TESTING OF PRESSURE PIPELINES

1.0 DESCRIPTION

This item shall govern the furnishing of all labor, materials, tools, equipment and related items required to perform hydrostatic testing of Ductile Iron and Polyvinyl Chloride (PVC) pressure pipelines for integrity and leakage.

2.0 MATERIALS

Not applicable.

3.0 CONSTRUCTION METHODS

A. For Ductile Iron Pipe, make hydrostatic pressure and leakage tests on entire pipeline in accordance with AWWA Standard C600-99, Section 5.2.

B. For PVC Pipe, make hydrostatic pressure and leakage tests on entire pipeline in accordance with AWWA Standard C605-94, Section 7.3.

C. Furnish all labor equipment, including test pump with regulated by-pass meters and gauges required for conducting pipeline tests. Furnish equipment and necessary piping as required to transport water used in testing from source to test location.

D. Schedule time and sequence of testing, subject to observation and approval by the Owner or Owner's Representative. Provide adequate labor, tools and equipment to operate valves and to locate and repair leaks discovered during the initial filling of the pipeline prior to actual testing or during the course of the tests.

E. After the pipe has been laid and backfilled and the backfill has been jetted or otherwise consolidated, subject all newly laid pipe or valved section thereof to the hydrostatic pressure specified below for the particular type of pipe. The duration of each pressure test shall be at least four hours, unless otherwise specified or noted on the plans. Disconnect all meters, fixtures, devices or appliances which are connected to the pipeline system and which might be damaged if subjected to the specified test pressure. Cap or plug the ends of the branch lines during the testing procedures.

F. Fill each valved (capped or plugged) section of pipe slowly with water and expel all air. If permanent air vents are not located at all high points, install corporation or blow-of cocks at such points so that the air can be expelled as filling takes place. After verification that all air has been expelled, close the cocks and keep the pipe filled until tested. Examine unexposed pipe, fittings, valves, hydrants and joints while under test pressure. Visible leaks shall be stopped. Remove and replace cracked or defective pipe, fittings, valves or hydrants discovered during testing. Replacement shall be with sound material. Repeat the test until specified requirements are achieved.

G. Where any section of a pipeline is proved with concrete thrust blocking, do not make hydrostatic pressure test until at least five days have elapsed after installation of the blocking.

H. Pressure/Leakage Tests

1. The duration of the hydrostatic test shall be a minimum of four (4) hours.

2. The pipeline shall be tested so that the pressure at the highest point in the test section is not less than 200 psi.

3. The maximum allowable leakage is the number of gallons per hour as determined by the following formulas.

a. For Ductile Iron Pipe:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:
L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D= nominal diameter of the pipe, in inches
P = 200, in psig

b. For PVC Pipe:

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

Where:
L = allowable leakage, in gallons per hour
N= number of joints in the length of pipeline tested
D= nominal diameter of the pipe, in inches
P = 200, in psig

H. Final Acceptance

1. No pipe installation will be accepted until known leaks have been repaired, whether or not leakage is within allowable limits. Locate and repair leaks at no additional cost to the Owner.

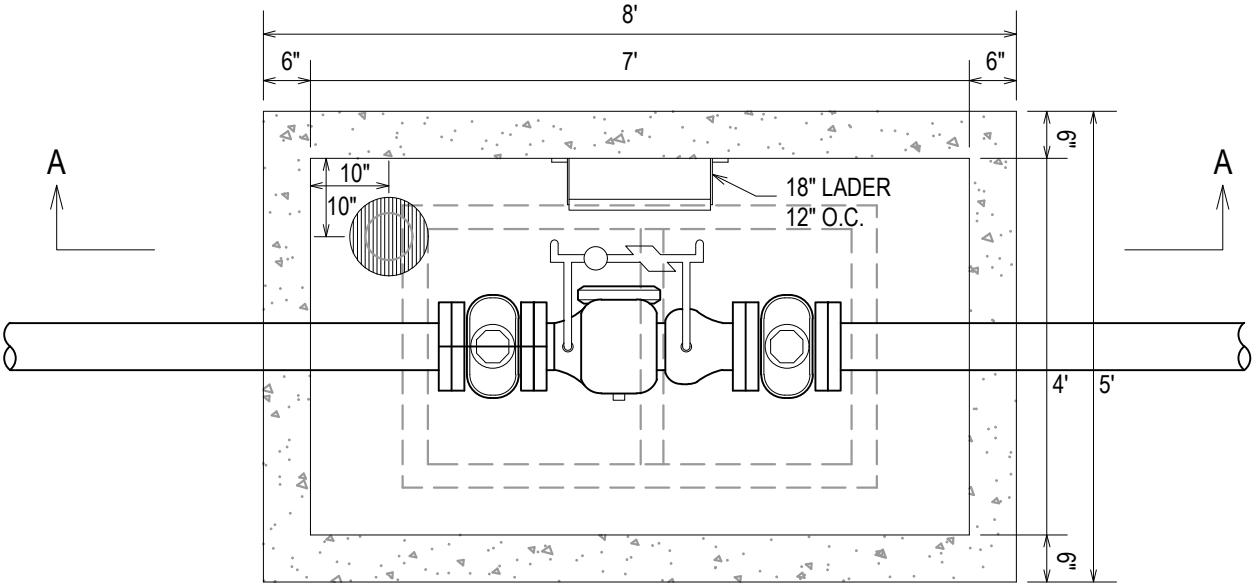
2. The Contractor will certify that all required pressure and leakage tests have been successfully completed before the pipeline is accepted.

I. Special Project Requirements

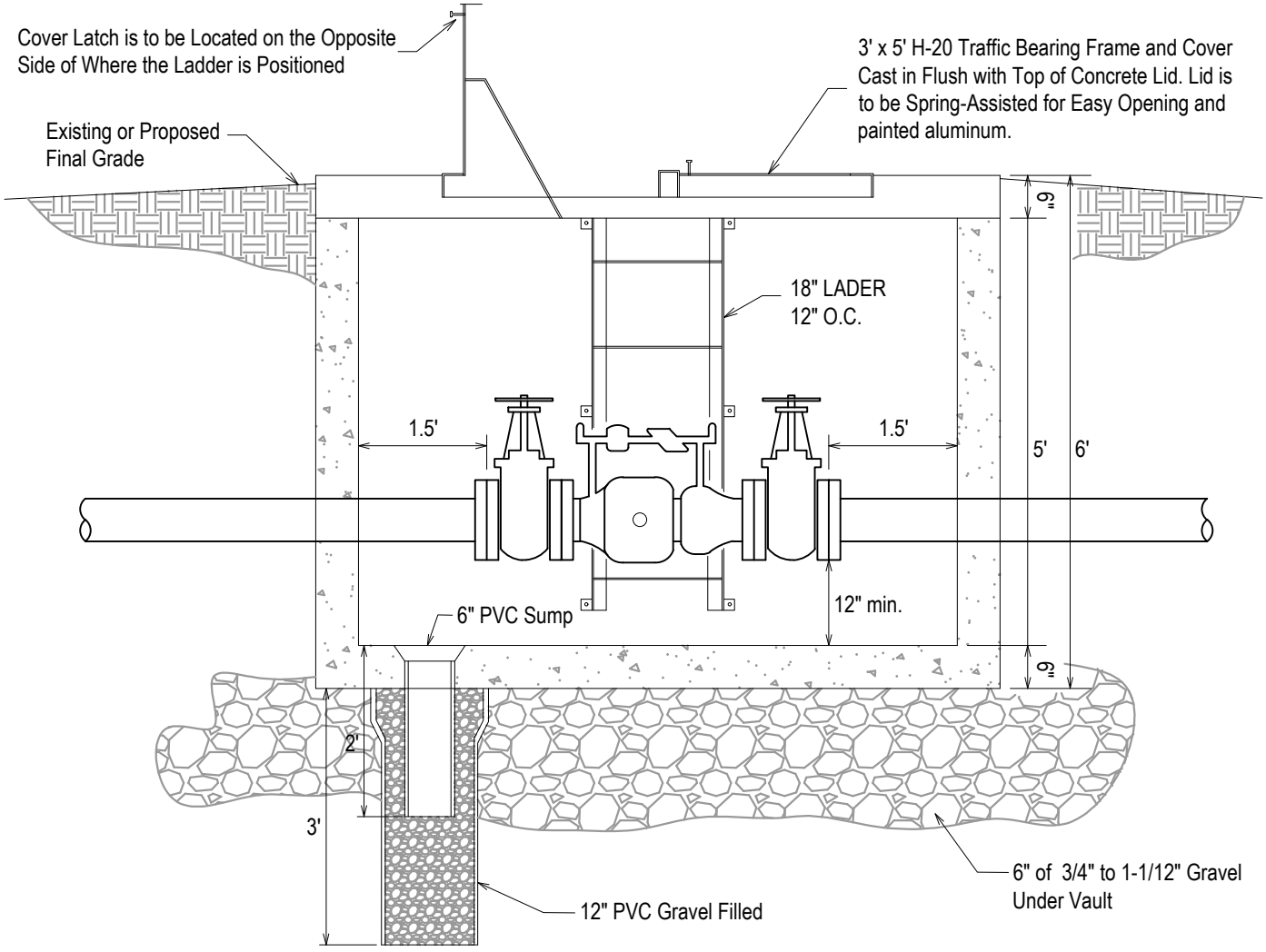
Water Source. Obtaining water for testing purposes shall be the responsibility of the Contractor. The Contractor shall provide all equipment and labor required to transport water from the source to the test point.

4.0 MEASUREMENT AND PAYMENT

No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this item, but shall be considered subsidiary to the particular items of work for which unit prices are required in the proposal.



PLAN



SECTION A-A

East Central SUD
OUR QUALITY IS CLEAR

6" DOUBLE CHECK DETECTOR ASSEMBLY WITH 5'x8' CONCRETE VAULT BOX

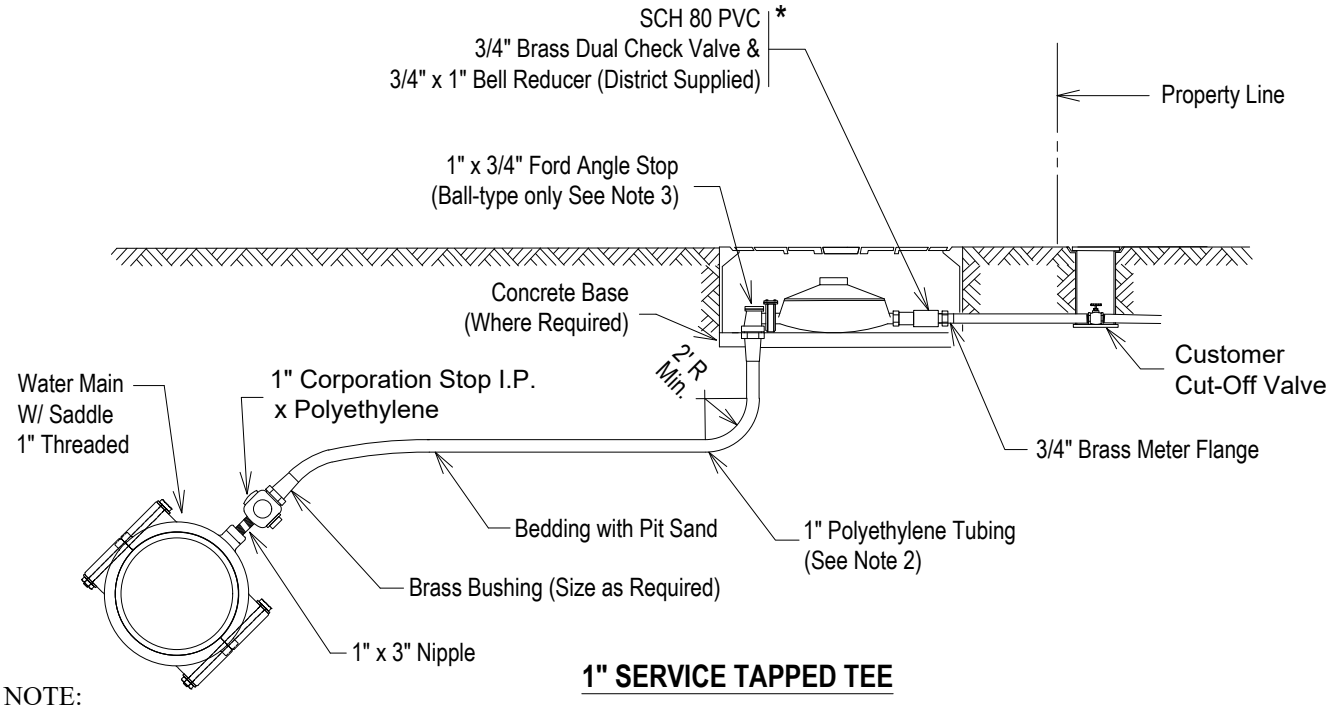
APPROVED	REVISED
JULY 2022	

DET-808-Ø1

SHEET 1 OF 1

PIPE TAPPING SCHEDULE	
PIPE DIAMETER	SERVICE SIZE
	1"
6" A.C.	Tap With Service Saddle
6" C.I. or D.I.	Tap With Service Saddle
8" A.C.	Tap With Service Saddle
8" C.I. or D.I.	Tap With Service Saddle
8" PVC	Tap With Service Saddle
1Ø" A.C.	Tap With Service Saddle
1Ø" C.I. or D.I.	Tap With Service Saddle
1Ø" PVC	Tap With Service Saddle
12" A.C.	Tap With Service Saddle
12" C.I. or D.I.	Tap With Service Saddle
12" PVC	Tap With Service Saddle
16" A.C.	Tap With Service Saddle
16" C.I. or D.I.	Tap With Service Saddle

* Tailpieces Supplied by ECSUD w/ Cost of Meter



1" SERVICE TAPPED TEE

NOTE:
1. No Direct Tap to Main, Saddle Required
2. Polyethylene Shall be 250 psi Rated - Color Blue
3. FORD Angle Stop BA43-342-WNL
4. Meter Box Shall be DFW 36C
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)

FOR PERFERED MANUFACTURERS SEE STANDARD SPECIFICATIONS

East Central SUD
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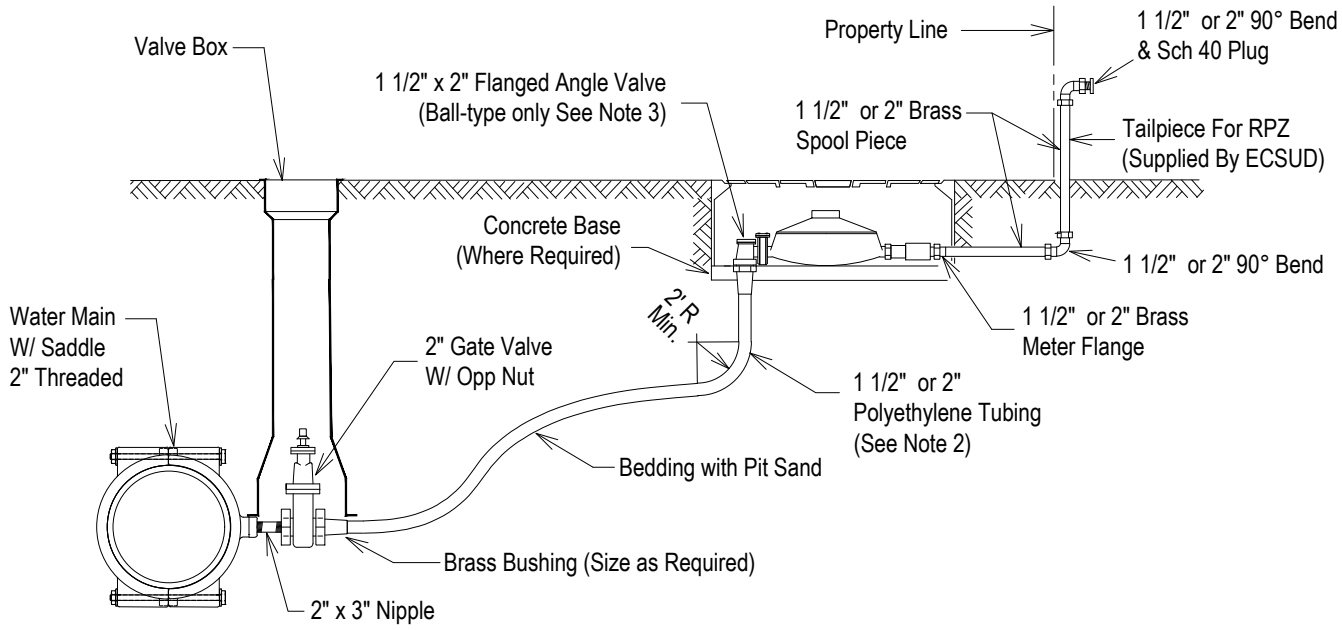
1" SERVICE INSTALLATION TAPPING SCHEDULE

APPROVED	REVISED
FEBRUARY 2025	

DET-824-Ø1

SHEET 1 OF 1

PIPE TAPPING SCHEDULE		
PIPE DIAMETER	SERVICE SIZE	
	1 1/2"	2"
6" A.C.	Tap With Service Saddle	Tap With Service Saddle
6" C.I. or D.I.	Tap With Service Saddle	Tap With Service Saddle
8" A.C.	Tap With Service Saddle	Tap With Service Saddle
8" C.I. or D.I.	Tap With Service Saddle	Tap With Service Saddle
8" PVC	Tap With Service Saddle	Tap With Service Saddle
10" A.C.	Tap With Service Saddle	Tap With Service Saddle
10" C.I. or D.I.	Tap With Service Saddle	Tap With Service Saddle
10" PVC	Tap With Service Saddle	Tap With Service Saddle
12" A.C.	Tap With Service Saddle	Tap With Service Saddle
12" C.I. or D.I.	Tap With Service Saddle	Tap With Service Saddle
12" PVC	Tap With Service Saddle	Tap With Service Saddle
16" A.C.	Tap With Service Saddle	Tap With Service Saddle
16" C.I. or D.I.	Tap With Service Saddle	Tap With Service Saddle



1 1/2" & 2" SERVICE TAPPED TEE

NOTE:
1. No Direct Tap to Main, Saddle Required
2. Polyethylene Shall be 250 psi Rated - Color Blue
3. Anything Greater Than 1 1/2" Will Use a Angle x Flange
4. Meter Box Shall be DFW 1324 C
5. Tracer wire to be Installed and Taped in 8' Intervals from Main to Meter Box. See DET-828-01

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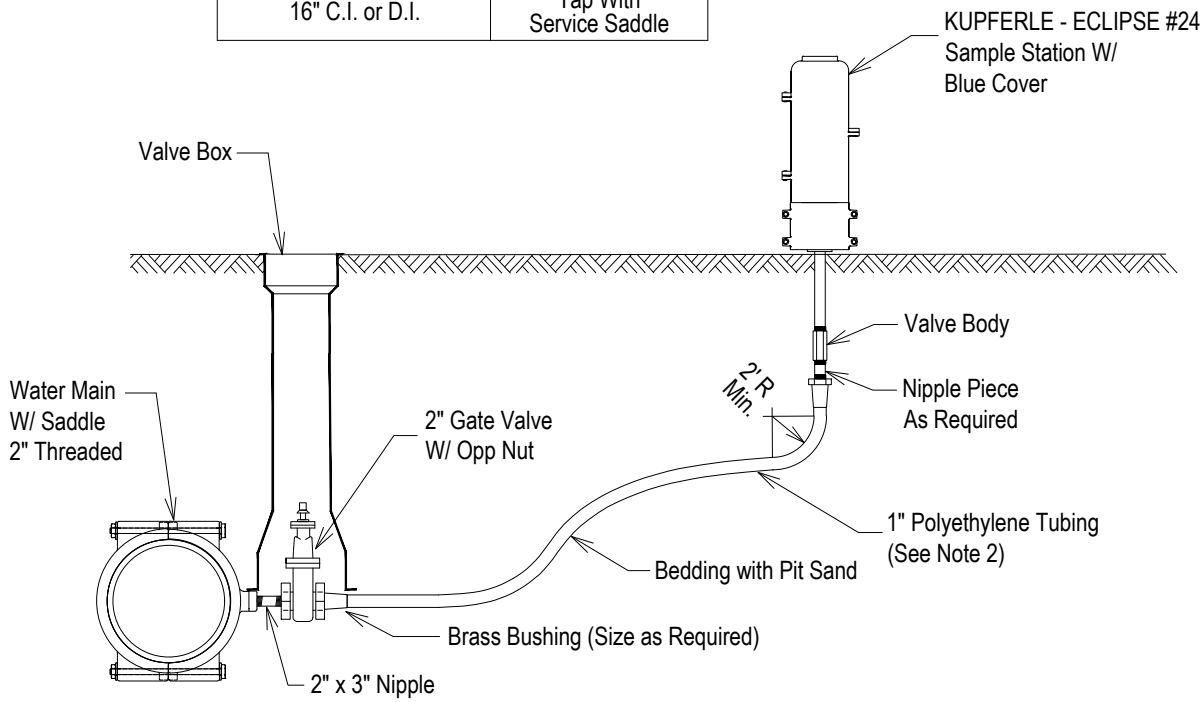
1 1/2" & 2" SERVICE INSTALLATION TAPPING SCHEDULE

APPROVED	REVISED
FEBRUARY 2025	
DET-824-Ø2	SHEET 2 OF 2

PIPE TAPPING SCHEDULE	
PIPE DIAMETER	SERVICE SIZE
	1"
6" A.C.	Tap With Service Saddle
6" C.I. or D.I.	Tap With Service Saddle
8" A.C.	Tap With Service Saddle
8" C.I. or D.I.	Tap With Service Saddle
8" PVC	Tap With Service Saddle
1Ø" A.C.	Tap With Service Saddle
1Ø" C.I. or D.I.	Tap With Service Saddle
1Ø" PVC	Tap With Service Saddle
12" A.C.	Tap With Service Saddle
12" C.I. or D.I.	Tap With Service Saddle
12" PVC	Tap With Service Saddle
16" A.C.	Tap With Service Saddle
16" C.I. or D.I.	Tap With Service Saddle



1" SERVICE TAPPED TEE FOR SAMPLE STATION

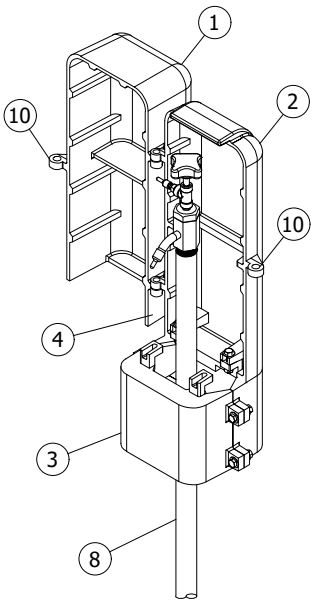
NOTE:

1. No Direct Tap to Main, Saddle Required
2. Polyethylene Shall be 250 psi Rated - Color Blue
3. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)

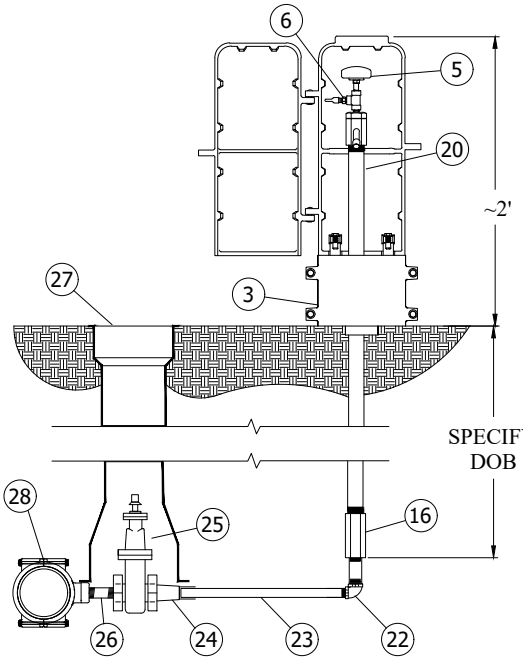
FOR PERFERED MANUFACTURERS SEE STANDARD SPECIFICATIONS

5. Tracer wire to be Installed and Taped in 8' Intervals from Main to Sample Station. See DET-828-01

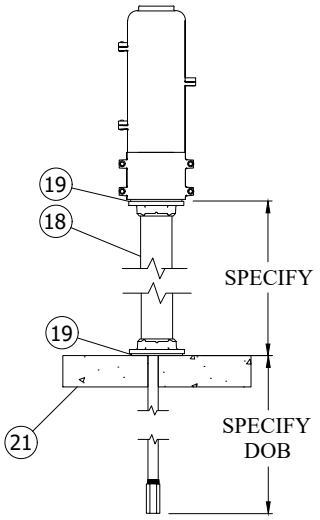
East Central SUD OUR QUALITY IS CLEAR	1" SERVICE INSTALLATION TAPPING SCHEDULE FOR SAMPLE STATIONS ONLY	APPROVED	REVISED
		FEBRUARY 2025	
		DET-824-Ø3	SHEET 1 OF 1



A ISO VIEW



1 #24 INSTALL DETAIL



B PEDESTAL OPTION

GENERAL SPECIFICATIONS	
MAXIMUM OPERATING PRESSURE	
STATION MATERIALS:	303, 304, 316, & 18-8 STAINLESS STEEL, BUNA-N
ENCLOSURE MATERIAL: ENCLOSURE COLOR:	CAST 319 ALUMINUM BLUE
WETTED MATERIALS:	BUNA-N RUBBER, 303, 304, 316 & 18-8 STAINLESS STEEL
DEPTH OF BURY: WEIGHT:	SPECIFY ~35 LBS @ 3' DOB
ADDITIONAL PEDESTAL WEIGHT:	~38 LBS FOR 3' PEDESTAL
CUSTOM LOGO: NSF CERT:	

ITEM	DESCRIPTION	NOTES
1	88 FRONT DOOR (COVER A)	
2	88 REAR DOOR (COVER B)	
3	88 BASE	2 PIECES
4	1/2" UNTHREADED NOZZLE	
5	OPERATING HANDLE	
6	DRAIN HOSE BARB	
7	DRAIN CAP	
8	1" S.S. BARREL	
9	S.S. OPERATING ROD	NOT SHOWN
10	LOCKING HOLE	
11	VALVE CORE	NOTE 5
12	VALVE SEAT CARRIER	NOTE 5
13	OPERATING SCREW	NOTE 5
14	SEAT O-RING	NOTE 5

ITEM	DESCRIPTION	NOTES
15	WATER PATH	
16	VALVE BODY	
17	INLET HOLES	
18	PEDESTAL	
19	PEDESTAL GASKET	
20	PACKING NUT	
21	CONCRETE	
22	3/4" S.S. ELBOW	
23	3/4" S.S. PIPE	AS REQ.
24	BRASS BUSHING	2" x $\frac{3}{4}$"
25	2" GATE VALVE W/ OPP NUT	
26	2" x 3" NIPPLE	BRASS
27	VALVE BOX	
28	SADDLE CLAMP	2" THREAD

Sampling Station shall be _____' bury, with a 1" FIP inlet, and 1/2" unthreaded blow off and sampling bibb.
Station shall be enclosed in a lockable, cast aluminum box with hinged openings.

When open, the station shall require no key for operation, and all water flow shall pass thru an all stainless steel waterway. All operational components shall be of stainless steel and serviceable / replaceable from above ground with no digging or excavation needed.

The operating screw shall be located undergound and inside of the valve body. The operating screw, when turned via the handle, shall raise and lower a valve seat carrier, for controlling the flow of water through the hydrant. The station shall utilize an o-ring for sealing of the valve core to valve seat carrier to shut off the flow of water. The operating rod shall be supported on both ends, via the packing nut and the valve seat carrier to prevent the station from vibrating/pulsing under high pressures and to ensure a smooth sample stream.

When open, the water shall flow through the 6 openings of the valve seat carrier, up and around the valve core, up the stand pipe and out through the nozzle.

The operating rod shall be hollow. A secondary drain port shall be located on the hollow operating rod, underneath the handle and when open shall allow for evacuation of any water remaining inside the station, via pump or compressed air blow off, to prevent freezing.

The station shall be model #24 as manufactured by Kupferle Water Solutions, St. Louis MO. 63102 or approved equal.

Notes:

1.) The color shall be Blue, check with the manufacturer for color options, and specify accordingly.

2.) When installed on or with concrete, Kupferle recommends the use of a gasket or barrier between the enclosure/pedestal and the concrete surface. when purchasing the station, if concrete install is specified on the order Kupferle will provide said gasket. the enclosure clamp on the bottom of the enclosure base will fit inside a 4" pvc pipe.

3.) Prolonged exposure to strong chlorides which can be present in concrete, cleaning agents, and sometime even potable water can lead to possible enclosure corrosion. regular maintenance and drying the station after use are the best methods for optimal station longevity.

4.) In corrosive solids the buried pipe should be prepped for additional resistance to corrosion. Kupferle recommends spraying all underground piping and fittings with bituminous spray tar, allowing proper time to dry, and then wrapping the parts.

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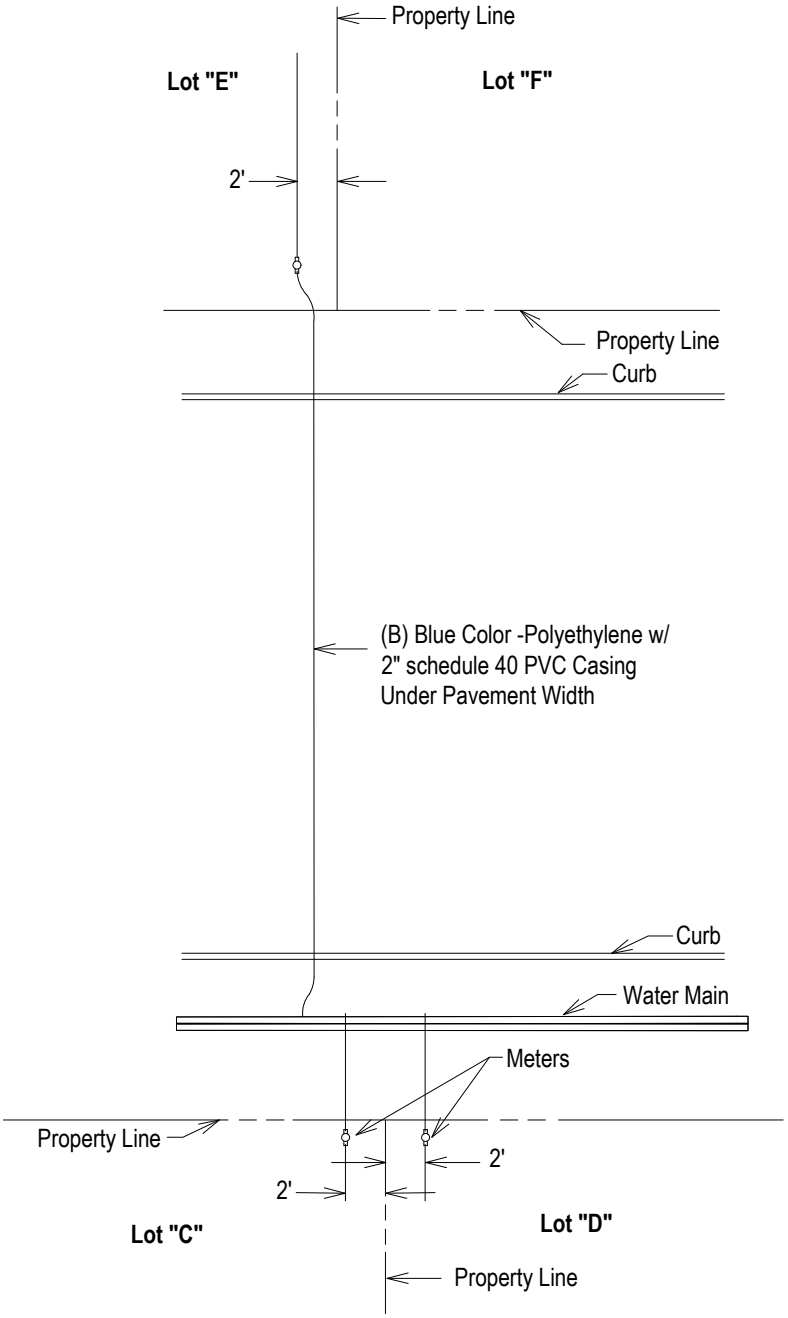
#24 SAMPLING STATION
SPEC SHEET

APPROVED	REVISED
FEBRUARY 2025	

DET-824-Ø4

SHEET 1 OF 1

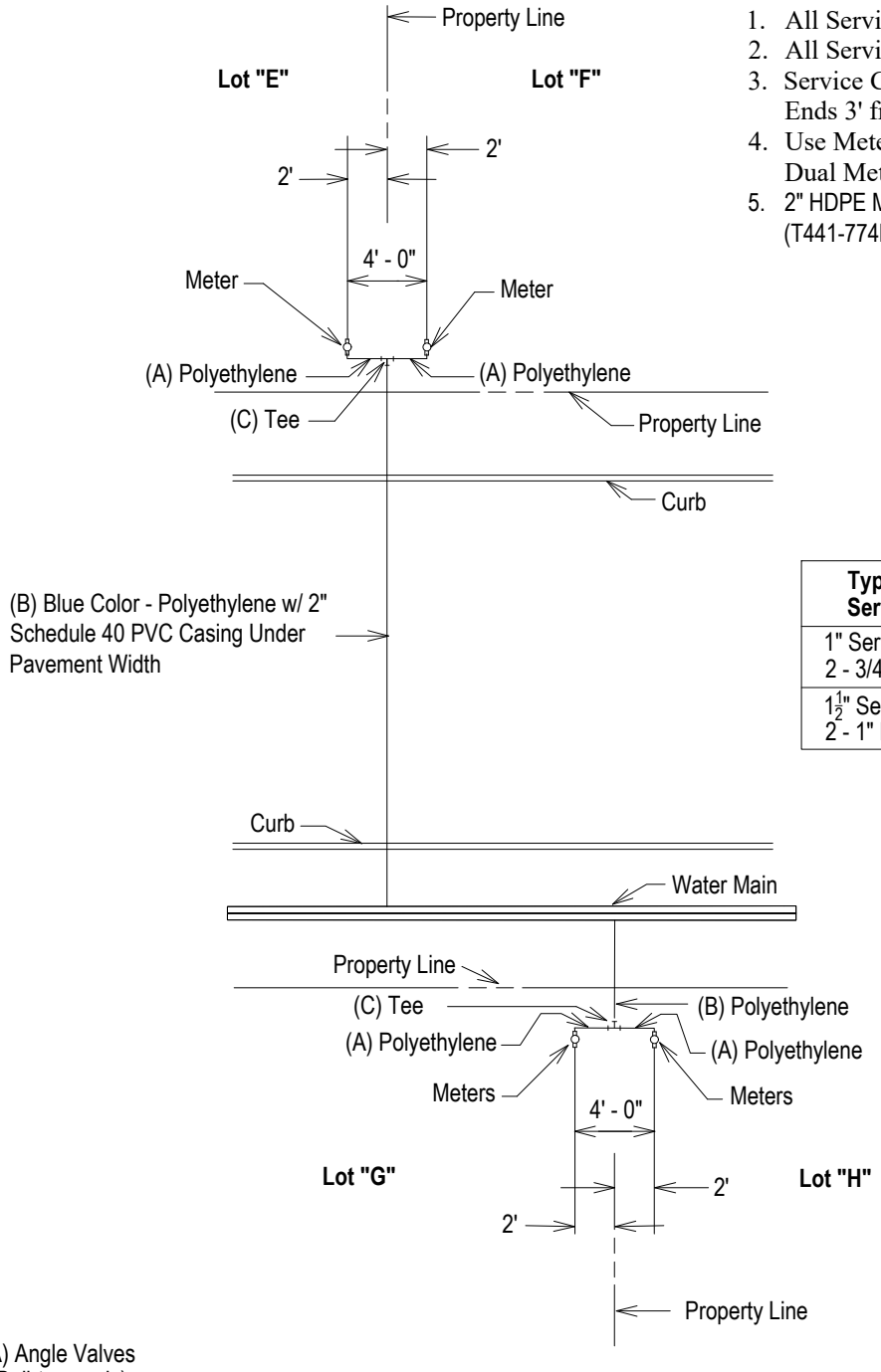


NOTE:
1. All Services to have Tracer Wire Installed.
2. All Service to be Sand Bedded with Pit Sand.
3. Service Casing Begins 3' from the Main and Ends 3' from the Angle Stop.
4. Use Meter Box DFW 36-C for Single Services
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)

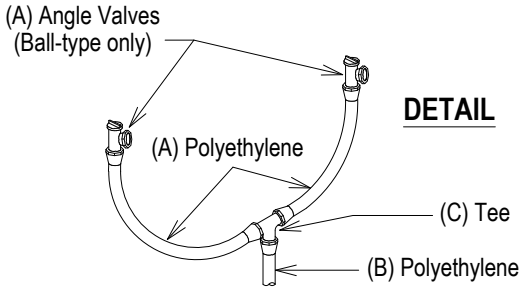
SINGLE SERVICE LINE - SINGLE METER

East Central SUD	TYPICAL SERVICE ARRANGEMENT	APPROVED	REVISED
		FEBRUARY 2025	
		DET-824-Ø5	SHEET 1 OF 4

NOTE:
1. All Services to have Tracer Wire Installed.
2. All Service to be Sand Bedded with Pit Sand.
3. Service Casing Begins 3' from the Main and Ends 3' from the Angle Stop.
4. Use Meter Box DFW 36-C Single for Each Dual Meter Service Split at Property Line.
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)



Type of Service	A	B	C
1" Service 2 - 3/4" Meters	3/4"	1"	3/4"x3/4"x1"
$1\frac{1}{2}$" Service 2 - 1" Meters	1"	$1\frac{1}{2}$"	1" x 1" x $1\frac{1}{2}$"



DETAIL

SINGLE SERVICE LINE - DUAL METER

East Central SUD
OUR QUALITY IS CLEAR

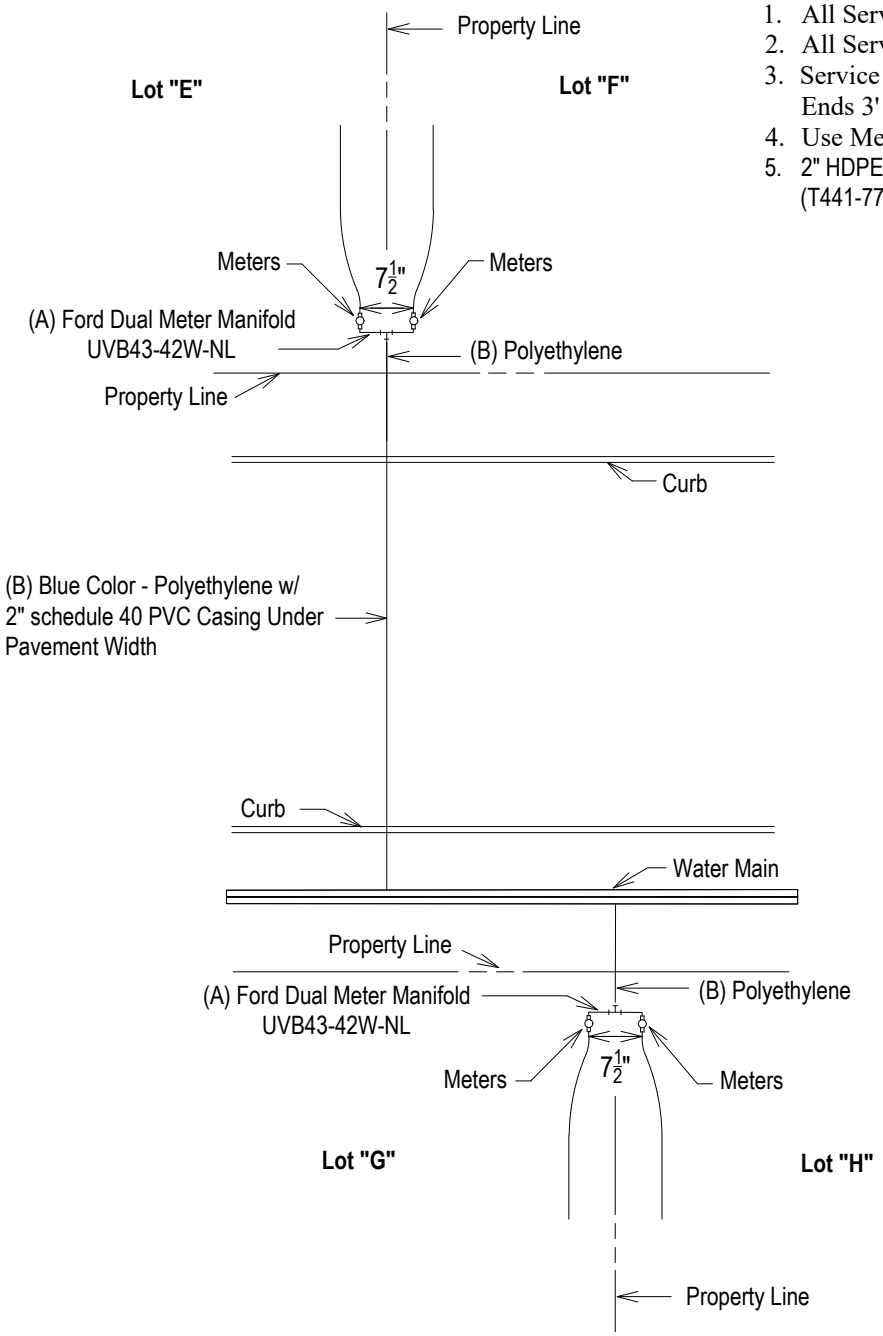
TYPICAL RURAL SERVICE ARRANGEMENT

APPROVED	REVISED
FEBRUARY 2025	

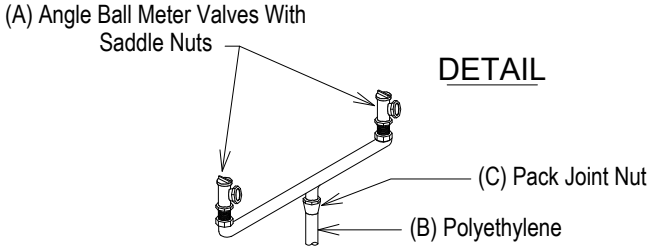
DET-824-Ø5

SHEET 2 OF 4

NOTE:
1. All Services to have Tracer Wire Installed.
2. All Service to be Sand Bedded with Pit Sand.
3. Service Casing Begins 3' from the Main and Ends 3' from the Angle Stop.
4. Use Meter Box DFW 38-C for Dual Services
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT TEE (T441-774NL)

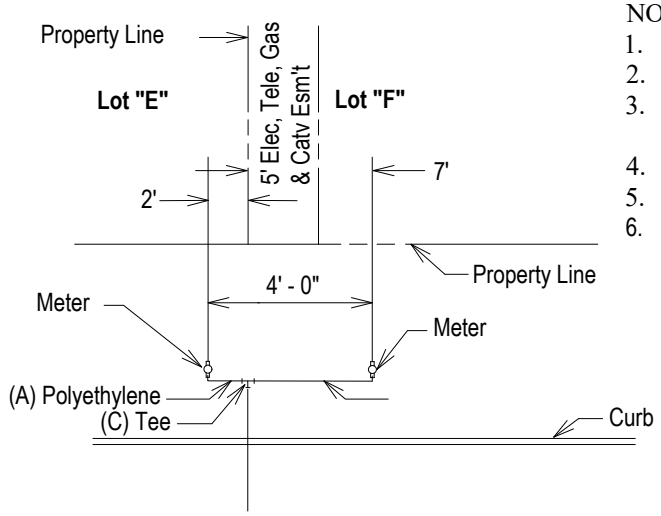


Type of Service	A	B	C
Dual Meter 2 - 3/4" Meters	1"	1"	1"



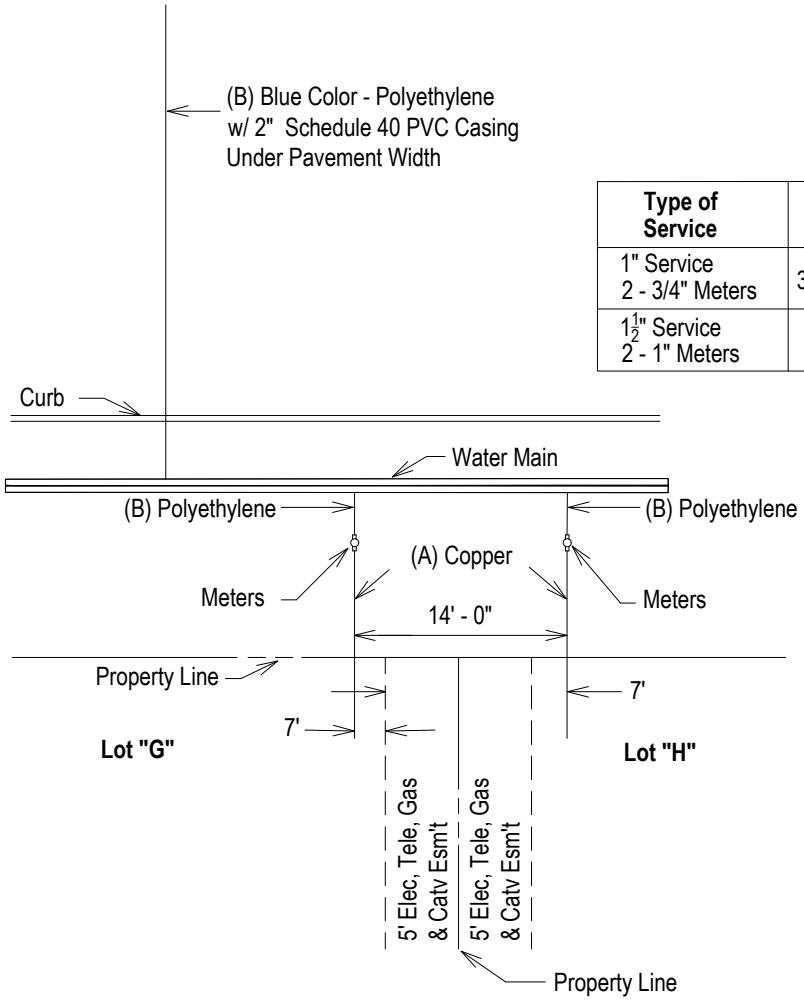
SINGLE SERVICE LINE - DUAL METER

East Central SUD OUR QUALITY IS CLEAR	**TYPICAL HIGH DENSITY RESIDENTIAL SERVICE ARRANGEMENT**	APPROVED FEBRUARY 2025	REVISED
		DET-824-Ø5	SHEET 3 OF 4



NOTE:
1. All Services to have Tracer Wire Installed.
2. All Service to be Sand Bedded with Pit Sand.
3. Service Casing Begins 3' from the Main and Ends 3' from the Angle Stop.
4. Use Meter Box DFW 36-C for Single Services
5. Use Meter Box DFW 38-C for Dual Services
6. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT TEE (T441-774NL)

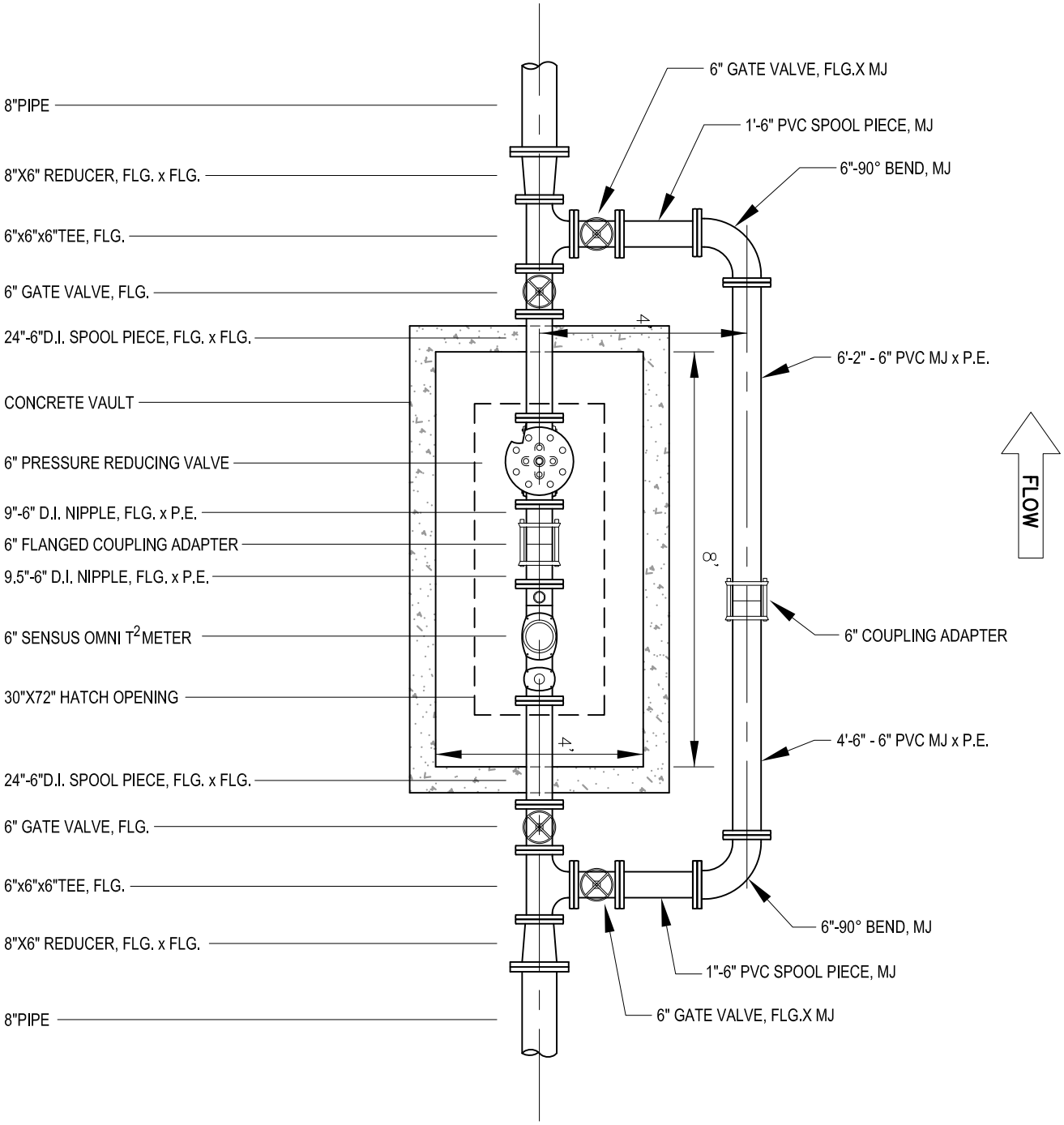
SINGLE SERVICE LINE - DUAL METER W/ EASEMENT



Type of Service	A	B	C
1" Service 2 - 3/4" Meters	3/4"	1"	3/4"x3/4"x1"
$1\frac{1}{2}$" Service 2 - 1" Meters	1"	$1\frac{1}{2}$"	1" x 1" x $1\frac{1}{2}$"

SINGLE SERVICE LINE W/ EASEMENT

East Central SUD OUR QUALITY IS CLEAR	**TYPICAL SERVICE ARRANGEMENT**	APPROVED FEBRUARY 2025	REVISED
		DET-824-Ø5	SHEET 4 OF 4

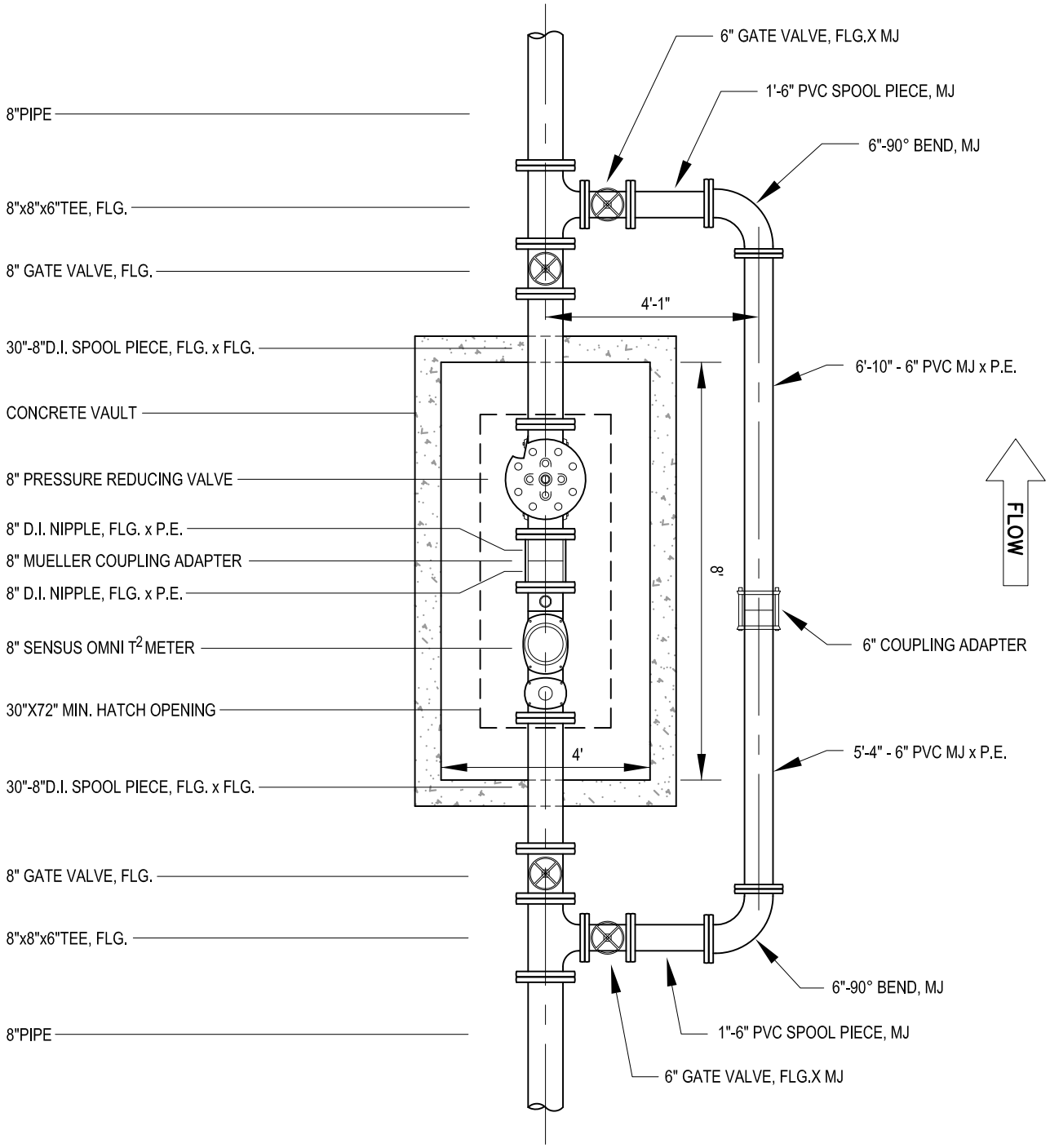


SCALE:1"=3'

East Central SUD
OUR QUALITY IS CLEAR

6" TURBO METER DETAIL
WITH 4'x8' CONCRETE VAULT BOX

APPROVED	REVISED
JULY 2022	
DET-825-Ø1	SHEET 1 OF 1

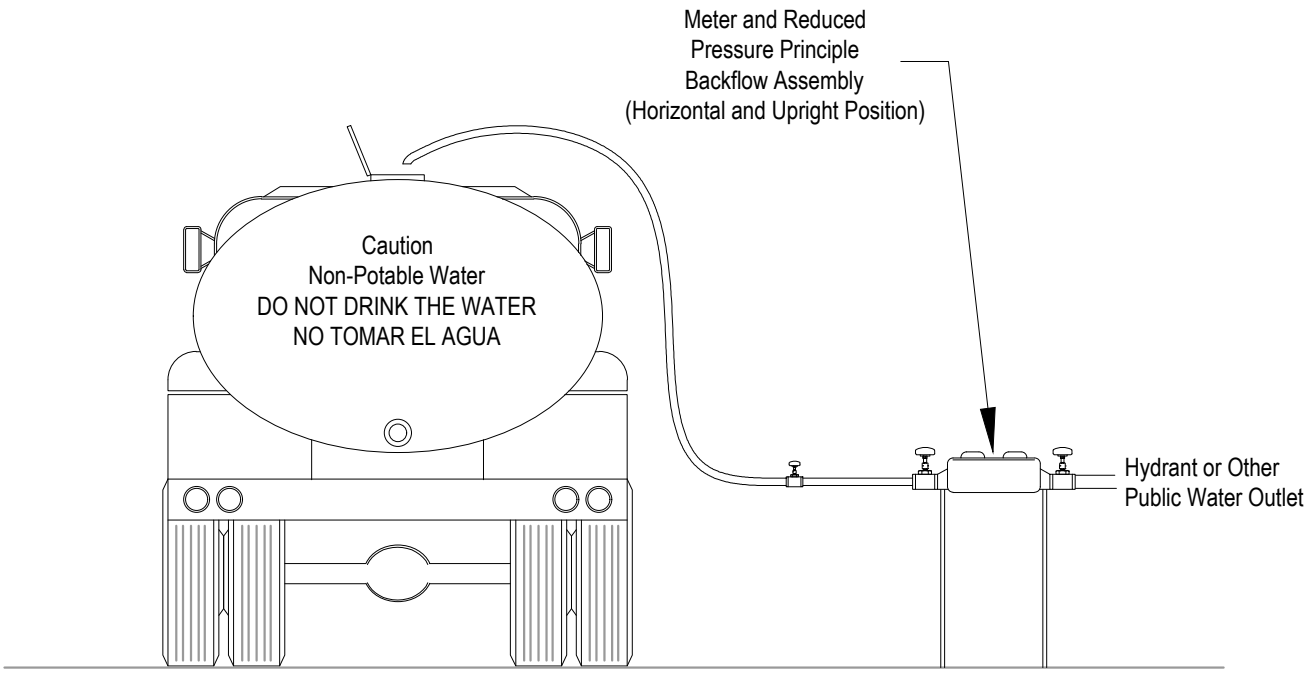


SCALE:1"=3'

East Central SUD
OUR QUALITY IS CLEAR

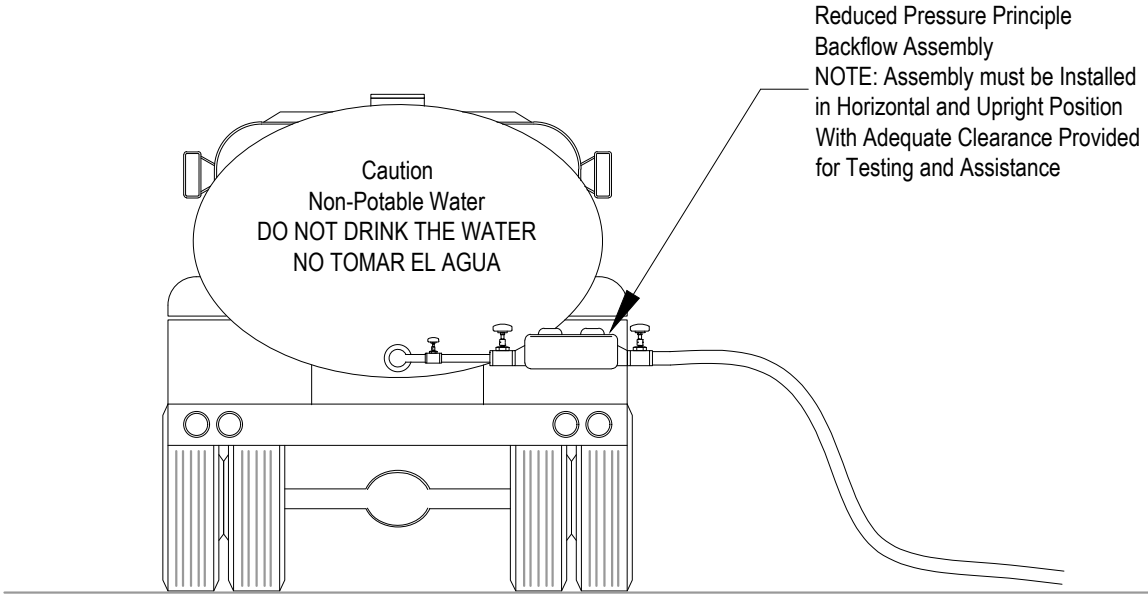
8" TURBO METER DETAIL
WITH 4'x8' CONCRETE VAULT BOX

APPROVED	REVISED
JULY 2022	
DET-825-Ø2	SHEET 1 OF 1



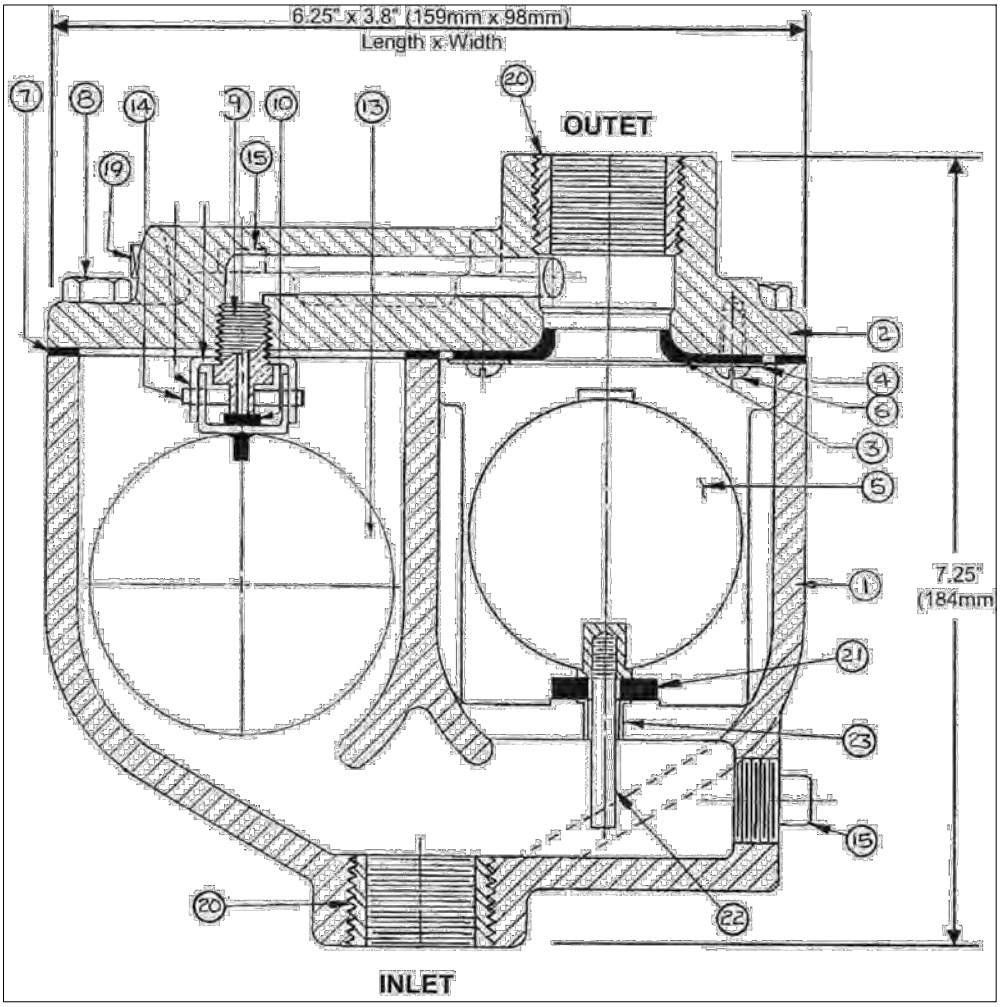
NOTE: Fire Hydrant Meter
Will not Support Backflow Assembly.
RIDGED SUPPORT MUST BE PROVIDED

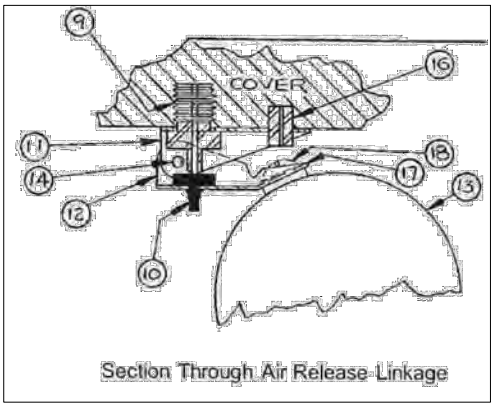
METHOD 1



METHOD 2

East Central SUD – OUR QUALITY IS CLEAR	**BACKFLOW PREVENTION PREVENTION FOR WATER HAULING EQUIPMENT AND/OR MIXING TANKS**	APPROVED	REVISED
		FEBRUARY 2025	
		DET-826-Ø1	SHEET 1 OF 1





PARTS LIST		
ITEM	**DESCRIPTION**	**MATERIAL**
1	BODY	CAST IRON, ASTM A126-B
2	COVER	CAST IRON, ASTM A126-B
3	SEAT (Air Vacuum)	BUNA-N RUBBER
4	SUPPORT RING	316 STAINLESS STEEL
5	FLOAT BALL (Air Vacuum)	316 STAINLESS STEEL
6	SEAT SCREWS	18-8 STAINLESS STEEL
7	COVER GASKET	ARMSTRONG CS-301
8	COVER BOLTS	ZINC PLATED STEEL (Standard) 316 STAINLESS STEEL (Optional)
9	ORIFICE	316 STAINLESS STEEL
10	ORIFICE BUTTON	BUNA-N RUBBER
11	LEVERAGE BRACKET	316 STAINLESS STEEL
12	FLOAT ARM	316 STAINLESS STEEL
13	FLOAT BALL (Air Release)	316 STAINLESS STEEL
14	SPRING PIN	302 STAINLESS STEEL
15	PIPE PLUG	STEEL
16	SPRING PIN	302 STAINLESS STEEL
17	LOCK WASHER	18-8 STAINLESS STEEL
18	FLOAT SCREW	18-8 STAINLESS STEEL
19	PIPE PLUG	STEEL
20	REDUCUNG BUSHING *	STEEL
21	CUSHION	EPDM RUBBER
22	BALL GUIDE	UHMWPE
23	GUIDE BEARING	LOW FRICTION POLYMER

* NOTE: ITEM 20 USED ON $\frac{1}{2}$" AND $\frac{3}{4}$" SIZE ONLY

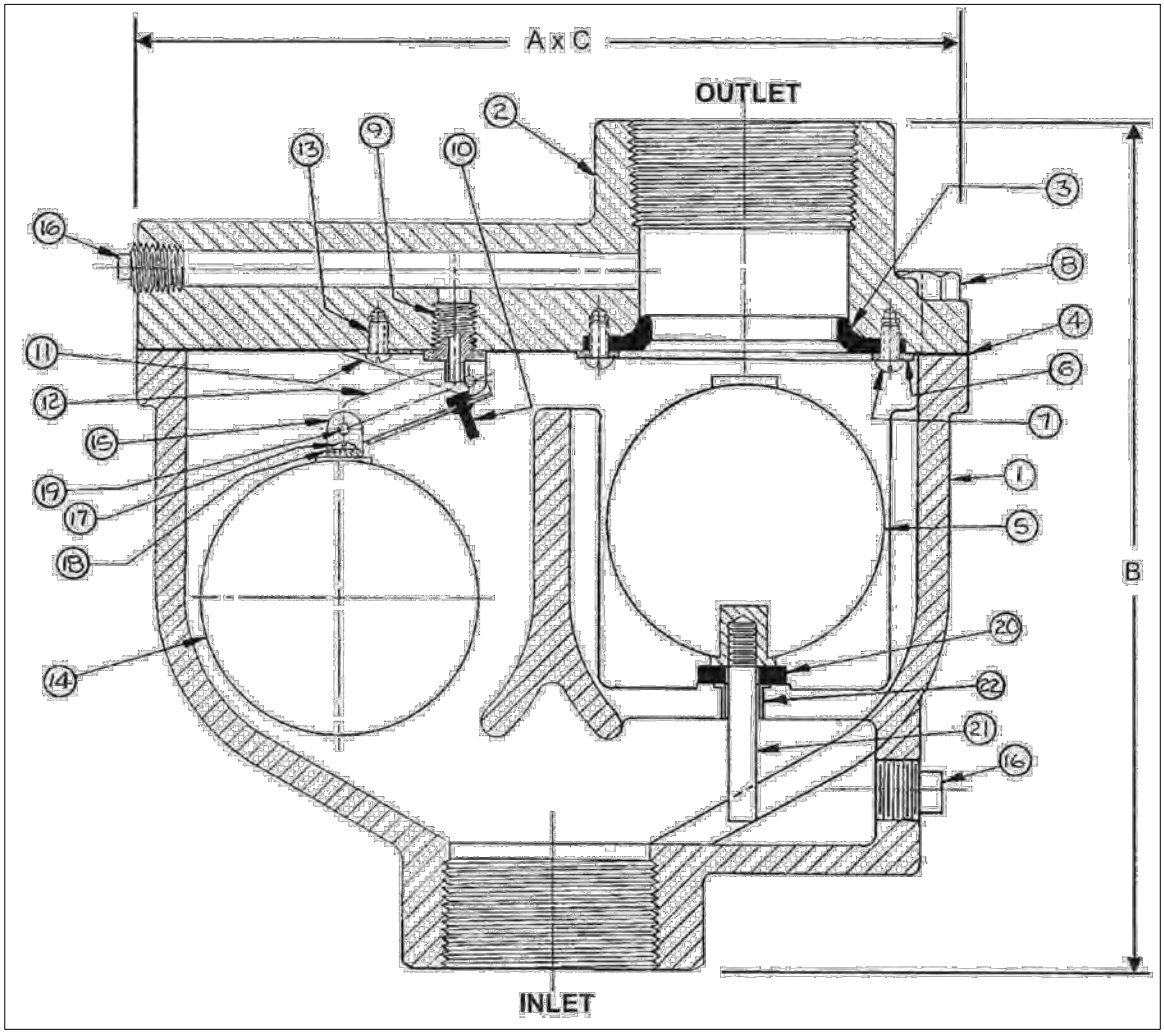
FIGURE 945 COMBINATION AIR VALVES ARE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA C512

FIGURE NUMBER	SIZE (INLET & OUTLET)	AIR RELEASE ORIFICE	MAX WORKING PRESSURE	WEIGHT
945-H	$\frac{1}{2}$", $\frac{3}{4}$" OR 1" NPT	$\frac{1}{16}$" (1,6mm)	300 PSI (2068 KPa)	15 lb (6,8 Kg)

East Central SUD
OUR QUALITY IS CLEAR

GA INDUSTRIES, a VAG Brand
COMPACT KINETIC COMBINATION AIR VALVE
FIGURE 945-H

APPROVED	REVISED
FEBRUARY 2025	
DET-827-Ø1	SHEET 1 OF 1



PARTS LIST		
ITEM	**DESCRIPTION**	**MATERIAL**
1	BODY	CAST IRON, ASTM A126-B
2	COVER	CAST IRON, ASTM A126-B
3	SEAT	BUNA-N RUBBER
4	COVER GASKET	ARMSTRONG CS-301
5	FLOAT BALL (Air Vacuum)	316 STAINLESS STEEL
6	SEAT FOLLOWER	316 STAINLESS STEEL
7	SEAT SCREWS	18-8 STAINLESS STEEL
8	COVER BOLTS	ZINC PLATED STEEL (Standard) 316 STAINLESS STEEL (Optional)
9	ORIFICE	316 STAINLESS STEEL
10	ORIFICE BUTTON	BUNA-N RUBBER
11	LEVERAGE BRACKET	316 STAINLESS STEEL
12	FLOAT ARM	316 STAINLESS STEEL
13	LOCATING SCREW	18-8 STAINLESS STEEL
14	FLOAT BALL (Air Release)	316 STAINLESS STEEL
15	PIVOT LINK	316 STAINLESS STEEL
16	PIPE PLUG	STEEL
17	FLOAT SCREW	18-8 STAINLESS STEEL
18	LOCK WASHER	18-8 STAINLESS STEEL
19	SPRING PIN	302 STAINLESS STEEL
20	CUSHION	EPDM RUBBER
21	FLOAT GUIDE	UHMWPE
22	GUIDE BEARING	LOW FRICTION POLYMER

FIGURE 945 COMBINATION AIR VALVES ARE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA C512

FIGURE NUMBER	MAX WORKING PRESSURE	AIR RELEASE ORIFICE	INLET	OUTLET	A (Length)	B (Height)	C (Width)	WEIGHT
945-H	300 PSI (2068 KPa)	$\frac{3}{32}$" (2,4mm)	2" NPT	2" NPT	9.00" (229mm)	9.38" (238mm)	4.75" (121mm)	30 lb (13,6 Kg)

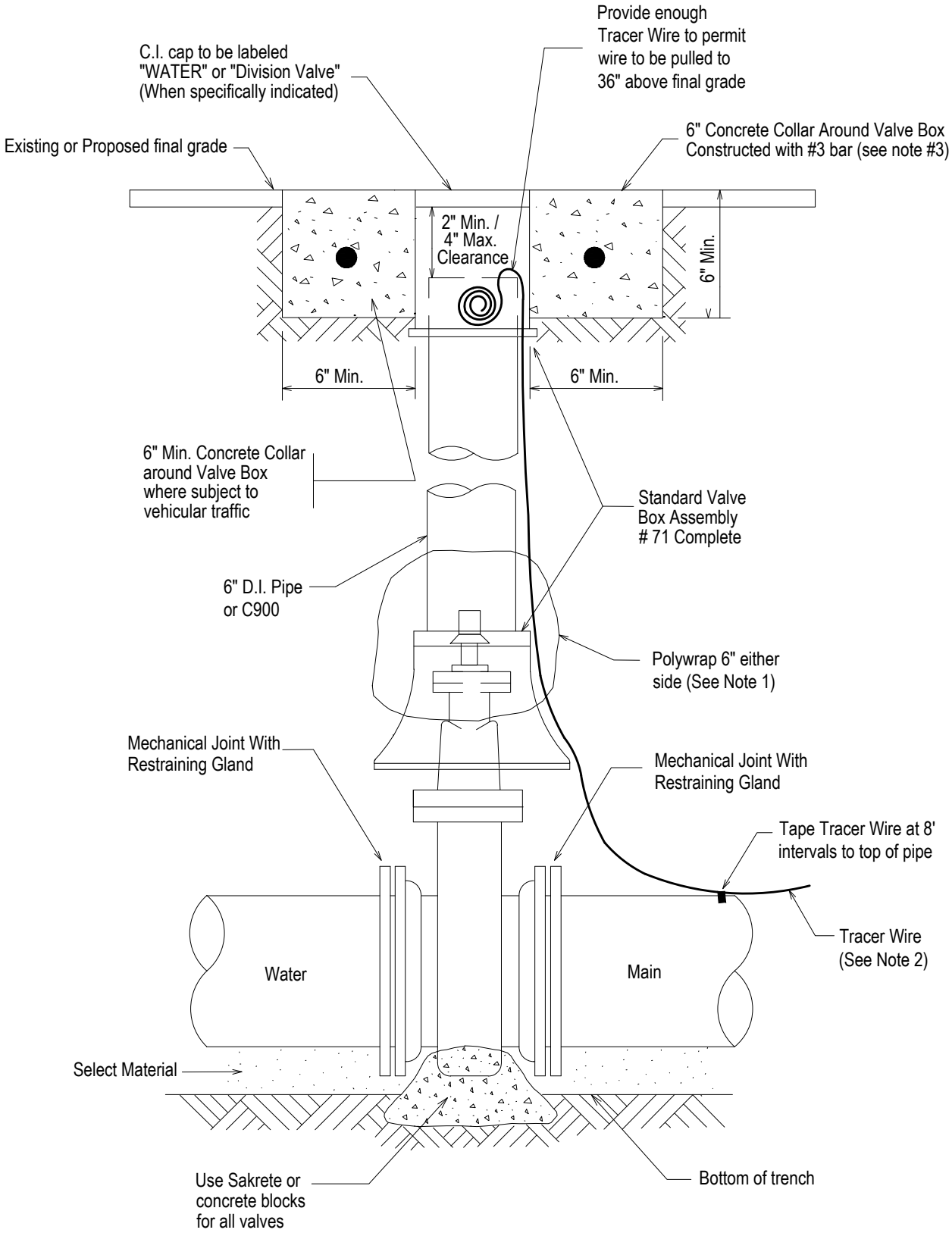
East Central SUD
OUR QUALITY IS CLEAR

GA INDUSTRIES, a VAG Brand
2" - COMPACT KINETIC COMBINATION AIR VALVE
FIGURE 945-H

APPROVED	REVISED
FEBRUARY 2025	

DET-827-Ø2

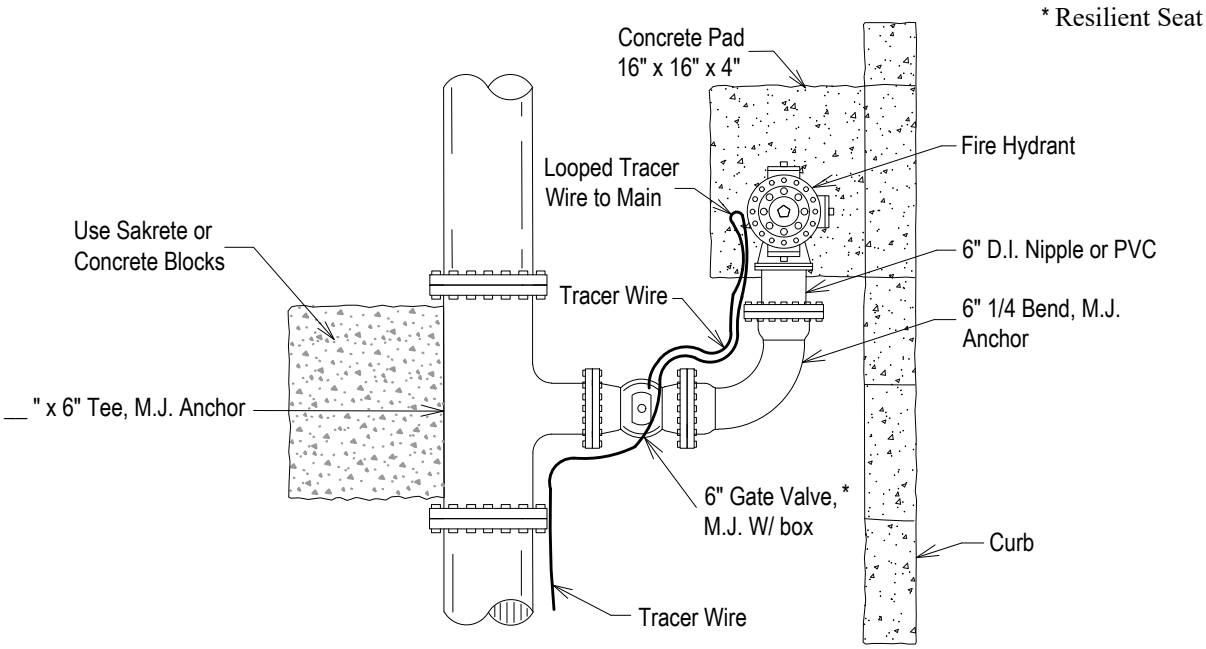
SHEET 1 OF 1



NOTE:

1. Polywrap C-900 or D.I. Pipe to Boot 6" on Either Side.
2. Tracer Wire to be Outside the Pipe Till Valve Box Top Section.
3. Min. 18" Concrete Form Tube Centered Around Valve Box for Concrete Collar W/ #3 Bar.

East Central SUD	INSTALLATION OF NON-GEARED GATE VALVE WITH VALVE BOX AND EXTENSION	APPROVED	REVISED
		JULY 2022	
		DET-828-Ø1	SHEET 1 OF 1

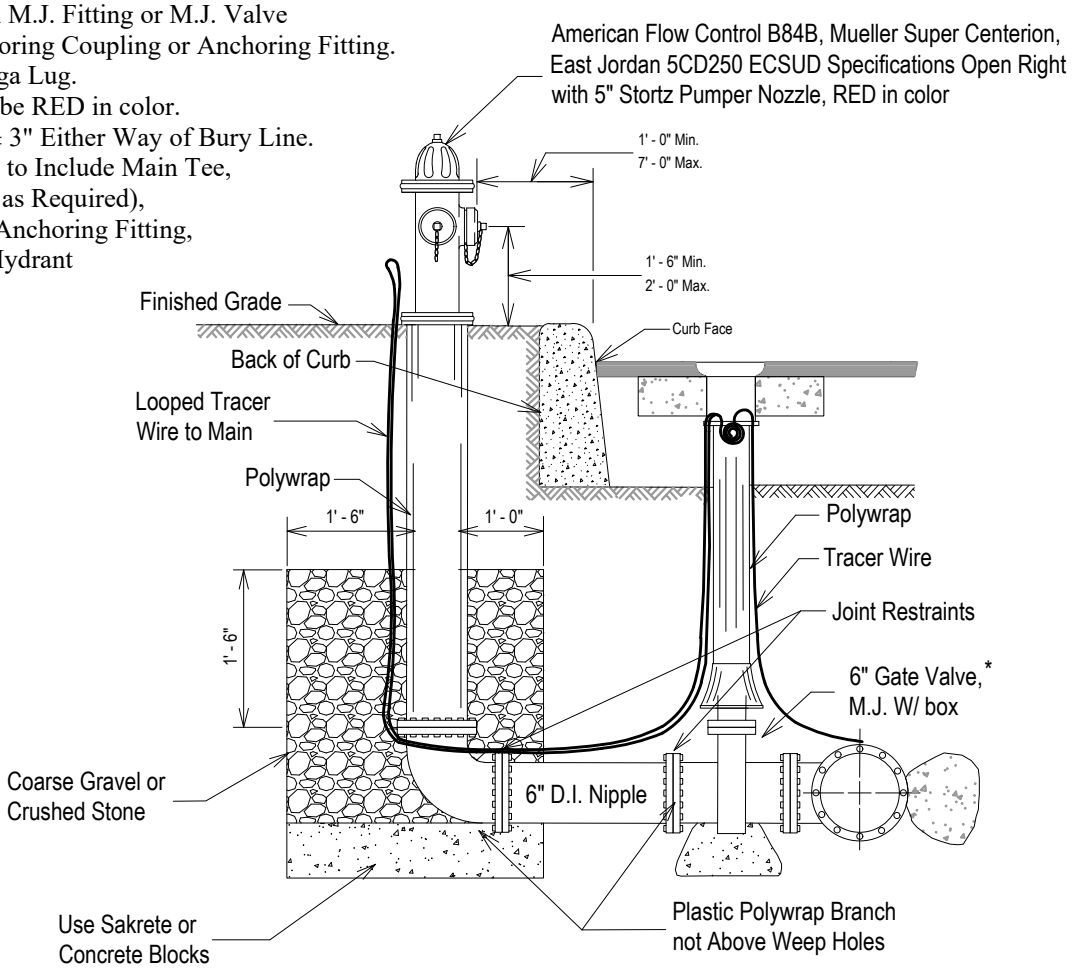


PREFERRED INSTALLATION

Plan shown, with Bend

NOTE:

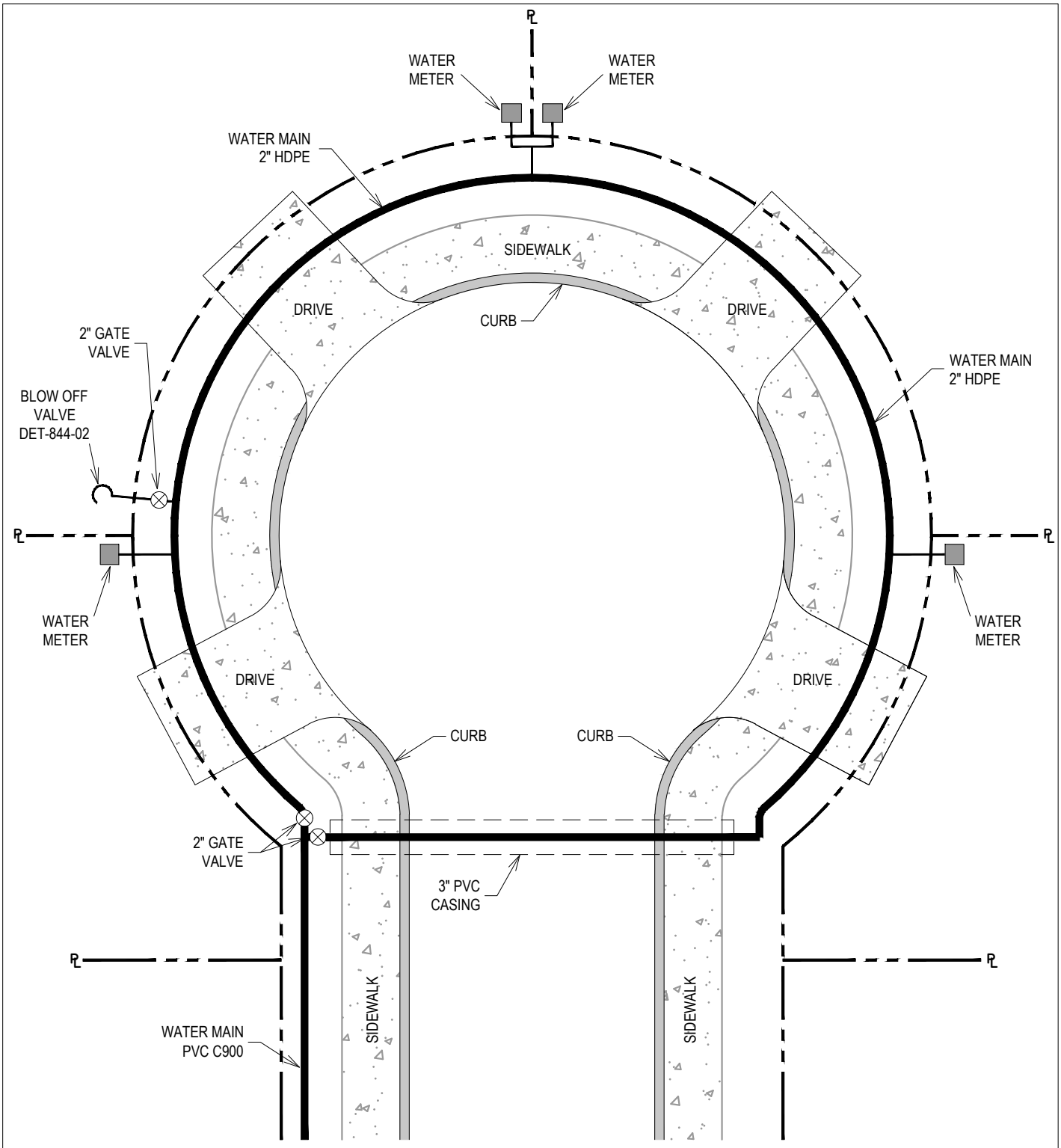
1. Polywrap Below Ground
2. Use Anchoring Tee with M.J. Fitting or M.J. Valve
3. Std. M.J. Tee with Anchoring Coupling or Anchoring Fitting.
4. All Fittings Shall be Mega Lug.
5. All Fire Hydrants are to be RED in color.
6. Fire Hydrants to be set ± 3" Either Way of Bury Line.
7. Fire Hydrant Assembley to Include Main Tee,
   2 - D.I. Nipples (Length as Required),
   Anchoring Coupling or Anchoring Fitting,
   6" - 90° Bend and Fire Hydrant



ALTERNATE INSTALLATION

Profile shown, without Horizontal Bend

East Central SUD OUR QUALITY IS CLEAR	**FIRE HYDRANT INSTALLATION**	APPROVED FEBRUARY 2025	REVISED
		DET-834-Ø1	SHEET 1 OF 1



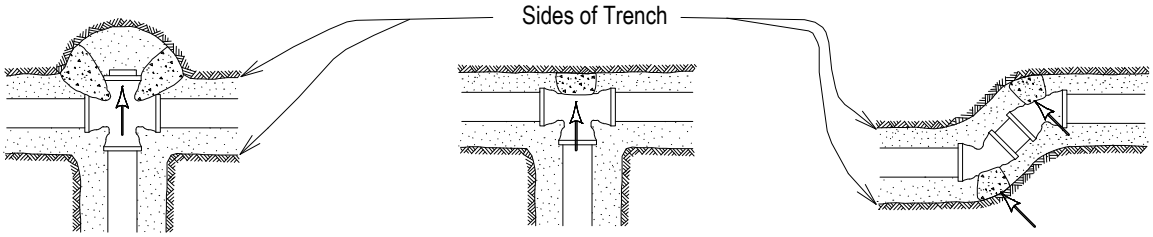
2" HDPE LINE - FOR CUL-DE-SAC'S

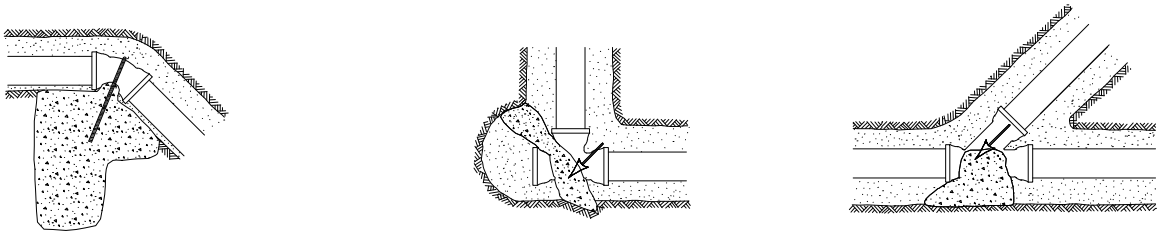
NOTE:

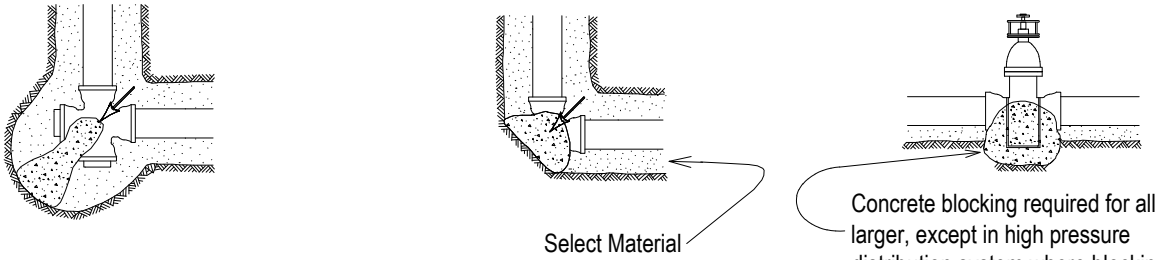
1. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)
2. 2" HDPE Main Will Use FORD 2" CT's Tee w/ FIPT Branch (T771-777-AWTNL) for Blow-Off

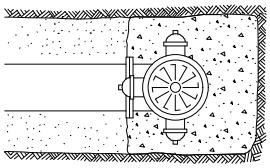
East Central SUD – OUR QUALITY IS CLEAR	TYPICAL CUL-DE-SAC LAYOUT WITH 2" HDPE WATER LINE	APPROVED	REVISED
		JUNE 2025	
		DET-835-Ø1	SHEET 1 OF 1

NOTE:
1. All Fittings Shall be Mega Lug
2. Dry Bags of Sakrete Shall be Placed as Thrust Blocking.



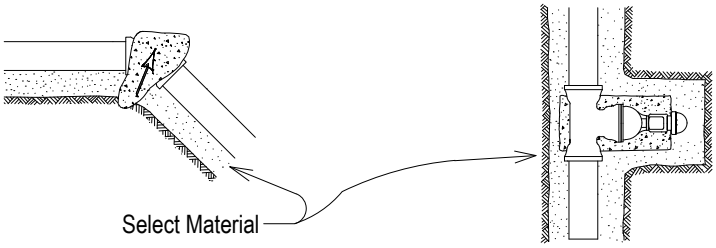




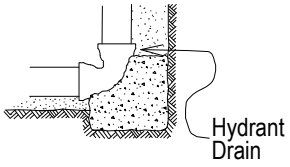


PLAN

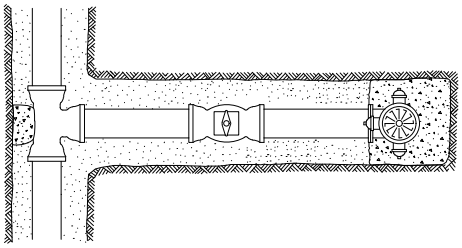
Pour base after Hydrant has been placed

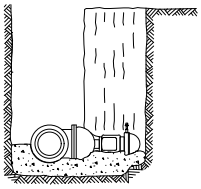


PLAN



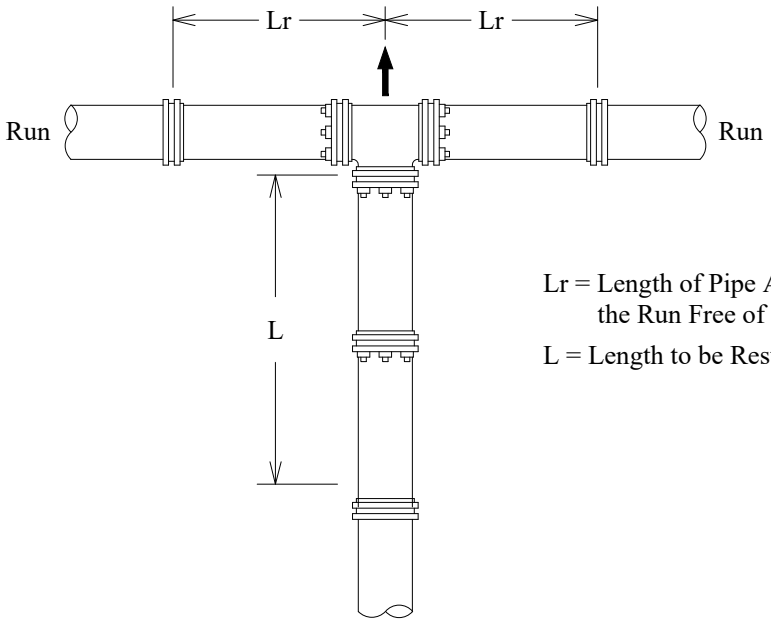
ELEVATION





ELEVATION

East Central SUD OUR QUALITY IS CLEAR	THRUST BLOCKS FOR FITTINGS (WATER ONLY)	APPROVED	REVISED
		FEBRUARY 2025	
		DET-839-Ø1	SHEET 1 OF 1



Lr = Length of Pipe Along the Run Free of Joints

L = Length to be Restrained

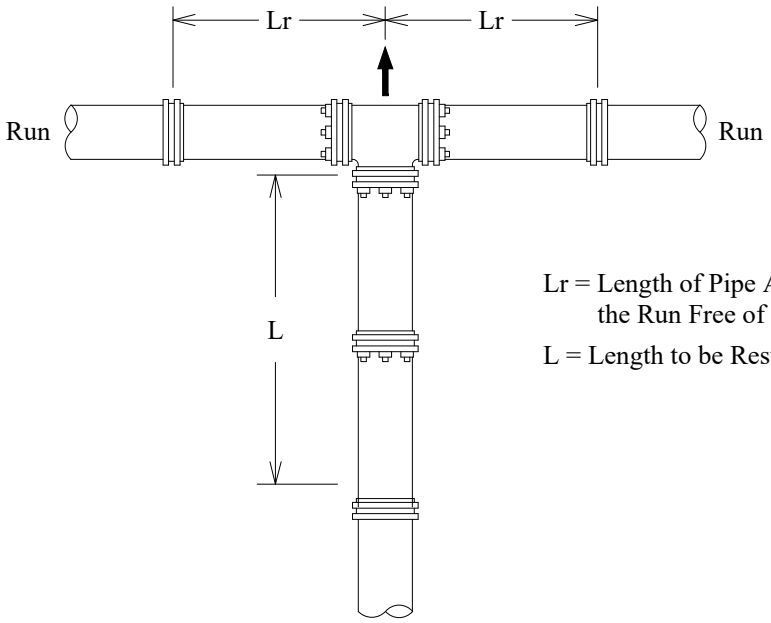
RESTRAINED LENGTH FOR TEES			
PIPE SIZE (Inch)	**BRANCH SIZE (Inch)**	**LENGTH OF RUN (Feet)**	**RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi**
6	4	0	42
6	4	5	7
6	4	10	1
6	6	0	59
6	6	5	35
6	6	10	11
8	4	0	42
8	4	5	1
8	6	0	59
8	6	5	28
8	6	10	1
8	8	0	77
8	8	5	53
8	8	10	30
8	8	15	6

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 Feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.



Lr = Length of Pipe Along the Run Free of Joints

L = Length to be Restrained

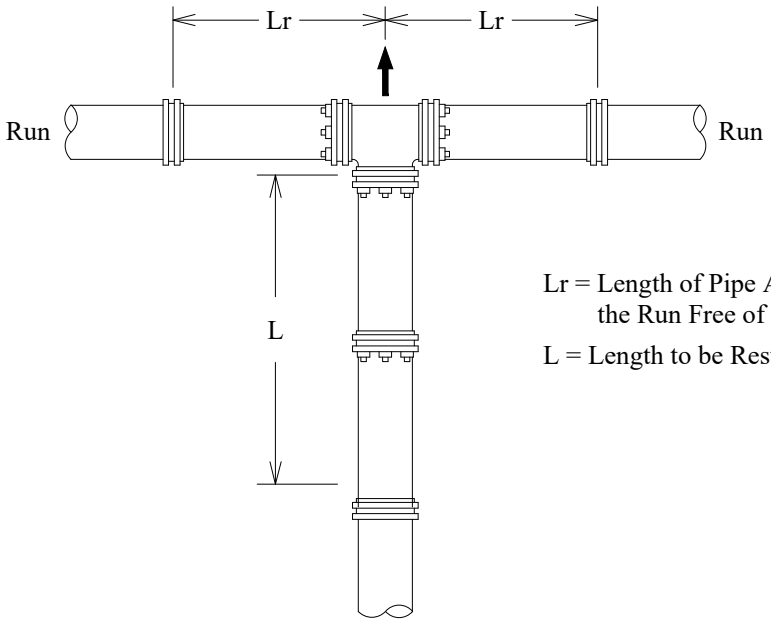
RESTRAINED LENGTH FOR TEES			
PIPE SIZE (Inch)	**BRANCH SIZE (Inch)**	**LENGTH OF RUN (Feet)**	**RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi**
12	4	0	42
12	4	5	1
12	6	0	59
12	6	5	13
12	6	10	1
12	8	0	77
12	8	5	42
12	8	10	7
12	8	15	1
12	12	0	109
12	12	5	86
12	12	10	63
12	12	15	39

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 Feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.



Lr = Length of Pipe Along the Run Free of Joints

L = Length to be Restrained

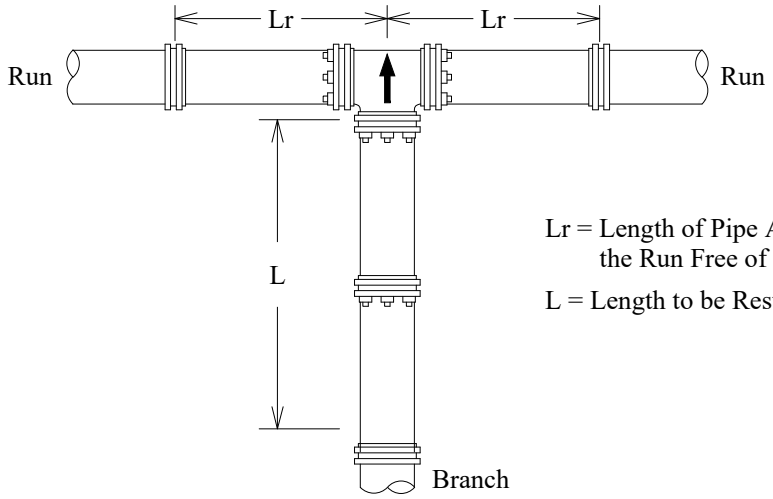
RESTRAINED LENGTH FOR TEES			
PIPE SIZE (Inch)	BRANCH SIZE (Inch)	LENGTH OF RUN (Feet)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
16	6	0	50
16	6	5	2
16	6	10	1
16	6	15	1
16	8	0	64
16	8	5	28
16	8	10	1
16	8	15	1
16	12	0	94
16	12	5	69
16	12	10	45
16	12	15	21
16	16	0	117
16	16	5	97
16	16	10	78
16	16	15	59

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 Feet Max..

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.



Lr = Length of Pipe Along the Run Free of Joints

L = Length to be Restrained

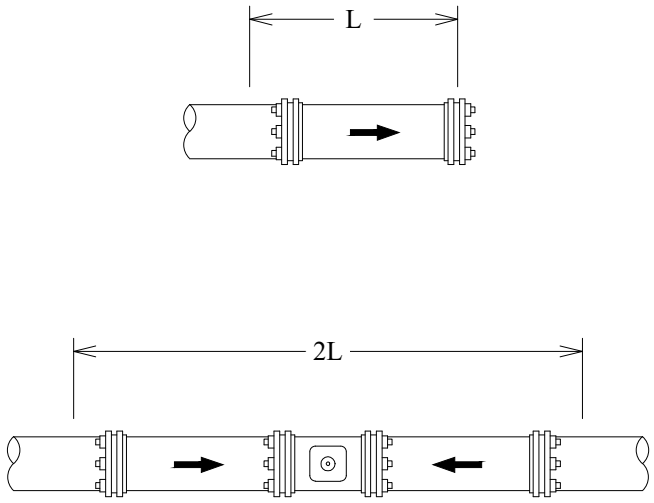
RESTRAINED LENGTH FOR TEES			
PIPE SIZE (Inch)	BRANCH SIZE (Inch)	LENGTH OF RUN (Feet)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
24	6	0	50
24	6	5	1
24	6	10	1
24	6	15	1
24	8	0	64
24	8	5	7
24	8	10	1
24	8	15	1
24	12	0	94
24	12	5	56
24	12	10	18
24	12	15	1
24	16	0	117
24	16	5	87
24	16	10	57
24	16	15	27
24	20	0	145
24	20	5	121
24	20	10	97
24	20	15	73
24	24	0	172
24	24	5	152
24	24	10	133
24	24	15	113

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.



L = Length to be Restrained

PIPE SIZE (Inch)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
6	59
8	77
10	93
12	109
16	117
20	145
24	172

RESTRAINED LENGTH DESIGN

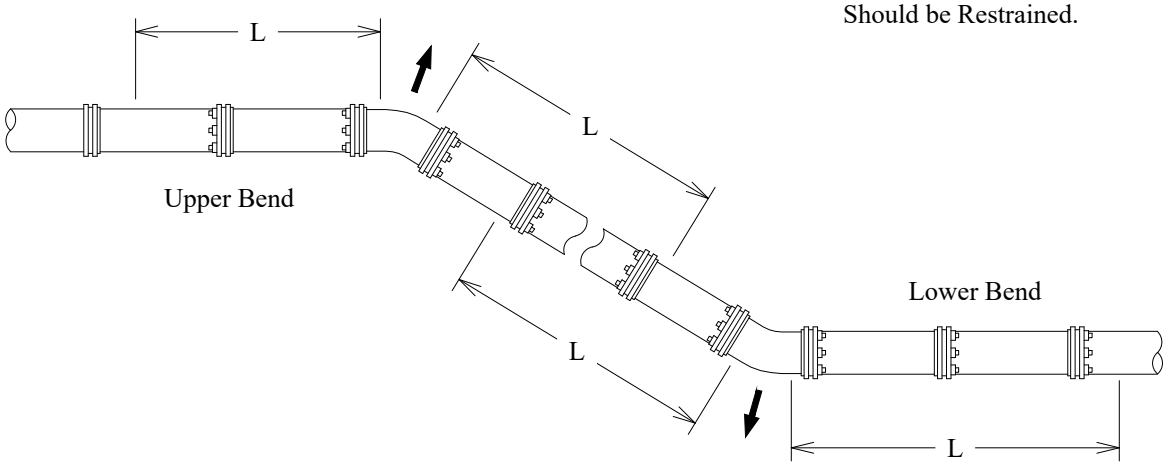
Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.

East Central SUD OUR QUALITY IS CLEAR	RESTRAINED LENGTHS FOR DEAD ENDS / INLINE VALVES ON 6" THRU 24" MAINS	APPROVED FEBRUARY 2025	REVISED
		DET-839-03	SHEET 1 OF 1

L = Length to be Restrained on Both Sides of Fitting. When Restrained Lengths Overlap on the Diagonal Pipe, all Pipe Between Fittings Should be Restrained.



PIPE SIZE (Inch)	BEND ANGLE (deg.)	LOW SIDE DEPTH	UPPER BEND RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi	LOWER BEND RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
6	45	5	24	8
6	22.5	5	12	4
6	11.25	5	6	2
6	45	10	24	5
6	22.5	10	12	2
6	11.25	10	6	1
8	45	5	32	11
8	22.5	5	15	5
8	11.25	5	8	3
8	45	10	32	7
8	22.5	10	15	3
8	11.25	10	8	2
12	45	5	45	16
12	22.5	5	22	7
12	11.25	5	11	4
12	45	10	45	10
12	22.5	10	22	5
12	11.25	10	11	2

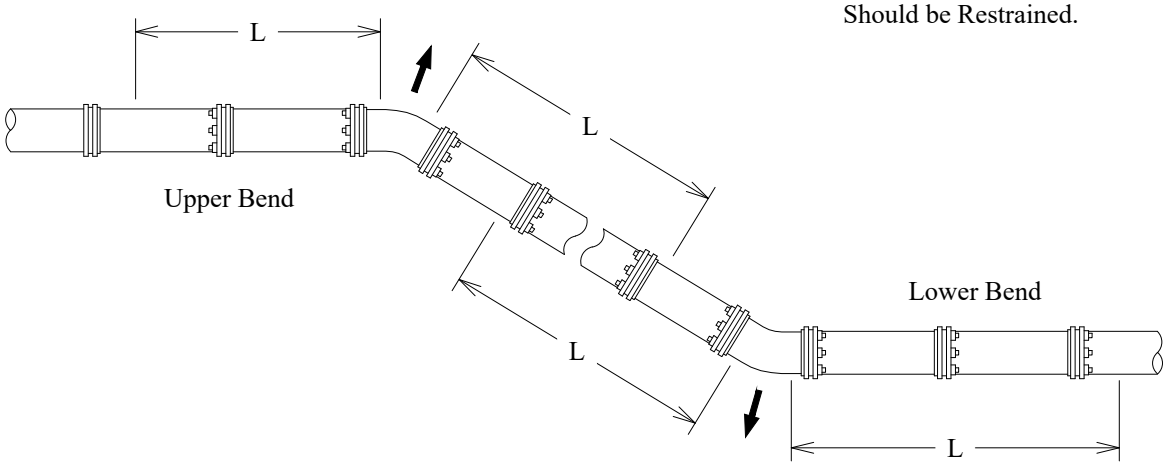
RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.

L = Length to be Restrained on Both Sides of Fitting. When Restrained Lengths Overlap on the Diagonal Pipe, all Pipe Between Fittings Should be Restrained.



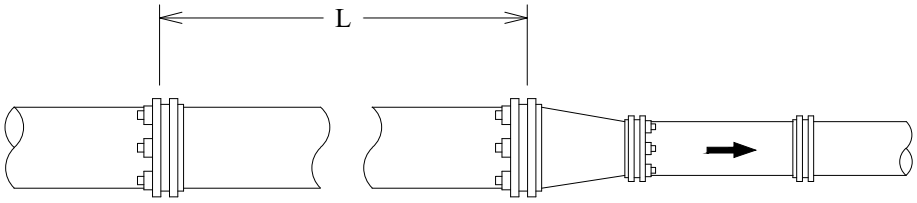
PIPE SIZE (Inch)	BEND ANGLE (deg.)	LOW SIDE DEPTH	UPPER BEND RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi	LOWER BEND RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
16	45	5	70	22
16	22.5	5	34	11
16	11.25	5	17	6
16	45	10	70	14
16	22.5	10	34	7
16	11.25	10	17	4
24	45	5	102	32
24	22.5	5	49	16
24	11.25	5	25	8
24	45	10	102	21
24	22.5	10	49	10
24	11.25	10	25	5

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.



L = Length to be Restrained

PIPE SIZE (Inch)	SMALL SIZE (Inch)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
6	4	30
8	4	55
8	6	32
12	4	95
12	6	80
12	8	58
16	6	97
16	8	83
16	12	43
24	6	159
24	8	150
24	12	124
24	16	96
24	20	53

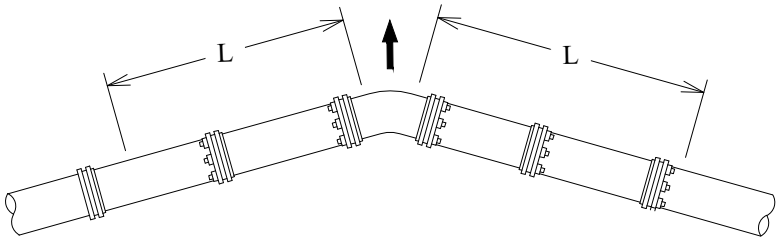
RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.

East Central SUD OUR QUALITY IS CLEAR	RESTRAINED LENGTHS FOR REDUCERS ON 6" THRU 24" MAINS	APPROVED	REVISED
		FEBRUARY 2025	
		DET-839-05	SHEET 1 OF 1



L = Length to be Restrained
on Both Sides of Fitting

PIPE SIZE (Inch)	BEND ANGLE (deg)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
6	90	23
6	45	9
6	22.5	5
6	11.25	2
8	90	30
8	45	12
8	22.5	6
8	11.25	3
12	90	43
12	45	18
12	22.5	8
12	11.25	4
16	90	59
16	45	25
16	22.5	12
16	11.25	6
24	90	86
24	45	36
24	22.5	17
24	11.25	9

RESTRAINED LENGTH DESIGN

Restrained Length Calculations are for P.V.C. Pipe Bedded in Compacted Granular Material Extending to the Top of the Pipe. The Native Soil Material is Assumed to be Inorganic Clay of High Plasticity. Depth of Bury is Assumed to be 4 Feet Min. and 5 feet Max.

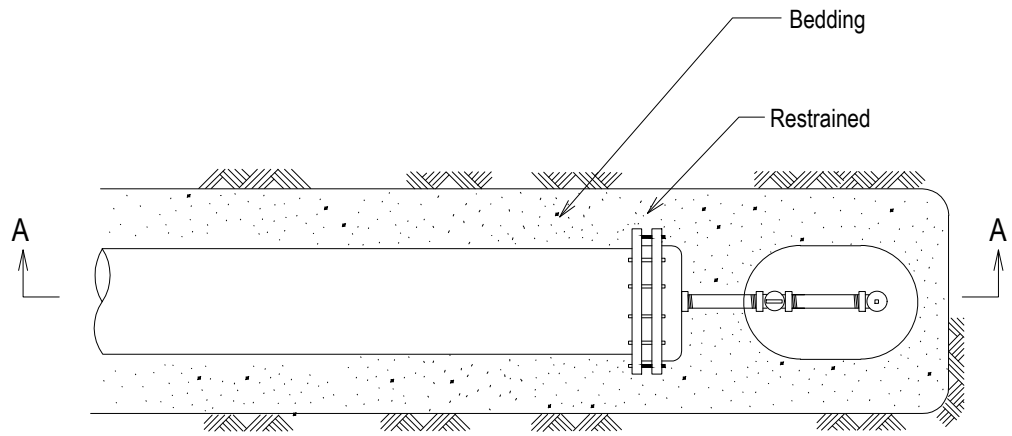
NOTE:

1. These Calculations are Provided for Reference. The Restrained Length Shall be Designed Based Upon the Conditions Encountered During Installation.
2. All joints within the calculated length must be restrained.
3. If your distance between fittings is less than or equal to the calculated restraint length, restrain all joints between those fittings.
4. When a valve is added see DET-893-03 for restrained length from a valve.

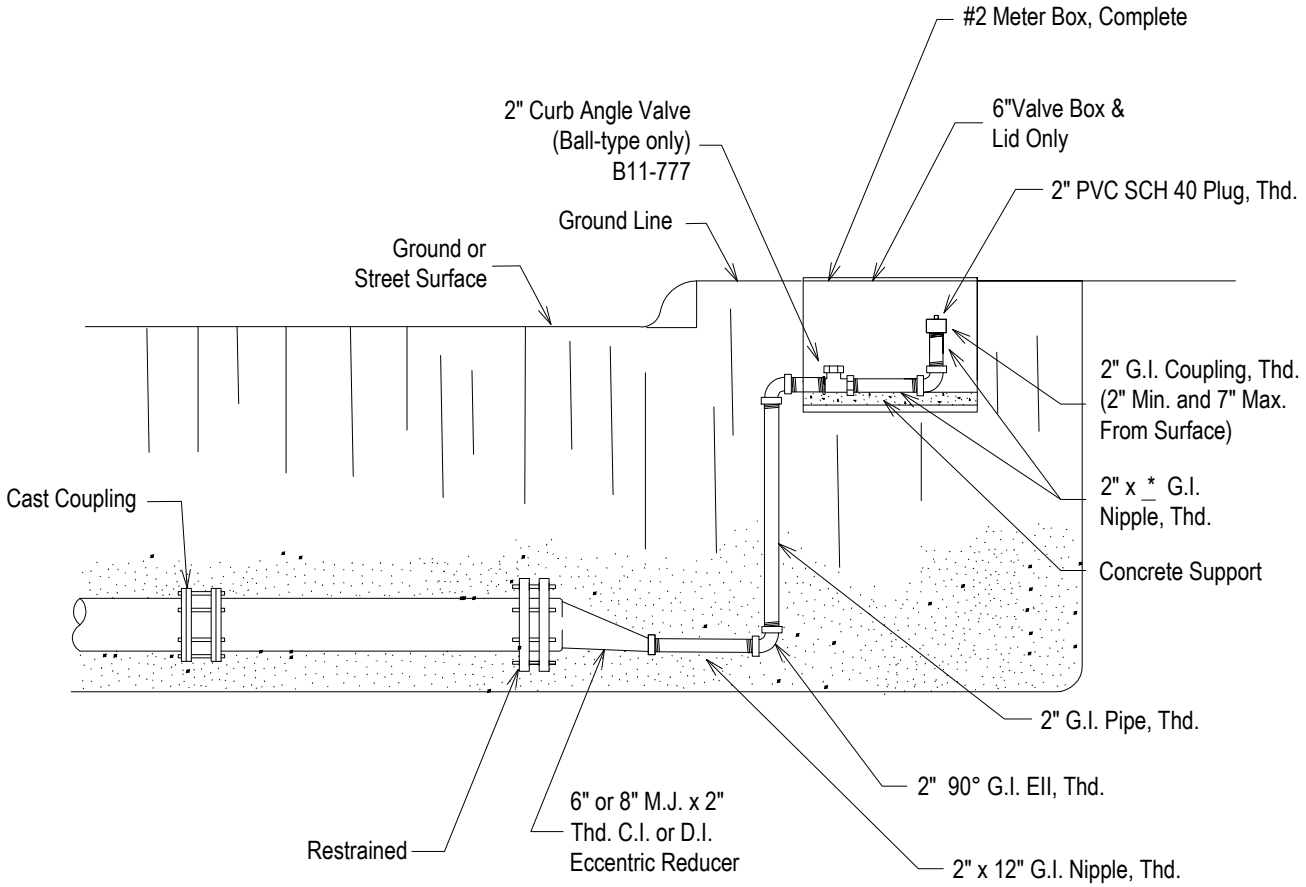
East Central SUD
OUR QUALITY IS CLEAR

RESTRAINED LENGTHS FOR HORIZONTAL BENDS ON 6" THRU 24" MAINS

APPROVED	REVISED
FEBRUARY 2025	
DET-839-06	SHEET 1 OF 1



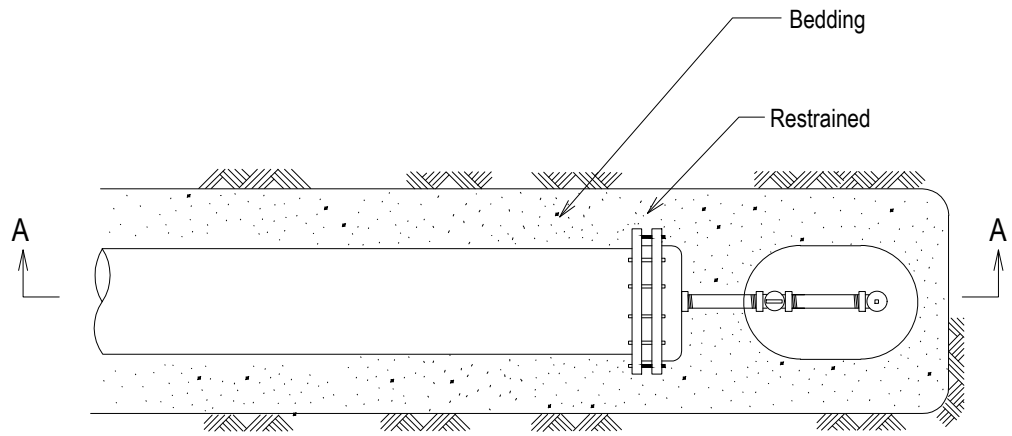
PLAN



SECTION A - A

* Cut to Fit in Meter Box

East Central SUD	2" PERMANENT BLOW-OFF ASSEMBLY ON 6" AND 8" MAINS	APPROVED JANUARY 2025	REVISED
		DET-844-02	SHEET 1 OF 2



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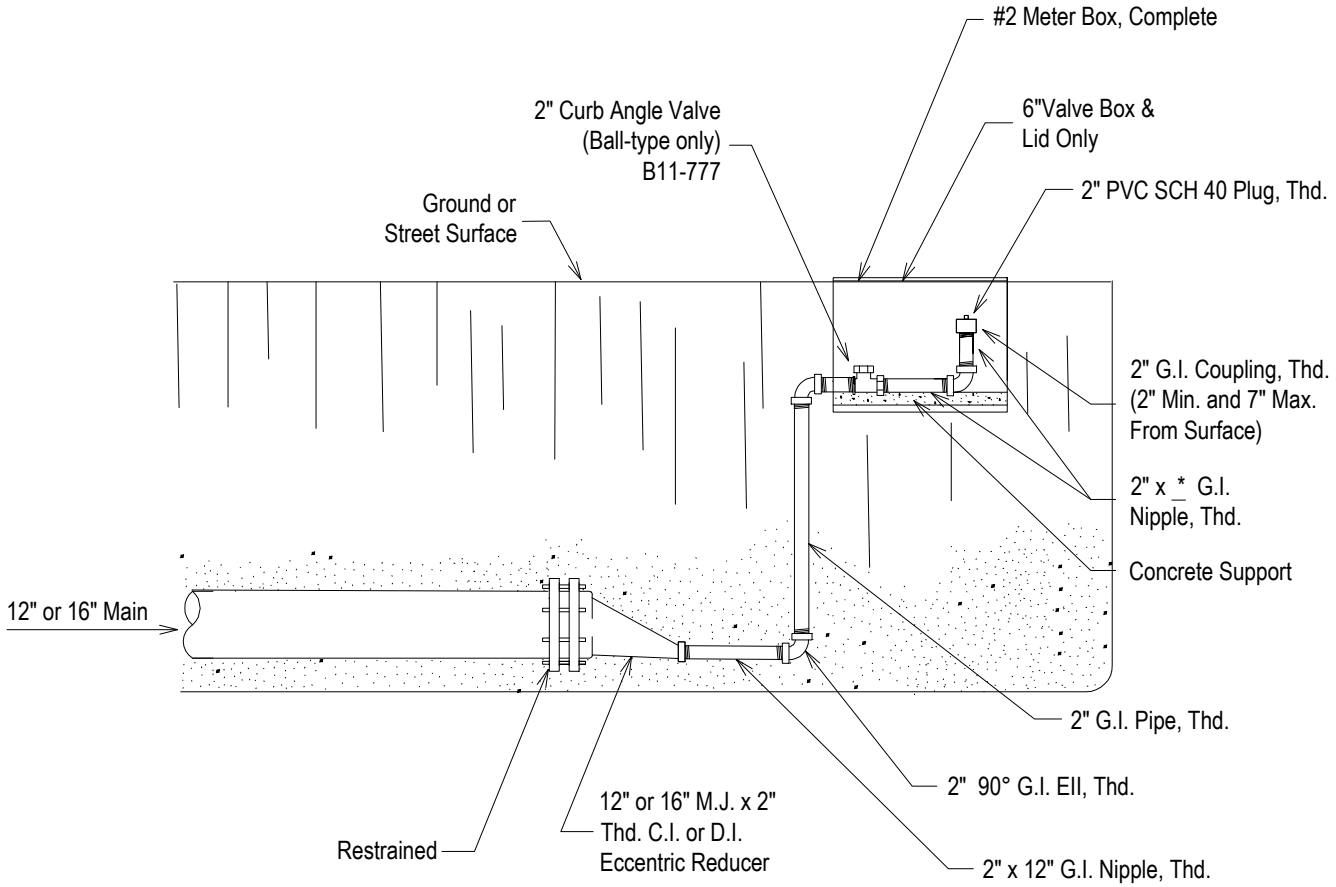


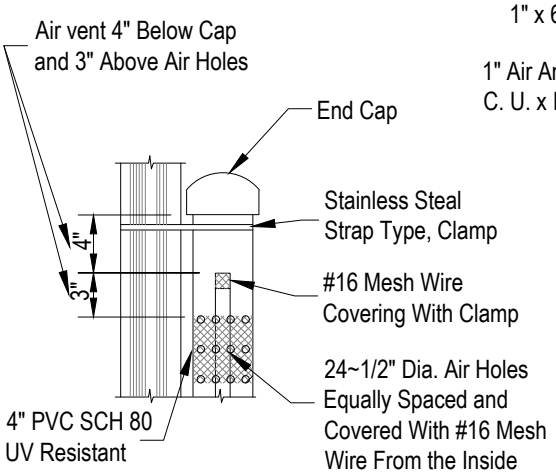
SECTION A - A

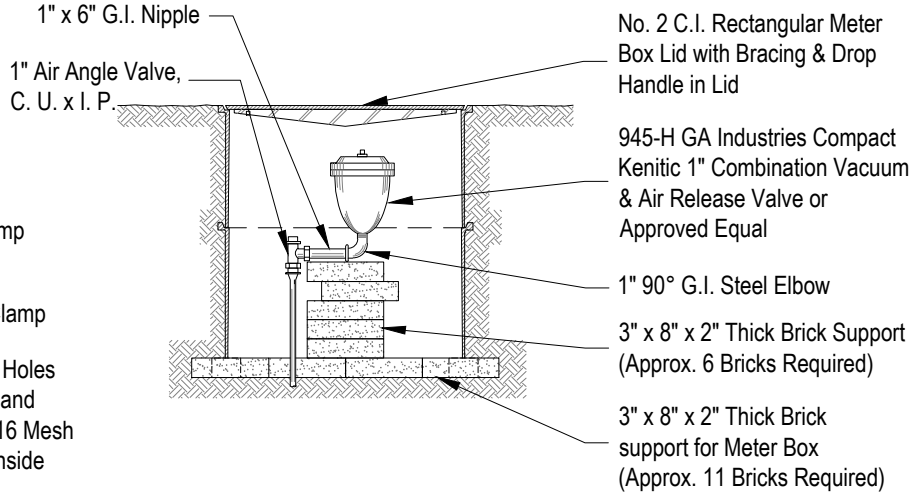
* Cut to Fit in Meter Box

East Central SUD
OUR QUALITY IS CLEAR

2" PERMANENT BLOW-OFF ASSEMBLY ON 12" AND 16" MAINS

APPROVED	REVISED
JANUARY 2025	
DET-844-02	SHEET 2 OF 2





Note: In Rural Areas, Riser Should Be at Property Line and at Maximum Height.

* Per Direction from Inspector

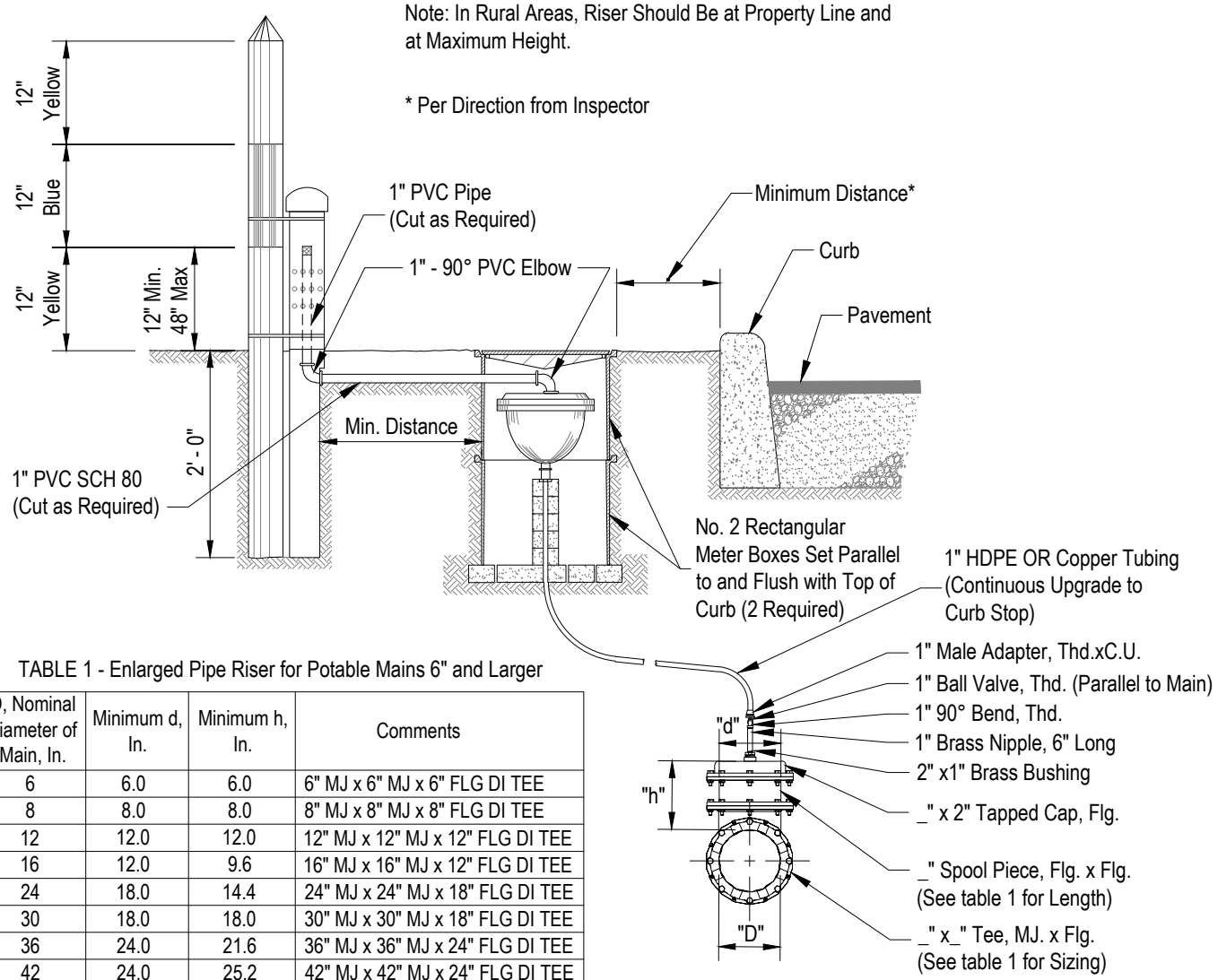


TABLE 1 - Enlarged Pipe Riser for Potable Mains 6" and Larger

D, Nominal Diameter of Main, In.	Minimum d, In.	Minimum h, In.	Comments
6	6.0	6.0	6" MJ x 6" MJ x 6" FLG DI TEE
8	8.0	8.0	8" MJ x 8" MJ x 8" FLG DI TEE
12	12.0	12.0	12" MJ x 12" MJ x 12" FLG DI TEE
16	12.0	9.6	16" MJ x 16" MJ x 12" FLG DI TEE
24	18.0	14.4	24" MJ x 24" MJ x 18" FLG DI TEE
30	18.0	18.0	30" MJ x 30" MJ x 18" FLG DI TEE
36	24.0	21.6	36" MJ x 36" MJ x 24" FLG DI TEE
42	24.0	25.2	42" MJ x 42" MJ x 24" FLG DI TEE
48	24.0	28.8	48" MJ x 48" MJ x 24" FLG DI TEE
54	30.0	32.4	Welded-on FLG Outlet
60	36.0	36.0	Welded-on FLG Outlet
66	24.0	23.1	Welded-on FLG Outlet
72	24.0	25.2	Welded-on FLG Outlet

Air Collection Traps in Air Valve Piping Notes:

1. Dimensions Derived from AWWA Manual 2nd Edition:
   Chapter 6 M51 Air Valves:
   Air-Release, Air/Vacuum & Combination

East Central SUD
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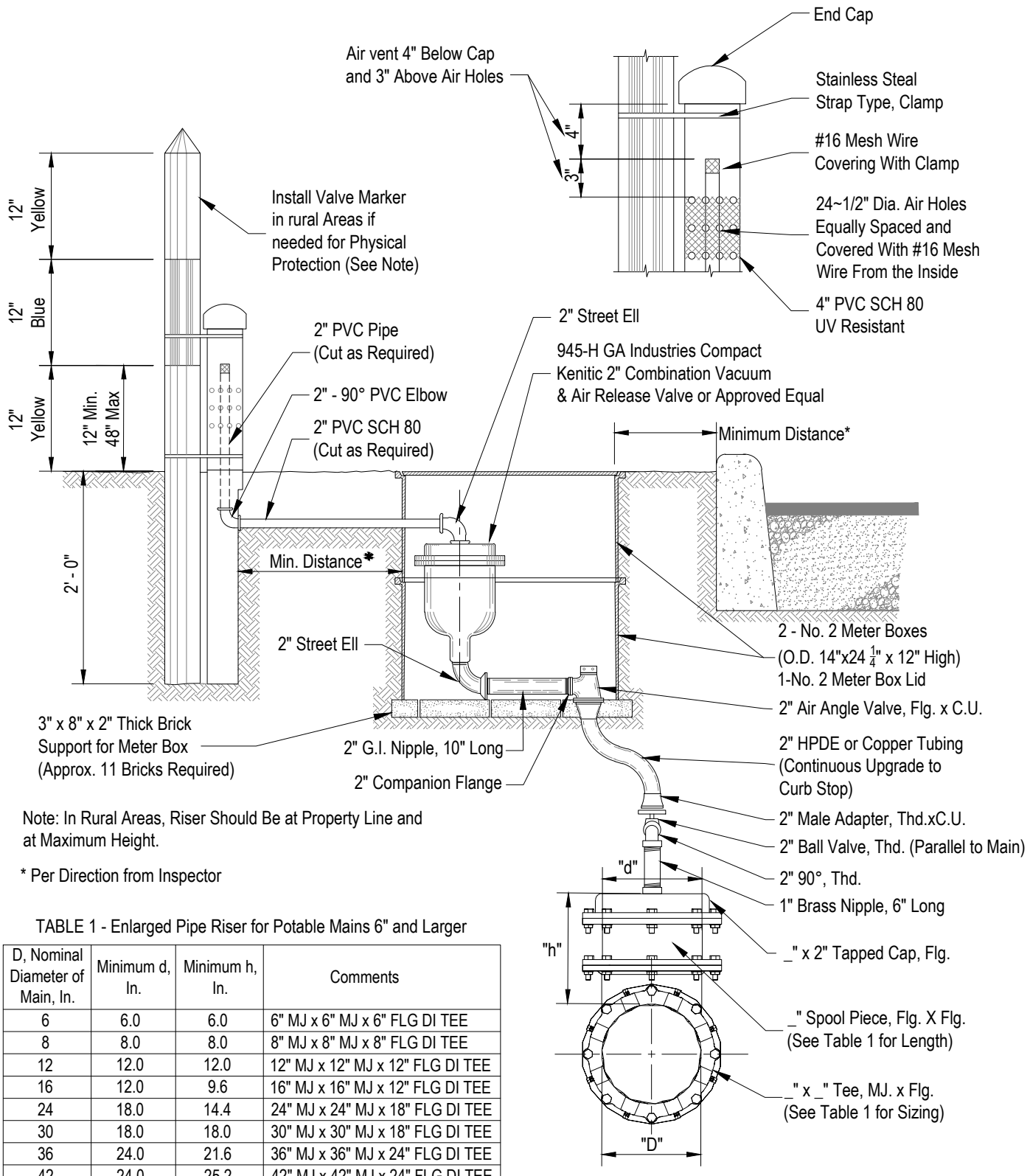
INSTALLATION OF 1" AIR RELEASE VALVE

APPROVED	REVISED
FEBRUARY 2025	

DET-846-Ø1

SHEET 1 OF 1



Note: In Rural Areas, Riser Should Be at Property Line and at Maximum Height.

* Per Direction from Inspector

TABLE 1 - Enlarged Pipe Riser for Potable Mains 6" and Larger

D, Nominal Diameter of Main, In.	Minimum d, In.	Minimum h, In.	Comments
6	6.0	6.0	6" MJ x 6" MJ x 6" FLG DI TEE
8	8.0	8.0	8" MJ x 8" MJ x 8" FLG DI TEE
12	12.0	12.0	12" MJ x 12" MJ x 12" FLG DI TEE
16	12.0	9.6	16" MJ x 16" MJ x 12" FLG DI TEE
24	18.0	14.4	24" MJ x 24" MJ x 18" FLG DI TEE
30	18.0	18.0	30" MJ x 30" MJ x 18" FLG DI TEE
36	24.0	21.6	36" MJ x 36" MJ x 24" FLG DI TEE
42	24.0	25.2	42" MJ x 42" MJ x 24" FLG DI TEE
48	24.0	28.8	48" MJ x 48" MJ x 24" FLG DI TEE
54	30.0	32.4	Welded-on FLG Outlet
60	36.0	36.0	Welded-on FLG Outlet
66	24.0	23.1	Welded-on FLG Outlet
72	24.0	25.2	Welded-on FLG Outlet

Air Collection Traps in Air Valve Piping Notes:

1. Dimensions Derived from AWWA Manual 2nd Edition:
   Chapter 6 M51 Air Valves:
   Air-Release, Air/Vacuum & Combination

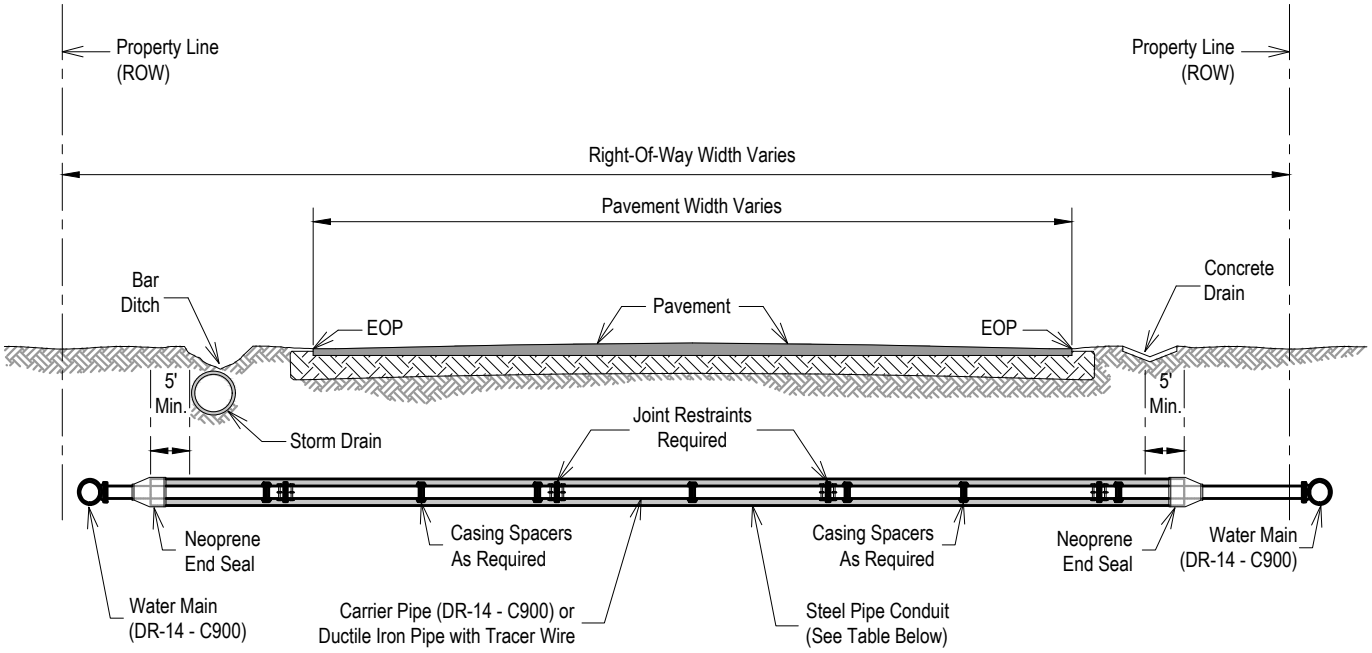
East Central SUD
OUR QUALITY IS CLEAR

INSTALLATION OF 2" AIR RELEASE VALVE

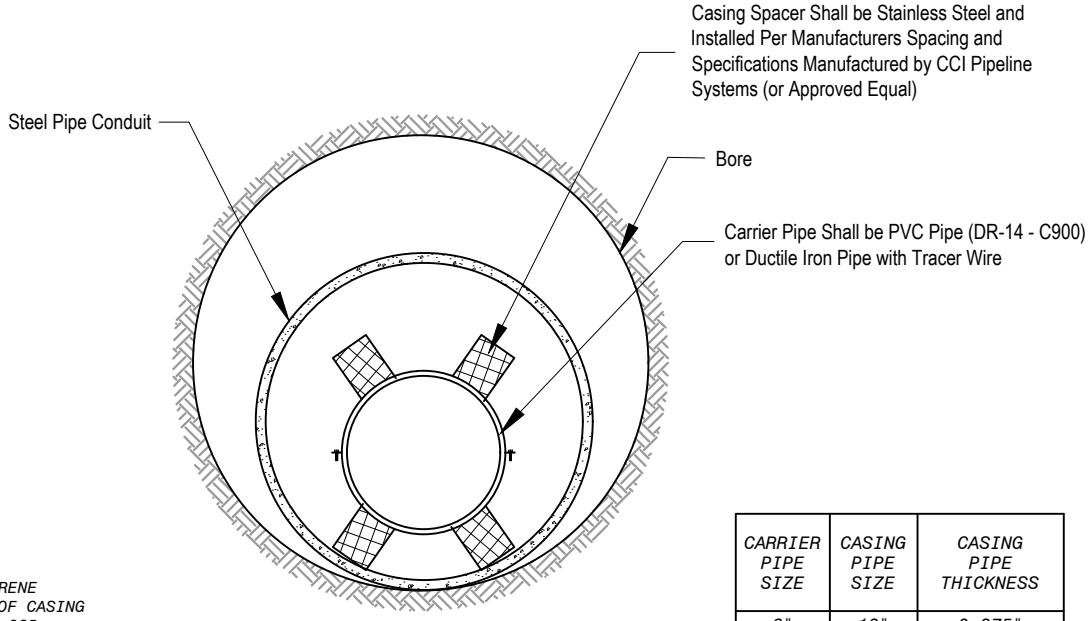
APPROVED	REVISED
FEBRUARY 2025	

DET-846-Ø2

SHEET 1 OF 1



BORE DEPTH SHALL MEET CITY, COUNTY OR STATE PERMIT REQUIREMENTS FOR THE APPROPRIATE MUNICIPALITY FOR THE PROJECT.



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASING PIPE AS MANUFACTURED BY CCI PIPELINE SYSTEMS (OR APPROVED EQUAL) SIZE AND SPACING SHALL BE DETERMINED BY MANUFACTURER

SECTION THROUGH PIPE IN CONDUIT

CARRIER PIPE SIZE	*CASING PIPE SIZE*	*CASING PIPE THICKNESS*
6"	*18"*	*0.375"*
8"	*20"*	*0.375"*
12"	*24"*	*0.375"*
16"	*30"*	*0.375"*
20"	*36"*	*0.438"*
24"	*42"*	*0.438"*
30"	*48"*	*1/2"*
36"	*54"*	*9/16"*

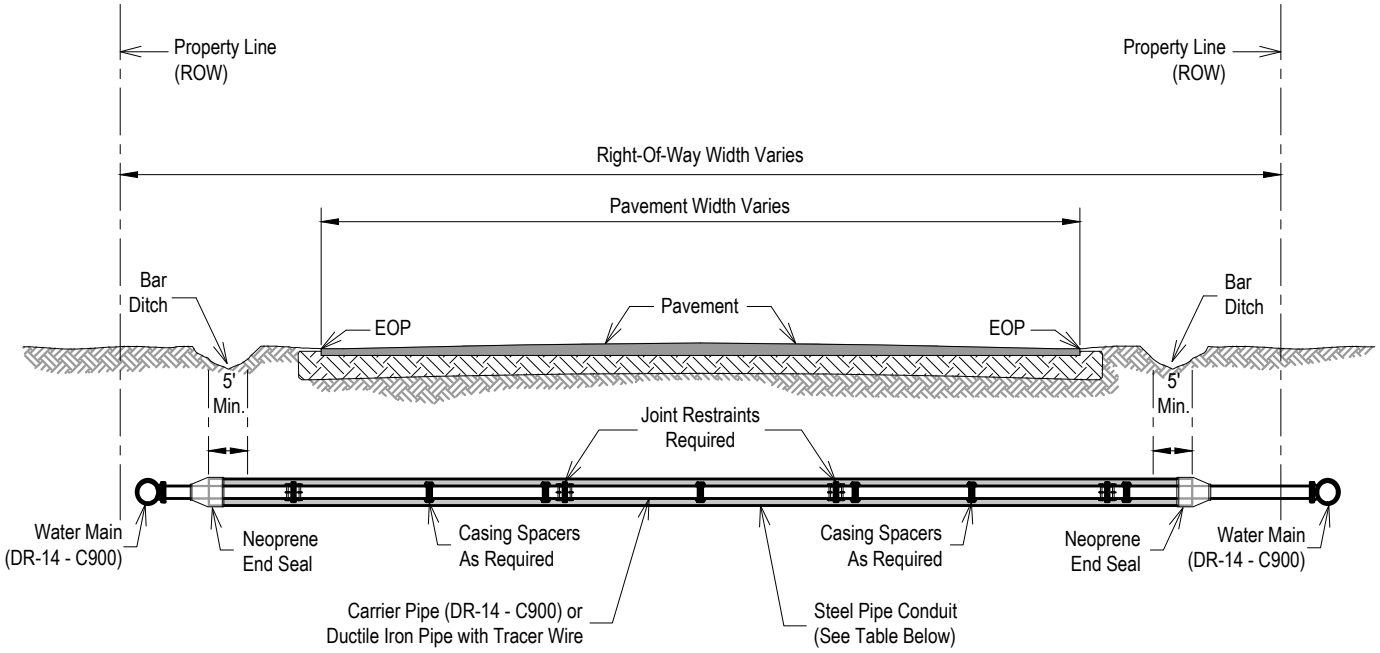
East Central SUD
OUR QUALITY IS CLEAR

TYPICAL BORE CROSSING UNDER ROAD

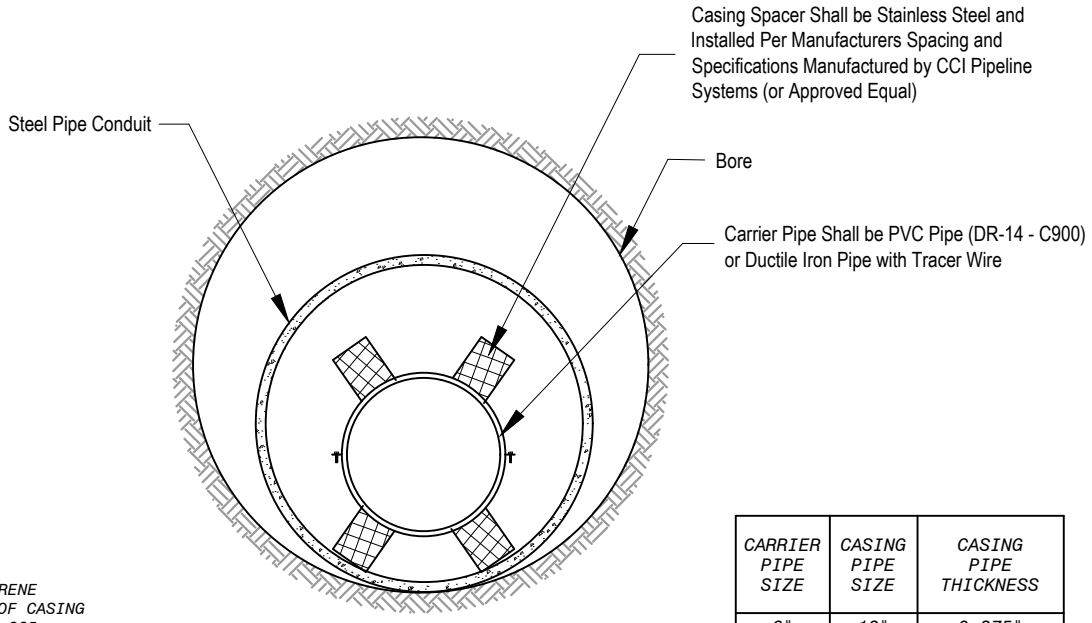
APPROVED	REVISED
FEBRUARY 2025	

DET-847-Ø1

SHEET 1 OF 3



BORE DEPTH SHALL MEET CITY, COUNTY OR STATE PERMIT REQUIREMENTS FOR THE APPROPRIATE MUNICIPALITY FOR THE PROJECT.



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASING PIPE AS MANUFACTURED BY CCI PIPELINE SYSTEMS (OR APPROVED EQUAL) SIZE AND SPACING SHALL BE DETERMINED BY MANUFACTURER

SECTION THROUGH PIPE IN CONDUIT

CARRIER PIPE SIZE	*CASING PIPE SIZE*	*CASING PIPE THICKNESS*
6"	*18"*	*0.375"*
8"	*20"*	*0.375"*
12"	*24"*	*0.375"*
16"	*30"*	*0.375"*
20"	*36"*	*0.438"*
24"	*42"*	*0.438"*
30"	*48"*	*1/2"*
36"	*54"*	*9/16"*

East Central SUD
OUR QUALITY IS CLEAR

TYPICAL ROAD BORE DETAIL

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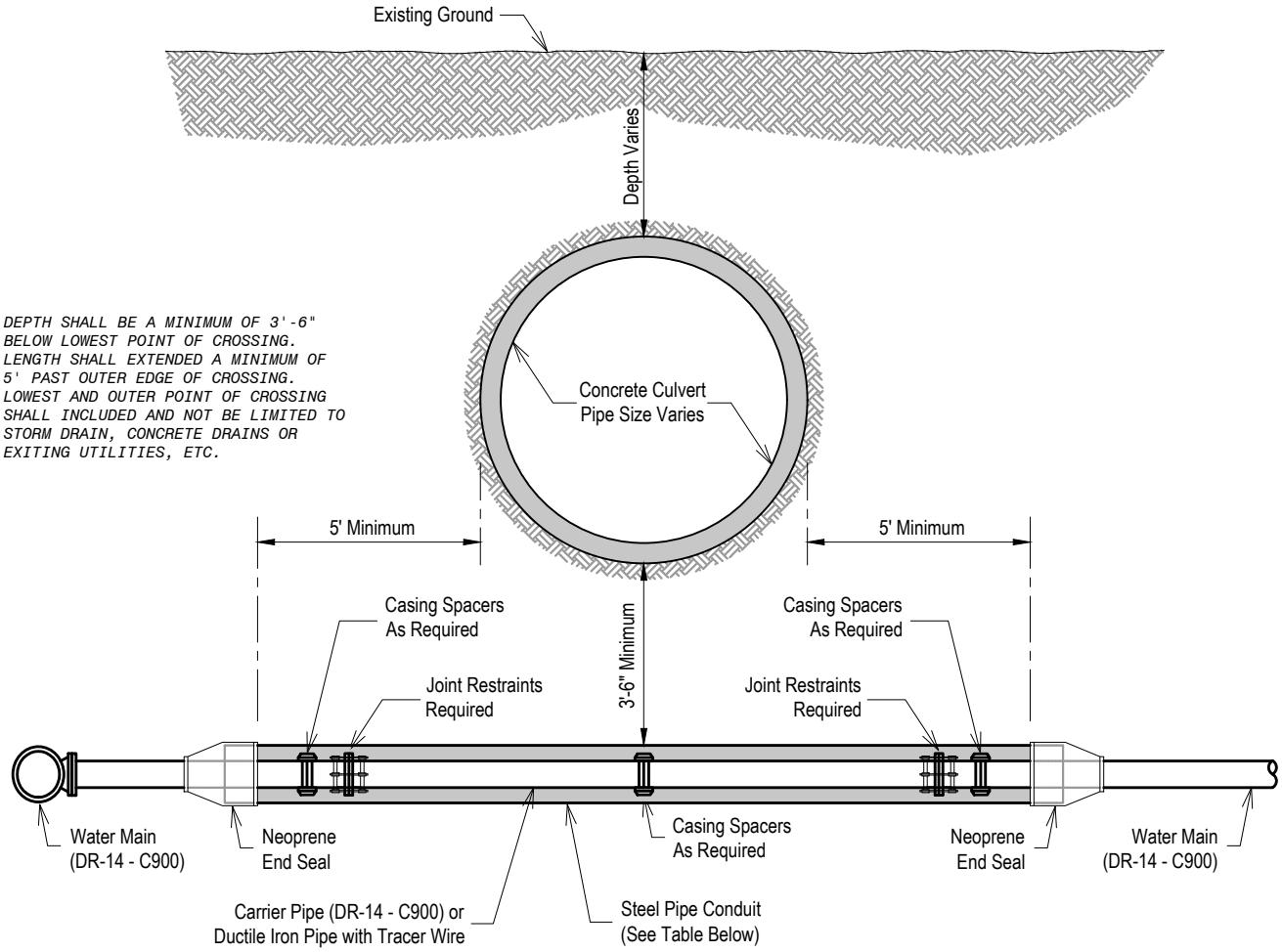
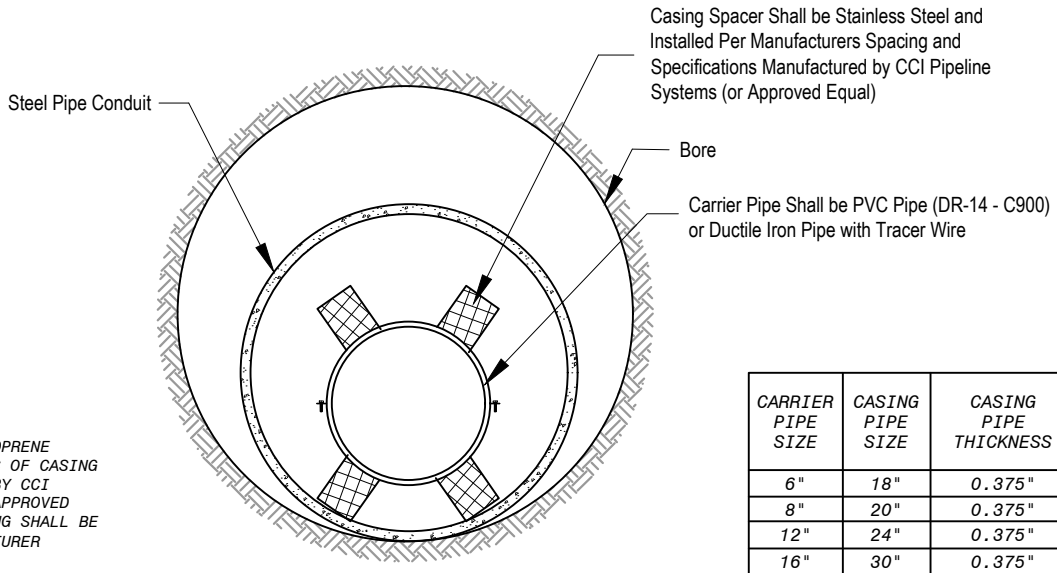
FEBRUARY 2025	

DET-847-Ø1

SHEET 1 OF 3



DEPTH SHALL BE A MINIMUM OF 3'-6" BELOW LOWEST POINT OF CROSSING. LENGTH SHALL EXTENDED A MINIMUM OF 5' PAST OUTER EDGE OF CROSSING. LOWEST AND OUTER POINT OF CROSSING SHALL INCLUDED AND NOT BE LIMITED TO STORM DRAIN, CONCRETE DRAINS OR EXITING UTILITIES, ETC.



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASING PIPE AS MANUFACTURED BY CCI PIPELINE SYSTEMS (OR APPROVED EQUAL) SIZE AND SPACING SHALL BE DETERMINED BY MANUFACTURER

CARRIER PIPE SIZE	*CASING PIPE SIZE*	*CASING PIPE THICKNESS*
6"	*18"*	*0.375"*
8"	*20"*	*0.375"*
12"	*24"*	*0.375"*
16"	*30"*	*0.375"*
20"	*36"*	*0.438"*
24"	*42"*	*0.438"*
30"	*48"*	*1/2"*
36"	*54"*	*9/16"*

SECTION THROUGH
PIPE IN CONDUIT

East Central SUD
OUR QUALITY IS CLEAR

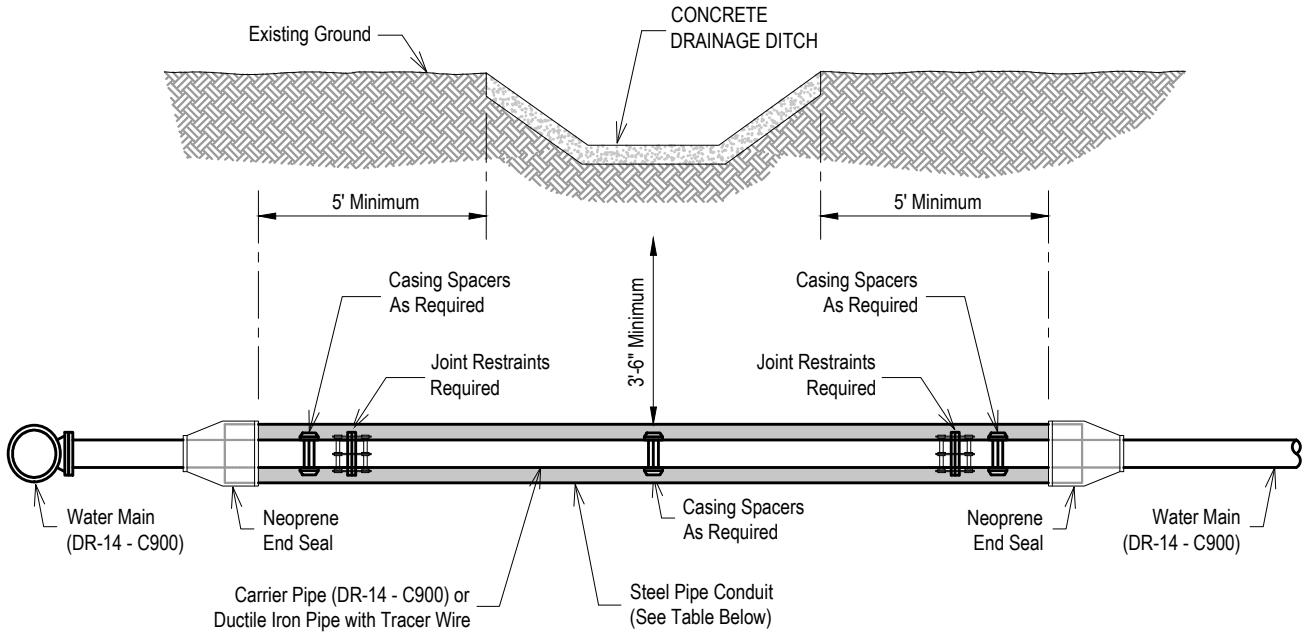
TYPICAL BORE CROSSING UNDER CONCRETE CULVERT / STORM SEWER

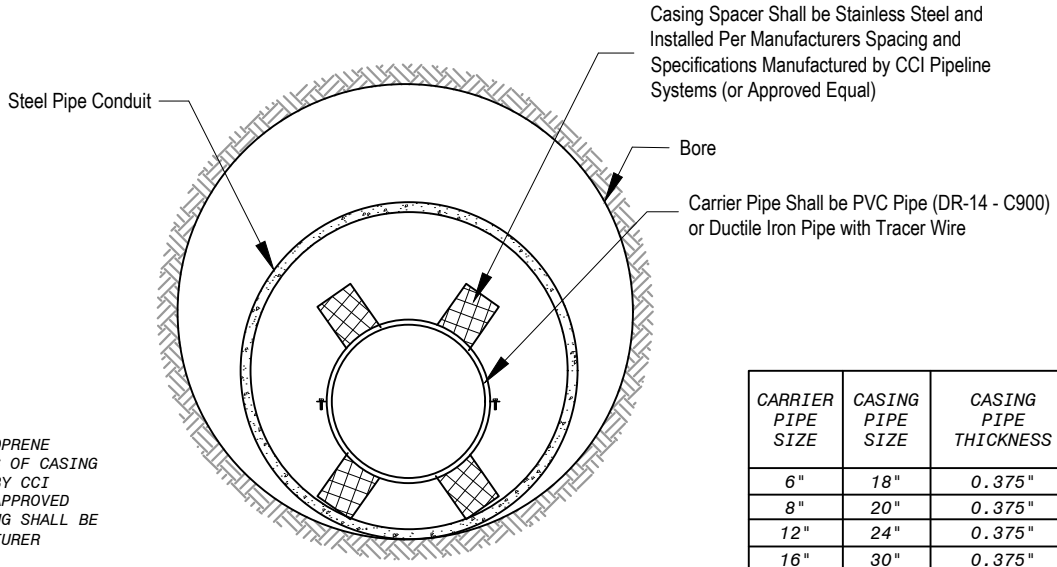
APPROVED	REVISED
FEBRUARY 2025	

DET-847-Ø1

SHEET 2 OF 3

DEPTH SHALL BE A MINIMUM OF 3'-6" BELOW LOWEST POINT OF CROSSING. LENGTH SHALL EXTENDED A MINIMUM OF 5' PAST OUTER EDGE OF CROSSING. LOWEST AND OUTER POINT OF CROSSING SHALL INCLUDED AND NOT BE LIMITED TO STORM DRAIN, CONCRETE DRAINS OR EXITING UTILITIES, ETC.





END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASING PIPE AS MANUFACTURED BY CCI PIPELINE SYSTEMS (OR APPROVED EQUAL) SIZE AND SPACING SHALL BE DETERMINED BY MANUFACTURER

CARRIER PIPE SIZE	*CASING PIPE SIZE*	*CASING PIPE THICKNESS*
6"	*18"*	*0.375"*
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36"	*54"*	*9/16"*

SECTION THROUGH PIPE IN CONDUIT

East Central SUD
OUR QUALITY IS CLEAR

TYPICAL BORE CROSSING UNDER DITCH WITH CONCRETE BOTTOM

APPROVED	REVISED
FEBRUARY 2025	

DET-847-Ø1

SHEET 3 OF 3