water service.

(See statement on Page V).

Southern Building Codes (Cont'd) Page 2

Section. 107 (Cont’d) and permitted there under, shall be guilty of a misdemeanor. Each such person shall be considered guilty of a separate offense for each and every day or portion thereof during which any violation of any of the provisions of this Code is committed or continued, and upon conviction of any such violation such person shall be punished within the limits and as provided by state laws. (Emphasis added)

Section 301.21 PRINCIPLE NO. 21;

Plumbing systems, including fixtures, shall be maintained in sanitary condition and proper working order.

Section 1203 WATER SUPPLY MANDATORY?

Every building used for human occupancy or habitation in which plumbing fixtures are installed shall be provided with an ample supply of potable water.

Section 1204.1 BACKFLOW

The water distribution system shall be protected against backflow. Every water outlet shall be protected from backflow, preferably by having the outlet end from which the water flows spaced a distance above the flood level rim of the receptacle into which the water flows sufficient to provide a "minimum air gap" as defined in ANSI A112.1.2. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessible backflow preventer complying with 1204.2. (Emphasis added)

Section 1204.2 APPROVAL OF DEVICES;

Devices installed in a potable water supply for the protection against backflow shall be maintained in good working condition by the person or persons having control of such devices. The Plumbing Official may inspect such devices, and if they are found to be defective or inoperative, shall require the replacement thereof.