

GENERAL NOTES

1. ALL VALVES SHALL REMAIN CLOSED UNTIL MAINS HAVE BEEN DISINFECTED, FLUSHED, AND RELEASED FOR PUBLIC USE BY THE ENGINEER.
2. EXISTING UTILITIES SHOWN ARE TAKEN FROM VARIOUS UTILITY COMPANY RECORDS. CONTRACTORS SHALL VERIFY THE EXACT LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES AND DRAINAGE STRUCTURES, WHETHER SHOWN ON THE PLANS OR NOT, PRIOR TO BEGINNING CONSTRUCTION. CONTRACTORS SHALL BE RESPONSIBLE FOR THE PROTECTION OF EXISTING UTILITIES AND DRAINAGE STRUCTURES DURING CONSTRUCTION.
3. ALL EXCAVATION SHALL BE UNCLASSIFIED REGARDLESS OF MATERIAL ENCOUNTERED.
4. BIDDERS ARE NOTIFIED TO MAKE SUBSURFACE INVESTIGATIONS AS THEY DEEM NECESSARY. NO ADDITIONAL PAYMENT WILL BE MADE FOR WATER, SAND, GRAVEL OR OTHER UNSTABLE CONDITIONS ENCOUNTERED IN EXCAVATIONS.
5. DETOUR OF TRAFFIC AROUND WORK ACTIVITIES, MAINTENANCE OF TRAFFIC CONTROL SIGNS, AND FLAGMEN ARE THE CONTRACTOR'S RESPONSIBILITY. NO SEPARATE PAYMENT WILL BE MADE.
6. THE CONTRACTOR SHALL PROTECT ALL OPEN EXCAVATIONS AND EQUIPMENT FROM CHILDREN, PEDESTRIANS, AND VEHICLES IN THE AREA.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RESTORATION OF ALL FENCES IN THE WORK AREA TO THEIR ORIGINAL CONDITION PRIOR TO COMPLETION OF THE CONTRACT. THIS SHALL APPLY TO ALL FENCES IN THE WORK AREA WHETHER THEY ARE SHOWN ON THE PLANS OR NOT.
8. CONTRACTOR SHALL PRESERVE ALL CONSTRUCTION STAKES, MARKS, ETC. ANY CONSTRUCTION STAKES, MARKS, ETC., DESTROYED OR REMOVED BY THE CONTRACTOR OR HIS EMPLOYEES SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
9. THE CONTRACTOR SHALL CONFER WITH EACH INDIVIDUAL PROPERTY OWNER AS TO THE LOCATION OF EACH INDIVIDUAL METER BOX.
10. CONTRACTOR SHALL DISINFECT ALL NEW WATER MAINS BEFORE TYING INTO EXISTING WATER MAINS.
11. ALL VALVES SHALL BE PERMANENTLY MARKED BY THE USE OF A VALVE MARKER. NO SEPARATE PAY ITEM.
12. CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITES(S) WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES FOR THE PROJECT DESCRIBED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR'S IMPLEMENTATION OF THESE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLY WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.
13. CONTRACTOR SHALL MAINTAIN FENCING FOR THE CONTAINMENT OF LIVESTOCK DURING CONSTRUCTION. ALL FENCES REMOVED FOR CONSTRUCTION SHALL BE REPLACED. ALL REQUIRED FENCING SHALL BE INCIDENTAL TO CONSTRUCTION AND NOT A SEPARATE PAY ITEM.
14. ALL DRIVEWAYS, INCLUDING DRAIN PIPES, CULVERTS AND HEADWALLS, DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED BY THE CONTRACTOR TO EQUAL OR BETTER THAN PRECONSTRUCTION CONDITION. ASPHALT DRIVES ARE NOT ALLOWED TO BE CUT WITHOUT OWNERS PERMISSION. INSTALLATION OF WATER MAINS CROSSING CONCRETE DRIVES WILL BE BORED. ALL DRAIN PIPE, CULVERT AND HEADWALL REPAIR SHALL BE INCIDENTAL TO CONSTRUCTION AND NOT A SEPARATE PAY ITEM. DRIVEWAY PAVEMENT REPAIR SHALL BE PAID FOR AS PER ITEM NO. 02950, "CUTTING AND PATCHING ASPHALT PAVEMENT, ASPHALT DRIVES, CONCRETE DRIVES, OR GRAVEL ROADS AND DRIVES". PAYMENT FOR BORES UNDER CONCRETE DRIVES SHALL BE PAID FOR AS PER ITEM 02445 "BORING AND CASING PIPE UNDER HIGHWAYS, RAILROADS, OR OTHER AREAS".
15. LOCATIONS OF COMBINATION AIR VALVES WHERE SHOWN ON PLANS ARE APPROXIMATE. FINAL LOCATIONS TO BE ADJUSTED IN FIELD AT TIME OF CONSTRUCTION AT THE DIRECTION OF THE ENGINEER.
16. ALL WORK SHALL BE SCHEDULED TO TAKE PLACE ON MONDAY THROUGH FRIDAY, DURING NORMAL WORK HOURS. CONTRACTOR SHALL NOTIFY ECSUD 48 HOURS PRIOR TO SERVICE SHUT OFF AFFECTING CUSTOMERS. SERVICE SHALL NOT BE SHUT OFF FOR MORE THAN EIGHT (8) HOURS AT A TIME.
17. THE CONTRACTOR SHALL IMMEDIATELY REPAIR OR REPLACE ANY PHYSICAL DAMAGE TO PROPERTY, INCLUDING, BUT NOT LIMITED TO, FENCES, PAVEMENT, DRIVEWAYS, LAWNS, CULVERTS, AND TREES, AT NO COST TO THE OWNER.
18. THE CONTRACTOR SHALL PROVIDE EROSION CONTROL AT ALL CULVERT, STREAM AND DRAINAGE SWALES CROSSINGS. EROSION CONTROL MEASURES SHALL INCLUDE AS A MINIMUM SILT FENCES. SILT FENCES SHALL BE INSTALLED PRIOR TO DISTURBANCE OF THE WORK AREAS AND SHALL REMAIN IN PLACE UNTIL FINAL STABILIZATION OF THE DISTURBED AREAS UPSTREAM. EROSION CONTROL SHALL BE COORDINATED WITH THE ENGINEER.
19. THE CONTRACTOR SHALL REMOVE AND REPLACE ANY MAILBOXES, TRAFFIC OR ROAD SIGNS ENCOUNTERED. NO SEPARATE PAY ITEM.
20. CONTRACTOR SHALL SUBMIT TO ENGINEER PROPOSED CONSTRUCTION SEQUENCE PRIOR TO BEGINNING CONSTRUCTION.
21. ALL FITTINGS ARE TO BE DUCTILE IRON, MECHANICAL JOINT TYPE, UNLESS OTHERWISE NOTED ON PLANS.
22. ALL THRUST BLOCKS SHALL BE INSPECTED BY OWNER AND/OR ENGINEER PRIOR TO BACKFILLING.
23. ALL EXISTING VALVES SHOWN ON PLANS TO BE ABANDONED, SHALL HAVE BOXES REMOVED AND SHALL BE BACKFILLED ACCORDING TO SPECIFICATIONS. NO SEPARATE PAY ITEM.
24. CONTRACTOR SHALL CONTAIN ALL CONSTRUCTION AND STAGING WITHIN EXISTING UTILITY EASEMENTS, UNLESS OTHER ARRANGEMENTS ARE MADE WITH OWNER AND/OR TxDOT.
25. WHERE THE NEW WATER MAIN SHOWN ON THE PLANS REQUIRES CROSSING AN EXISTING WATER MAIN OR OTHER UTILITY, THE CONTRACTOR SHALL VERTICALLY DEFLECT THE PROPOSED WATER MAIN. DEFLECTION SHALL BE IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS. FITTINGS ARE NOT PERMISSIBLE, UNLESS OTHERWISE SHOWN ON THE PLANS. NO SEPARATE PAY ITEM.
26. WATER MAINS SHALL BE INSTALLED WITH 48" MINIMUM COVER OVER THE TOP OF THE PIPE AND A MAXIMUM DEPTH OF BURY OF 60", UNLESS OTHERWISE NOTED ON THE PLANS OR DIRECTED BY THE ENGINEER.
27. CONTRACTOR TO PROVIDE POSITIVE DRAINAGE AWAY FROM ALL CONCRETE FOUNDATIONS, VAULT BOXES AND OVERFLOW BOXES THROUGHOUT THE PROJECT SITE.
28. ALL GATE VALVES SHALL "OPEN RIGHT".
29. AN AIR RELEASE VALVE SHALL BE INSTALLED AT THE HIGHEST ELEVATION POINT(S) OF THE WATER DISTRIBUTION SYSTEM LOCATED WITHIN A DEVELOPMENT. THE EXACT LOCATION SHALL BE COORDINATED IN THE FIELD AND VERIFIED AGAINST THE FINAL GRADING PLAN. INSTALLATION SHALL BE IN ACCORDANCE WITH THE ECSUD STANDARDS AND THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE A VALVE BOX OR APPROVED ENCLOSURE FOR ACCESS AND MAINTENANCE.
30. A MINIMUM OF ONE (1) WATER SAMPLE STATION SHALL BE INSTALLED WITHIN A DEVELOPMENT TO ALLOW FOR ROUTINE WATER QUALITY MONITORING. THE SAMPLE STATION SHALL BE LOCATED NEAR THE SUBDIVISION ENTRANCE OFF A WATER MAIN IN A PUBLICLY ACCESSIBLE AREA, OR AT A REPRESENTATIVE LOCATION APPROVED BY ECSUD. THE STATION SHALL BE INSTALLED PER ECSUD STANDARDS, MANUFACTURER'S SPECIFICATIONS AND IN COMPLIANCE WITH ALL APPLICABLE HEALTH AND SAFETY REGULATIONS. COORDINATE FINAL LOCATION WITH ECSUD PRIOR TO INSTALLATION. ALL COMPONENTS SHALL BE SUITABLE FOR POTABLE WATER USE, AND THE STATION SHALL BE PROTECTED FROM FREEZING, TAMPERING, AND OTHER ENVIRONMENTAL FACTORS.
31. WHEN INSTALLING A CUT-IN TEE TO TIE INTO AN EXISTING WATER MAIN, MECHANICAL BELL JOINT RESTRAINTS SHALL BE PROVIDED ON ALL ADJACENT EXISTING PIPE JOINTS TO PREVENT SEPARATION DUE TO THRUST FORCES. RESTRAINTS SHALL BE INSTALLED ON A MINIMUM OF ONE FULL LENGTH OF PIPE ON EACH SIDE OF THE NEW TEE, OR AS REQUIRED BY ECSUD STANDARDS. ALL RESTRAINT DEVICES SHALL BE COMPATIBLE WITH THE EXISTING PIPE MATERIAL AND PRESSURE CLASS, AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. COORDINATE WITH ECSUD FOR FINAL APPROVAL OF RESTRAINT TYPE AND EXTENT.
32. ALL CONNECTIONS TO EXISTING WATER MAINS SHALL BE PERFORMED USING THE HIGH TEST HYPOCHLORITE (HTH) METHOD IN ACCORDANCE WITH AWWA C651 DISINFECTION PROCEDURES. THE HTH METHOD SHALL INVOLVE THE APPLICATION OF A CHLORINE SOLUTION DIRECTLY TO ALL INTERIOR SURFACES OF THE NEW FITTINGS, PIPE, AND APPURTENANCES IMMEDIATELY PRIOR TO INSTALLATION. THIS INCLUDES SWABBING OR SPRAYING WITH A MINIMUM 1% CHLORINE SOLUTION. NO OTHER DISINFECTION METHOD WILL BE ACCEPTED FOR TIE-INS. ALL WORK SHALL BE PERFORMED UNDER THE SUPERVISION OF ECSUD AND IN COMPLIANCE WITH THEIR STANDARDS. PROPER FLUSHING AND BACTERIOLOGICAL TESTING SHALL FOLLOW PRIOR TO PLACING THE MAIN INTO SERVICE.

**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-off 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.



**TESTING FOR PRESSURE PIPELINES**

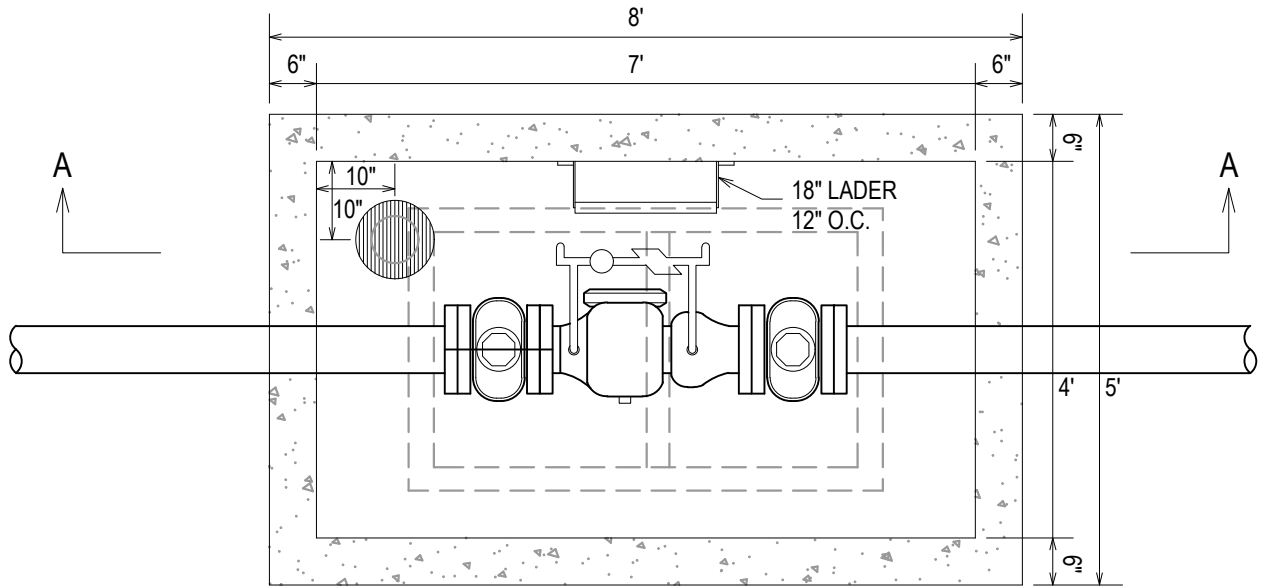
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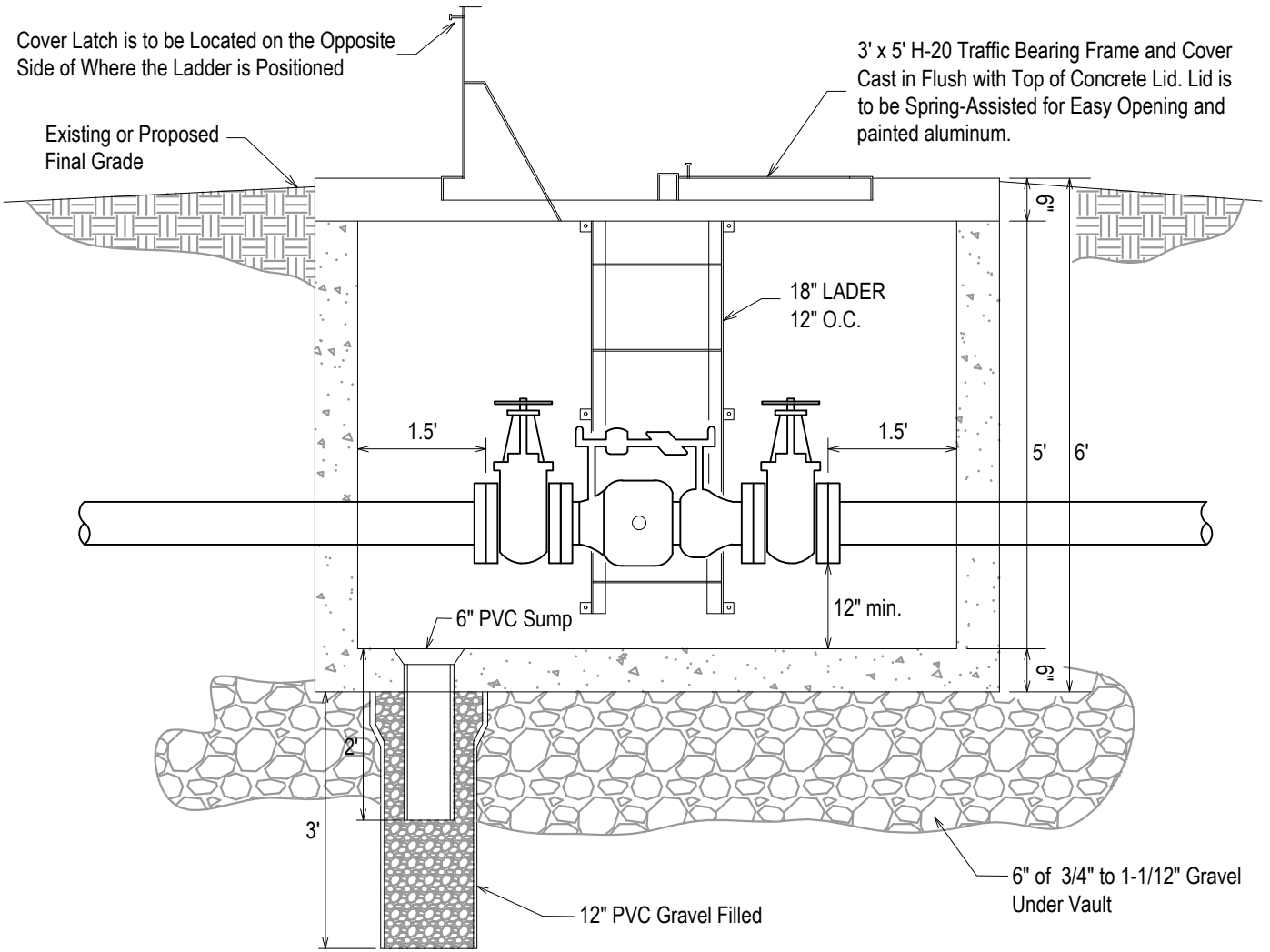
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**DET-100-Ø1**

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**PLAN**



**SECTION A-A**



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

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**DET-808-01**

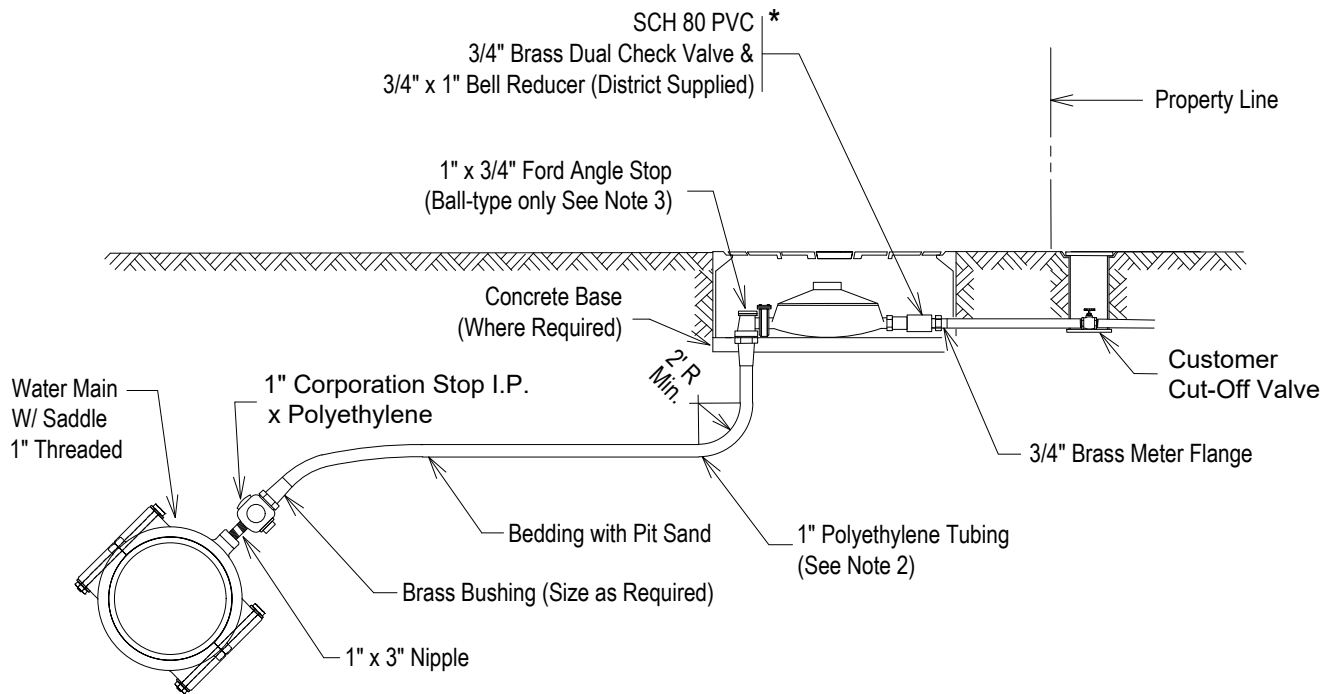
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1 OF 1

**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 37C
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)  
For Preferred Manufactures See Standard Specifications
6. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWWA Standards and Applied to Manufacturer Specifications.
7. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.

\* Tailpieces Supplied by  
ECSUD w/ Cost of Meter

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
10" A.C.	Tap With Service Saddle
10" C.I. or D.I.	Tap With Service Saddle
10" 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**



**1" SERVICE INSTALLATION  
TAPPING SCHEDULE**

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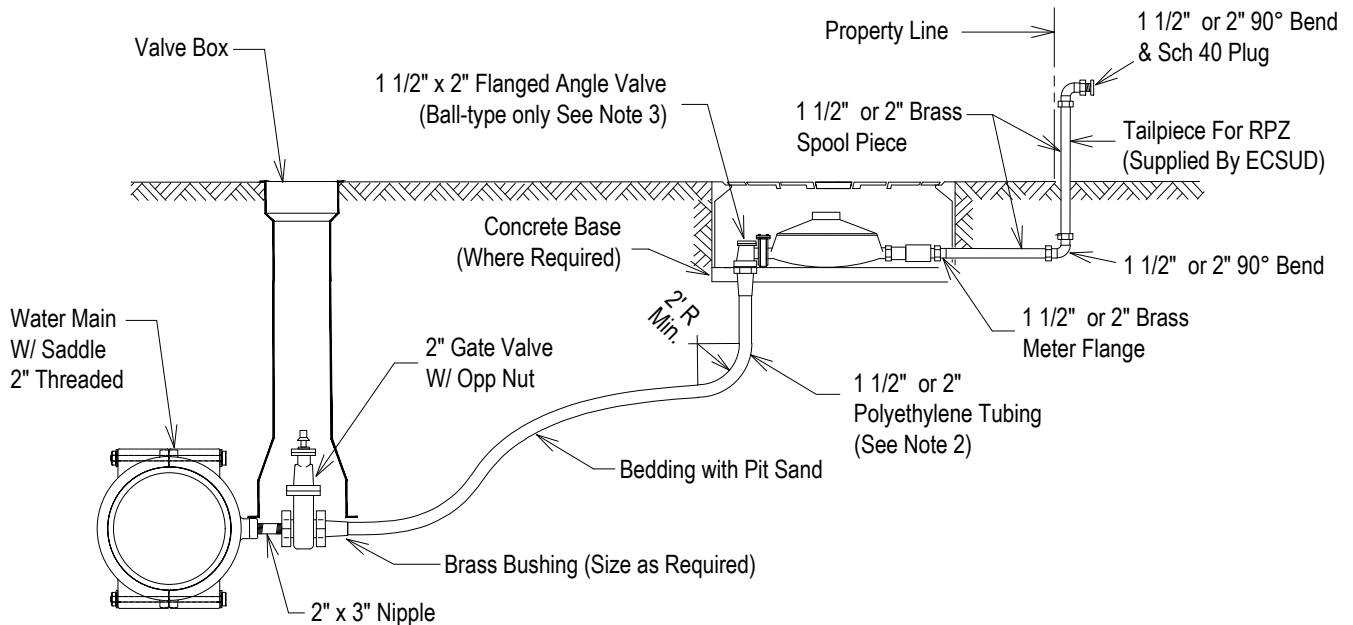
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1 OF 1

**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 65C
5. Tracer wire to be Installed and Taped in 8' Intervals from Main to Meter Box. See DET-828-01
6. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWWA Standards and Applied to Manufacturer Specifications.
7. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.

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**



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

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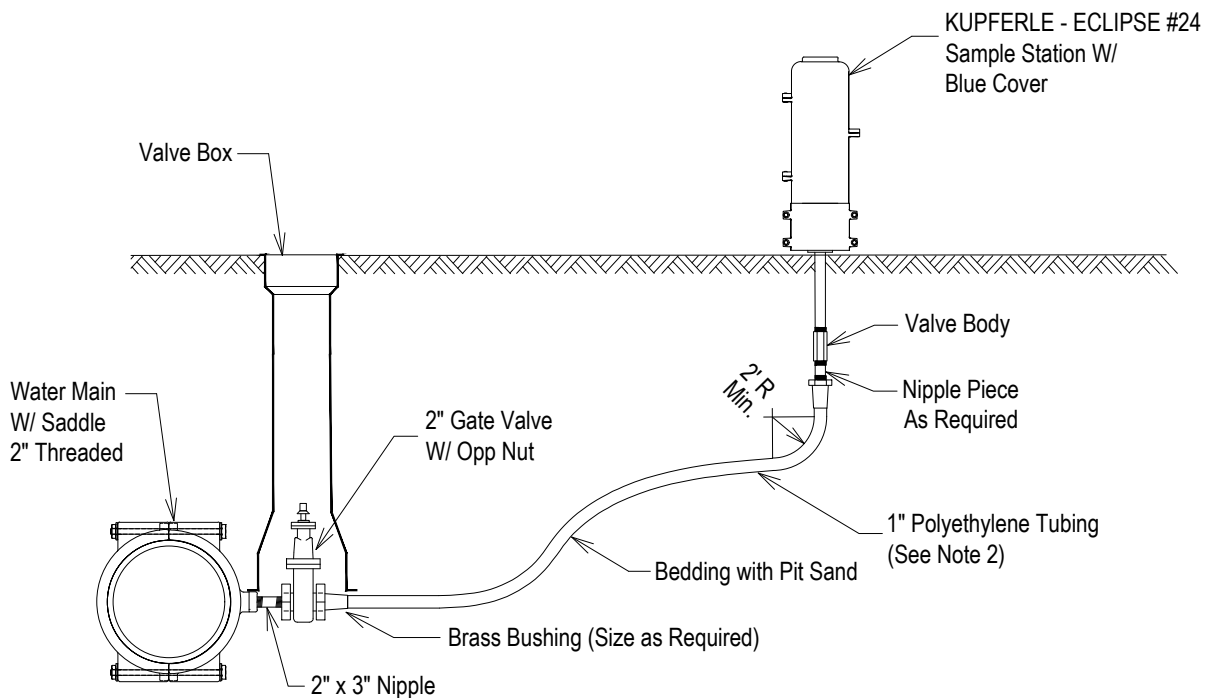
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SHEET  
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**NOTE:**

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 Preferred Manufactures See Standard Specifications
4. Tracer wire to be Installed and Taped in 8' Intervals from Main to Meter Box. See DET-828-01
5. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWWA Standards and Applied to Manufacturer Specifications.
6. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.

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
10" A.C.	Tap With Service Saddle
10" C.I. or D.I.	Tap With Service Saddle
10" 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**



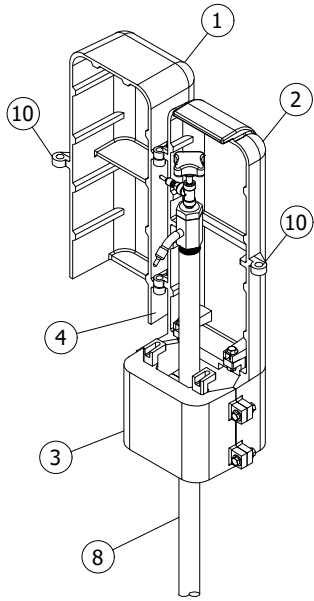
**1" SERVICE INSTALLATION  
TAPPING SCHEDULE  
FOR SAMPLE STATIONS ONLY**

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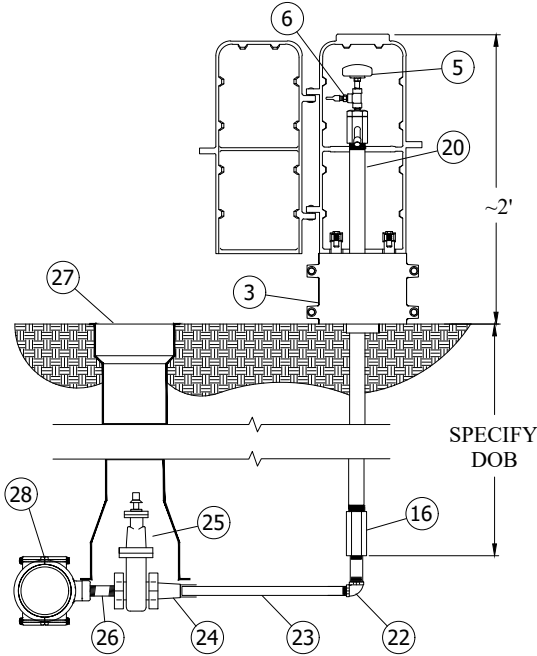
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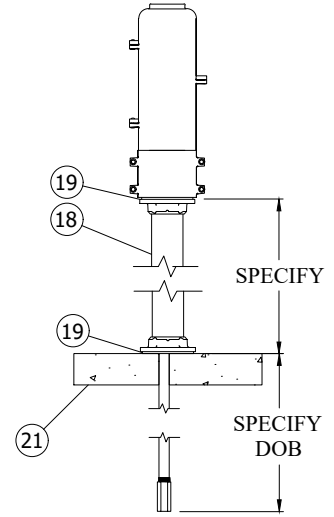
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1 OF 1



**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 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 underground 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.



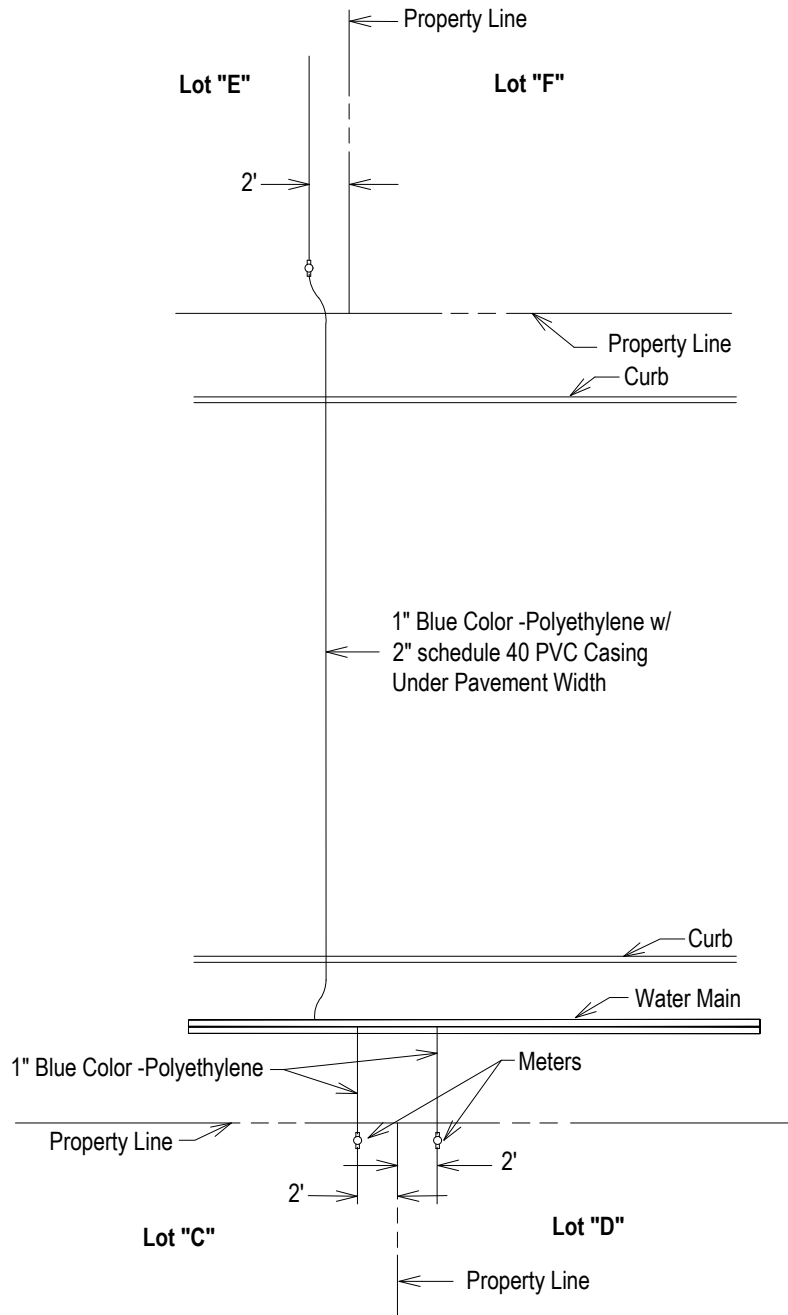
**#24 SAMPLING STATION  
SPEC SHEET**

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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 37C for Single Services
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)
6. All Service Lines to Meter Box shall be 1" Blue Polyethylene Pipe.

**SINGLE SERVICE LINE - SINGLE METER**



**TYPICAL SERVICE  
ARRANGEMENT**

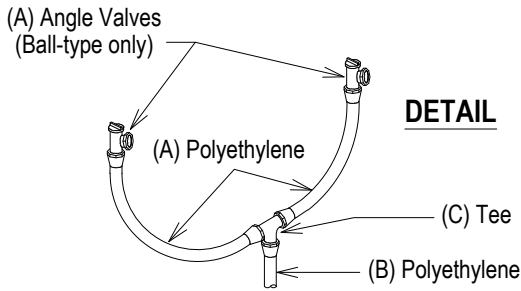
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**DET-824-05**

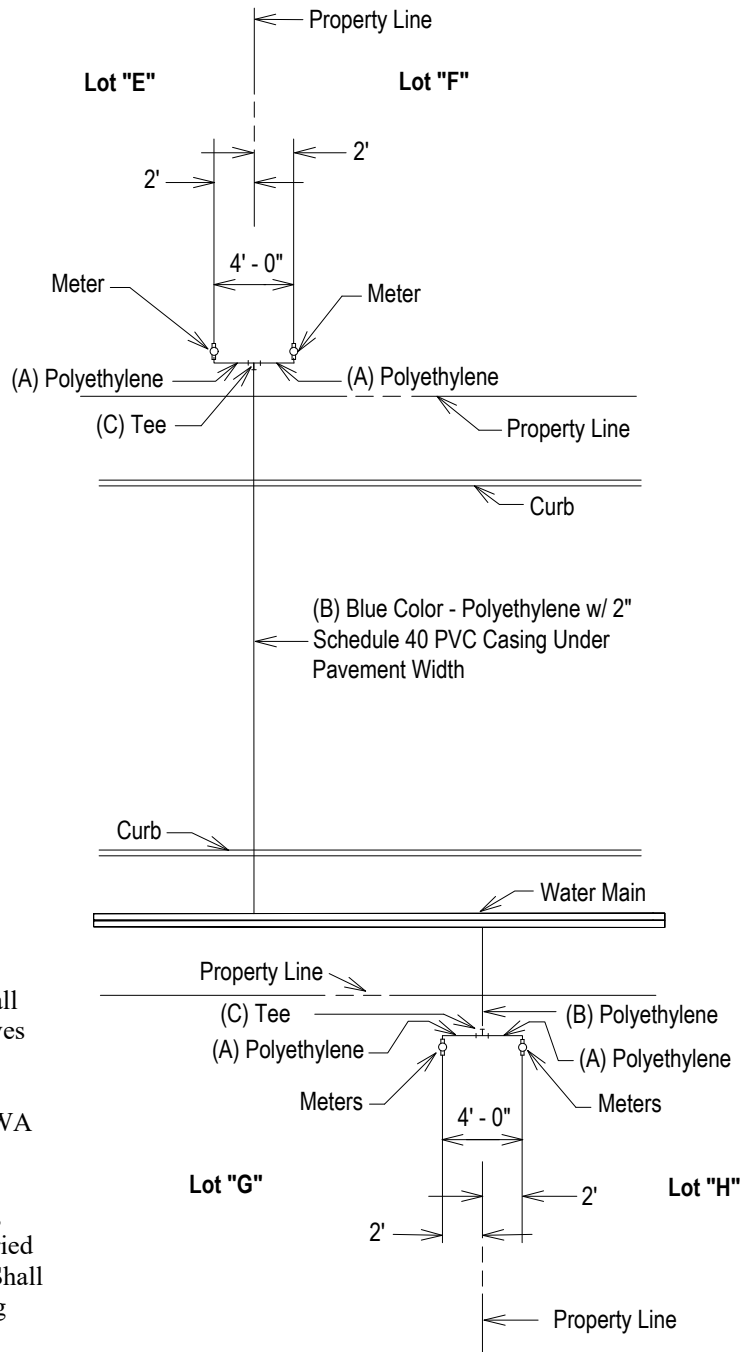
SHEET  
1 OF 4



Type of Service	A	B	C
1" Service 2 - 3/4" Meters	3/4"	1"	3/4"x3/4"x1"
1 1/2" Service 2 - 1" Meters	1"	1 1/2"	1" x 1" x 1 1/2"

**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 38C 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)
5. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWA Standards and Applied to Manufacturer Specifications.
6. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.



**SINGLE SERVICE LINE - DUAL METER**



**TYPICAL RURAL  
SERVICE ARRANGEMENT**

APPROVED

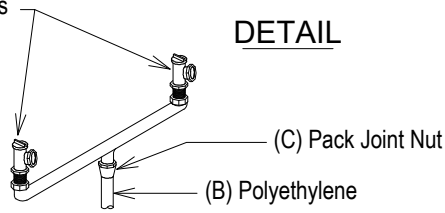
APRIL 2026

REVISED

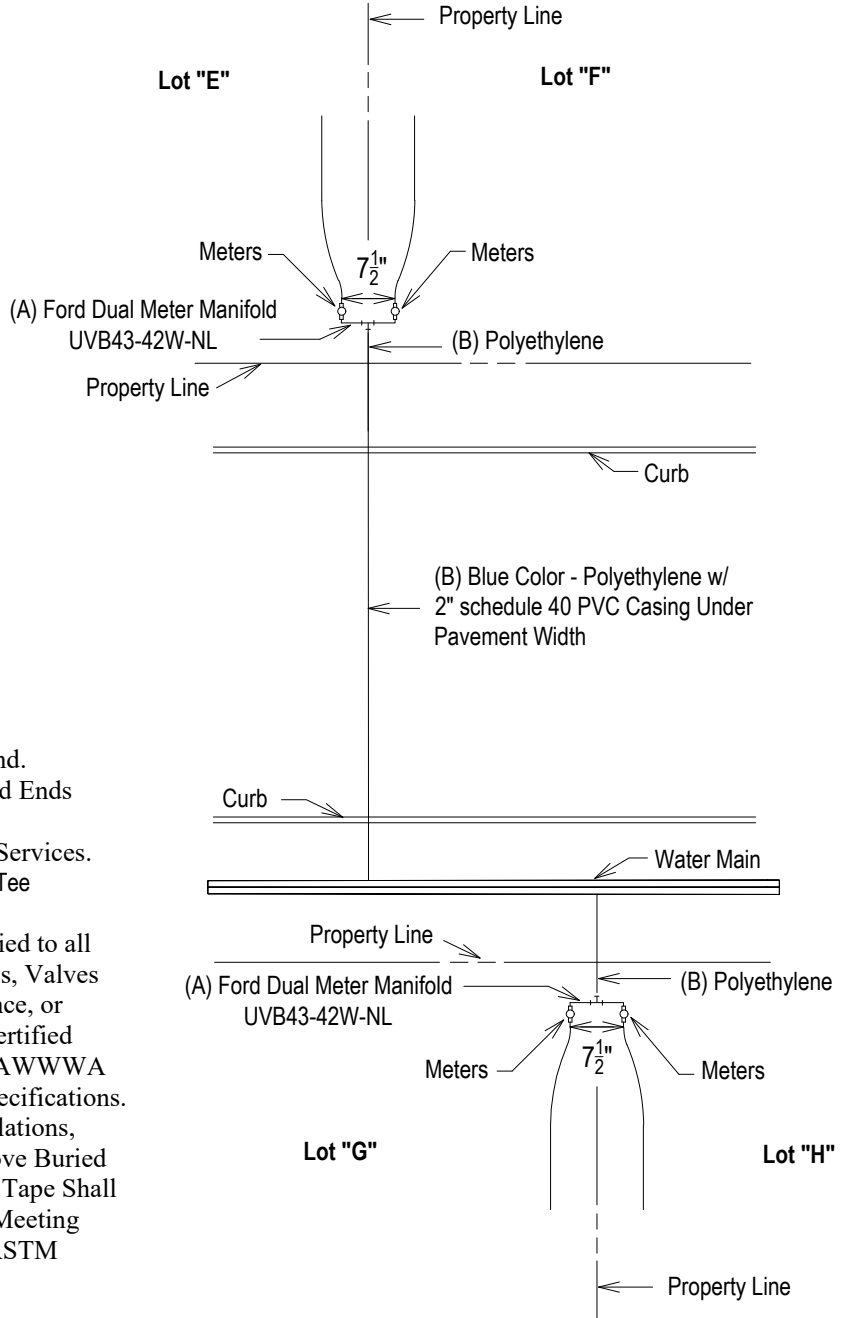
**DET-824-05**

SHEET  
2 OF 4

(A) Angle Ball Meter Valves With Saddle Nuts



(A) Ford Dual Meter Manifold UVB43-42W-NL



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

**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 38C for Dual Meter Services.
5. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)
5. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWWA Standards and Applied to Manufacturer Specifications.
6. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.

**SINGLE SERVICE LINE - DUAL METER**



**TYPICAL HIGH DENSITY RESIDENTIAL SERVICE ARRANGEMENT**

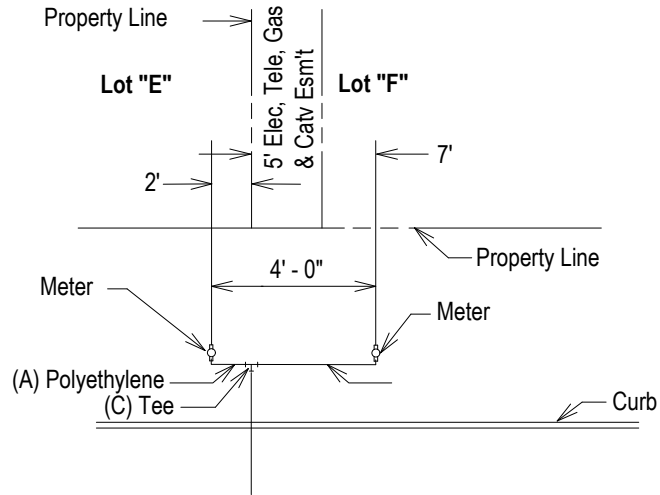
APPROVED

APRIL 2026

REVISED

**DET-824-05**

SHEET  
3 OF 4



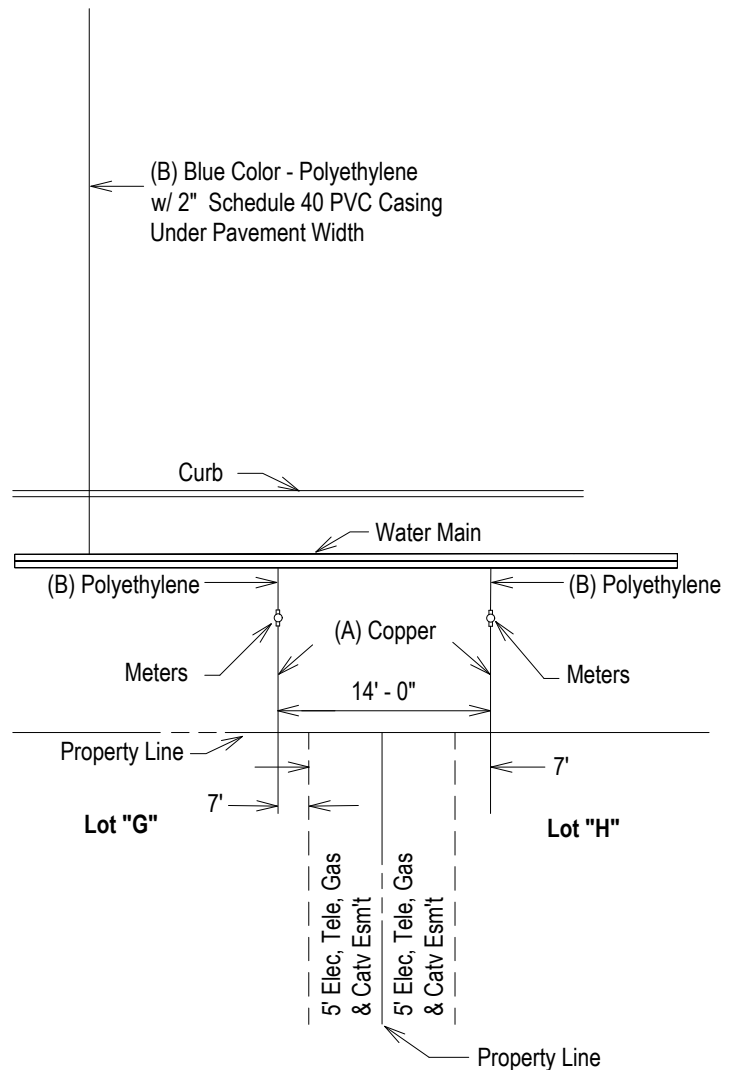
**SINGLE SERVICE LINE - DUAL METER W/ EASEMENT**

Type of Service	A	B	C
1" Service 2 - 3/4" Meters	3/4"	1"	3/4"x3/4"x1"
1 1/2" Service 2 - 1" Meters	1"	1 1/2"	1" x 1" x 1 1/2"

(B) Blue Color - Polyethylene  
w/ 2" Schedule 40 PVC Casing  
Under Pavement Width

**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 37C For Single Meter Services.
5. Use Meter Box DFW 38C for Dual Meter Services.
6. 2" HDPE Main Will Use FORD 2" CT's x 1" FIPT Tee (T441-774NL)
5. Copper Coat/Copper Anti-seize to be Applied to all Threaded Connections, Bolts, Nuts, Flanges, Valves and Fittings During Installation, Maintenance, or Repairs. Product Shall be NSF/ANSI 61 Certified Adhering to Latest TCEQ Guidelines and AWWA Standards and Applied to Manufacturer Specifications.
6. Burial Tape to be Used in all Trench Installations, Positioned Continuously 12-24 Inches Above Buried Water Mains, Service Lines and Hydrants. Tape Shall be Color-Coded (Blue for Potable Water) Meeting American Public Works Association and ASTM Standards for Durability.



**SINGLE SERVICE LINE W/ EASEMENT**



**TYPICAL  
SERVICE ARRANGEMENT**

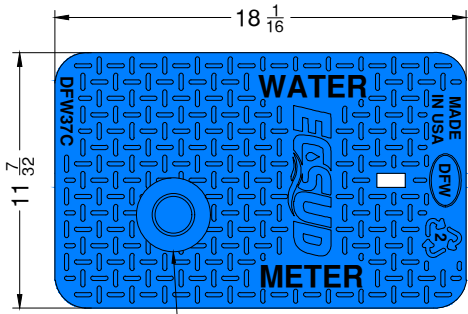
APPROVED

APRIL 2026

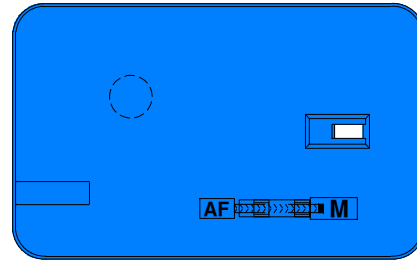
REVISED

**DET-824-05**

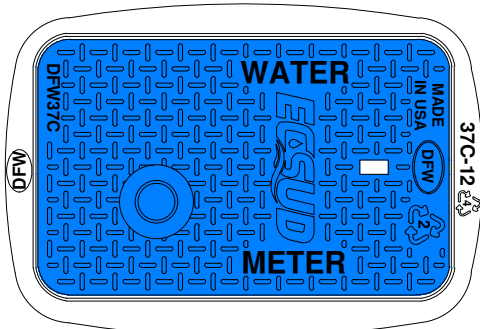
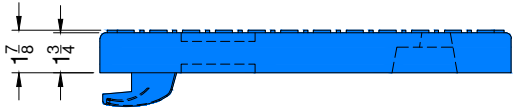
SHEET  
4 OF 4



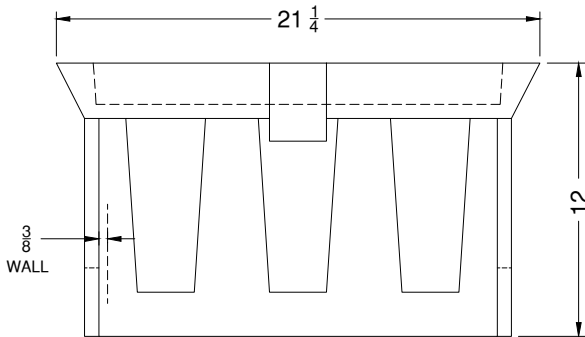
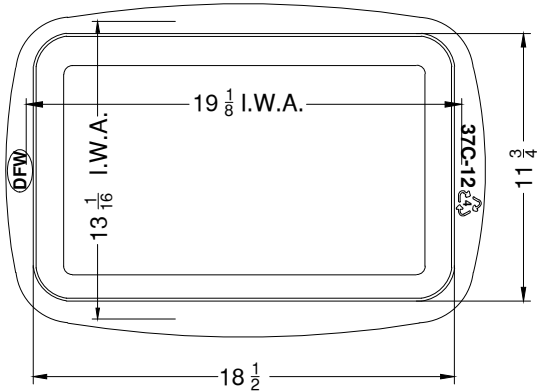
Ø1 1/16 x 0.63 RECESS WITH  
Ø1 7/8 KNOCKOUT FOR SENSUS ENDPOINT



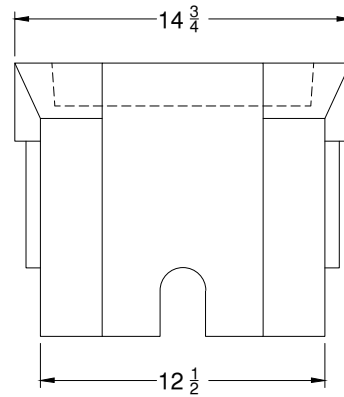
**DFW37C-AF3MF 63D ECS-LID**



**DFW37C-12-AF3MF 63D ECS**



**DFW37C-12-BODY**



**DFW37C-12-AF3MF 63D ECS**



**NOTE:**

1. DIM'S ± 1/8" U.N.O.
2. LID MATERIAL: ANTI-FLOAT
3. BODY MATERIAL: LLDPE
4. WALL THICKNESS: 3/8" MINIMUM
5. I.W.A = INSIDE WORK AREA

BODY KEY	
12	12" DEEP BOX

LID KEY	
AF	ANTI FLOAT MATERIAL
3	BLUE COLOR
M	MAGNET
F	KNOCKOUT HOLE
63D	SENSUS RECESS
ECS	EAST CENTRAL SUD



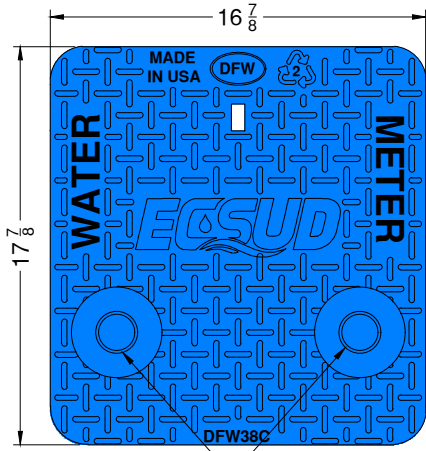
**TYPICAL  
SINGLE SERVICE METER BOX  
1" METER AND BELOW**

APPROVED  
APRIL 2026

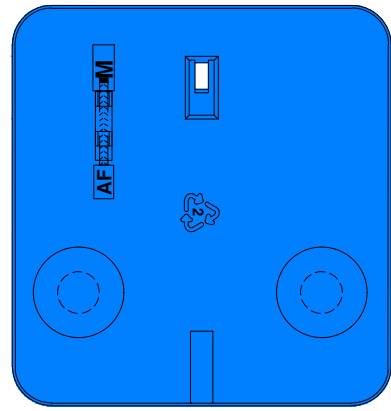
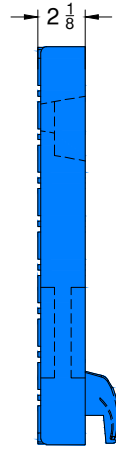
REVISED

**DET-824-Ø6**

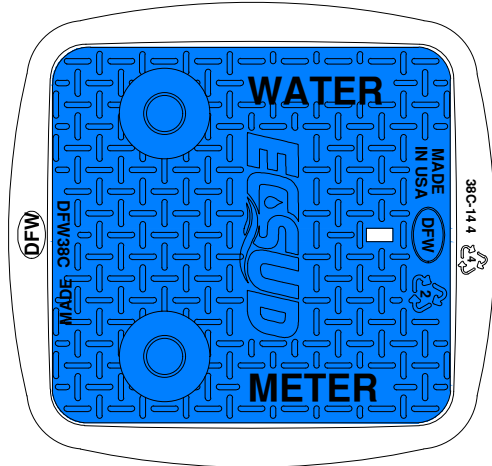
SHEET  
1 OF 4



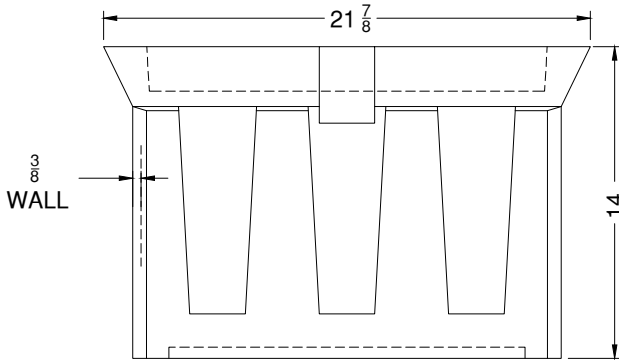
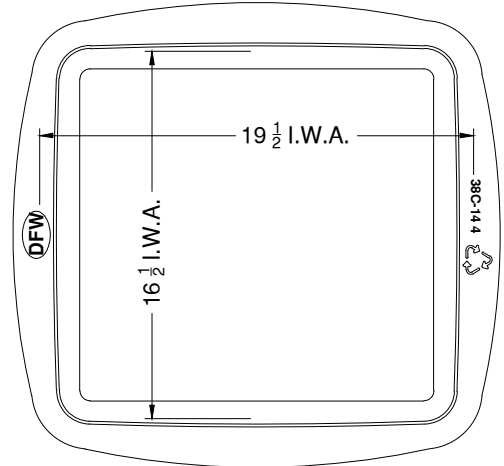
Ø1 1/16 x 0.63 RECESS WITH  
Ø1 1/8 KNOCKOUT FOR SENSUS ENDPOINT



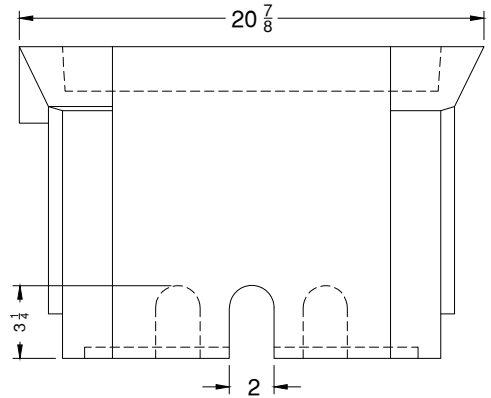
**DFW38C-AF3MF 63D ECS-LID**



**DFW38C-14-AF3MF 63D ECS**



**DFW38C-14-BODY**



**DFW38C-14-AF3MF 63D ECS**

**DFW**  
**DFW PLASTICS, INC.**  
PO Box 648, Bedford, TX 76095  
817.439.3600  
www.dfwplasticsinc.com



**NOTE:**

1. DIM'S ± 1/8" U.N.O.
2. LID MATERIAL: ANTI-FLOAT
3. BODY MATERIAL: LLDPE
4. WALL THICKNESS: 3/8" MINIMUM
5. I.W.A = INSIDE WORK AREA

BODY KEY	
14	14" DEEP BOX

LID KEY	
AF	ANTI FLOAT MATERIAL
3	BLUE COLOR
M	MAGNET
F	KNOCKOUT HOLE
63D	SENSUS RECESS
ECS	EAST CENTRAL SUD



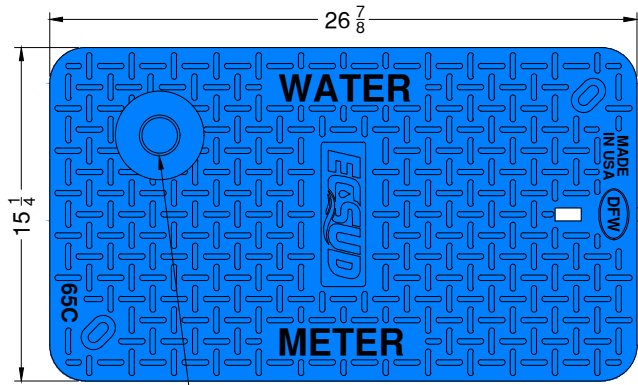
**TYPICAL  
DUAL SERVICE METER BOX  
1" METER AND BELOW**

APPROVED  
APRIL 2026

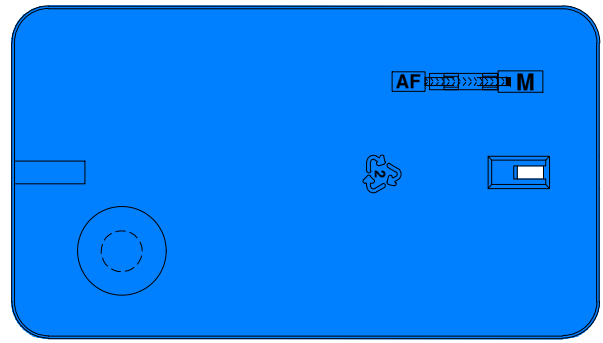
REVISED

**DET-824-Ø6**

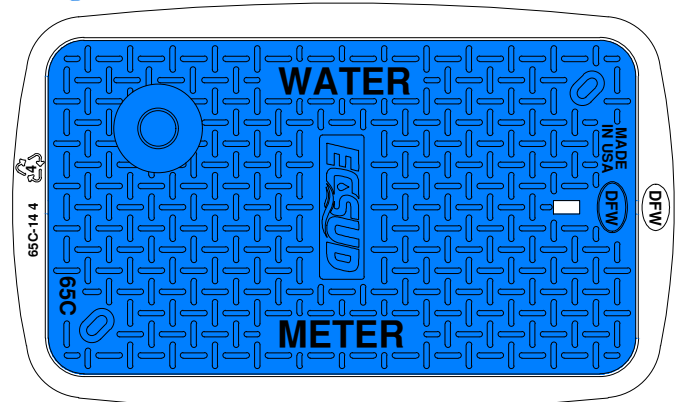
SHEET  
2 OF 4



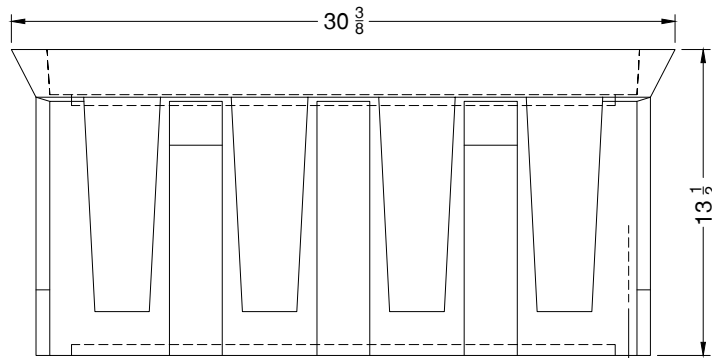
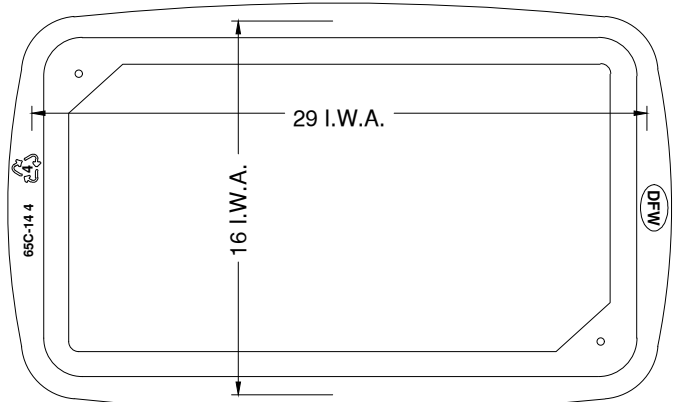
04-116" x 0.63" RECESS WITH  
Ø1-5/8" KNOCKOUT FOR SENSUS ENDPOINT



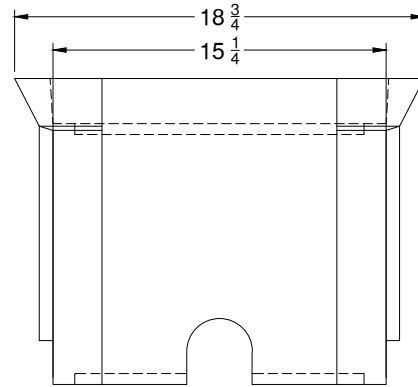
**DFW65C-AF3MF 63D ECS-LID**



**DFW65C-14-AF3MF 63D ECS**



**DFW65C-14-BODY**



**DFW65C-14-AF3MF 63D ECS**

**NOTE:**

1. DIM'S ± 1/8" U.N.O.
2. LID MATERIAL: ANTI-FLOAT
3. BODY MATERIAL: LLDPE
4. WALL THICKNESS: 3/8" MINIMUM
5. I.W.A = INSIDE WORK AREA



BODY KEY	
14	14" DEEP BOX

LID KEY	
AF	ANTI FLOAT MATERIAL
3	BLUE COLOR
M	MAGNET
F	KNOCKOUT HOLE
63D	SENSUS RECESS
ECS	EAST CENTRAL SUD



**SINGLE SERVICE METER BOX  
1-1/2" THRU 2"**

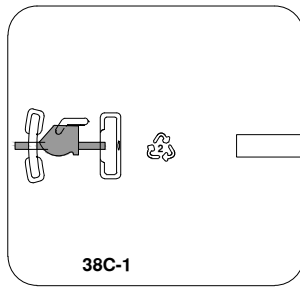
APPROVED

APRIL 2026

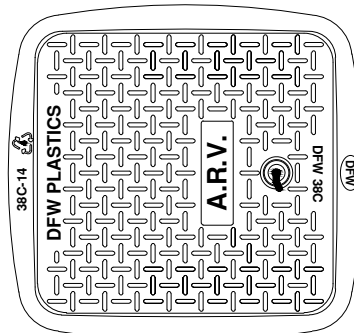
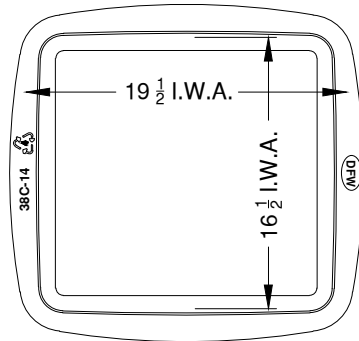
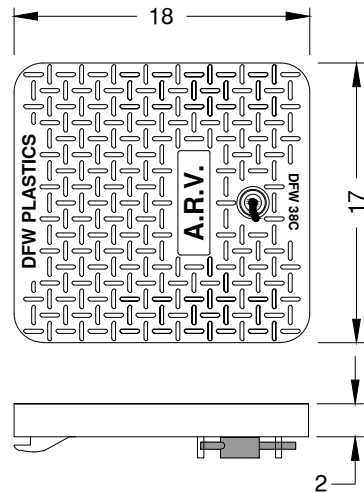
REVISED

**DET-824-Ø6**

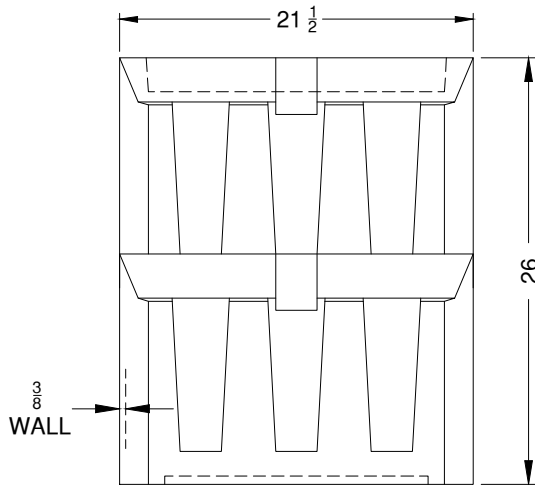
SHEET  
3 OF 4



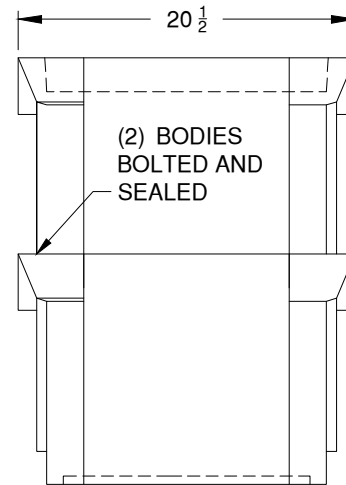
**DFW38CNP-AF1MS ARV-LID**



**DFW38CNP-J26-AF1MS ARV**



**DFW38CNP-J26-BODY**



**DFW38CNP-J26-AF1MS ARV**

**DFW38CNP-J26-AF1MS ARV**

**NOTE:**

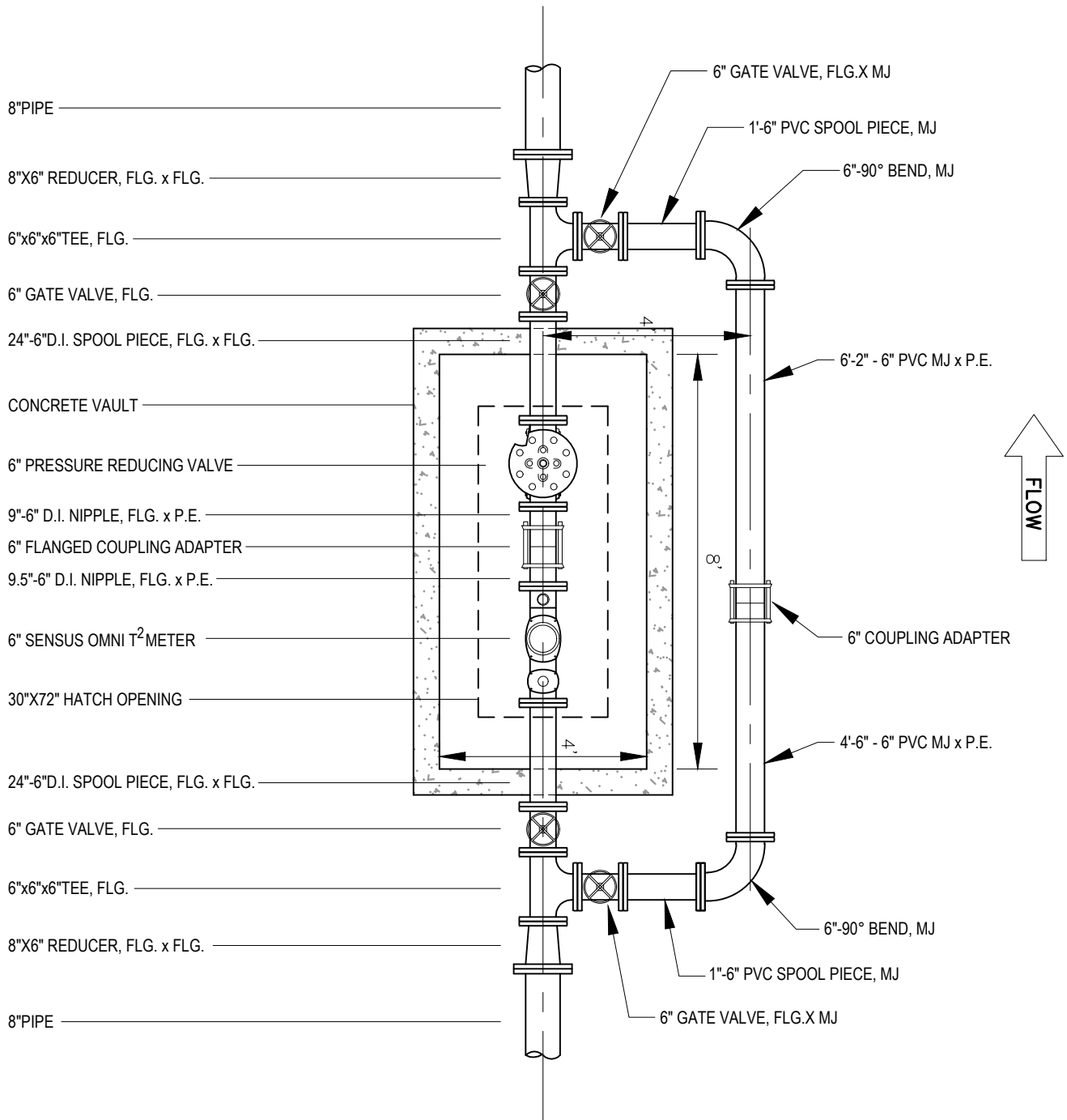
1. DIM'S ± 1/8" U.N.O.
2. LID MATERIAL: HDPE
3. BODY MATERIAL: LLDPE
4. WALL THICKNESS: 3/8" MINIMUM
5. I.W.A = INSIDE WORK AREA

BODY KEY	
C	STANDARD WALL - 3/8"
NP	NO PIPE SLOTS
J26	JOINED ASSEMBLY

LID KEY	
AF	ANTI FLOAT MATERIAL
1	BLACK COLOR
M	MAGNET
S	SECURITY BRASS LOCK
ARV	AIR RELEASE VALVE

**DFW PLASTICS, INC.**

PO Box 648, Bedford, TX 76095  
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SCALE:1"=3'



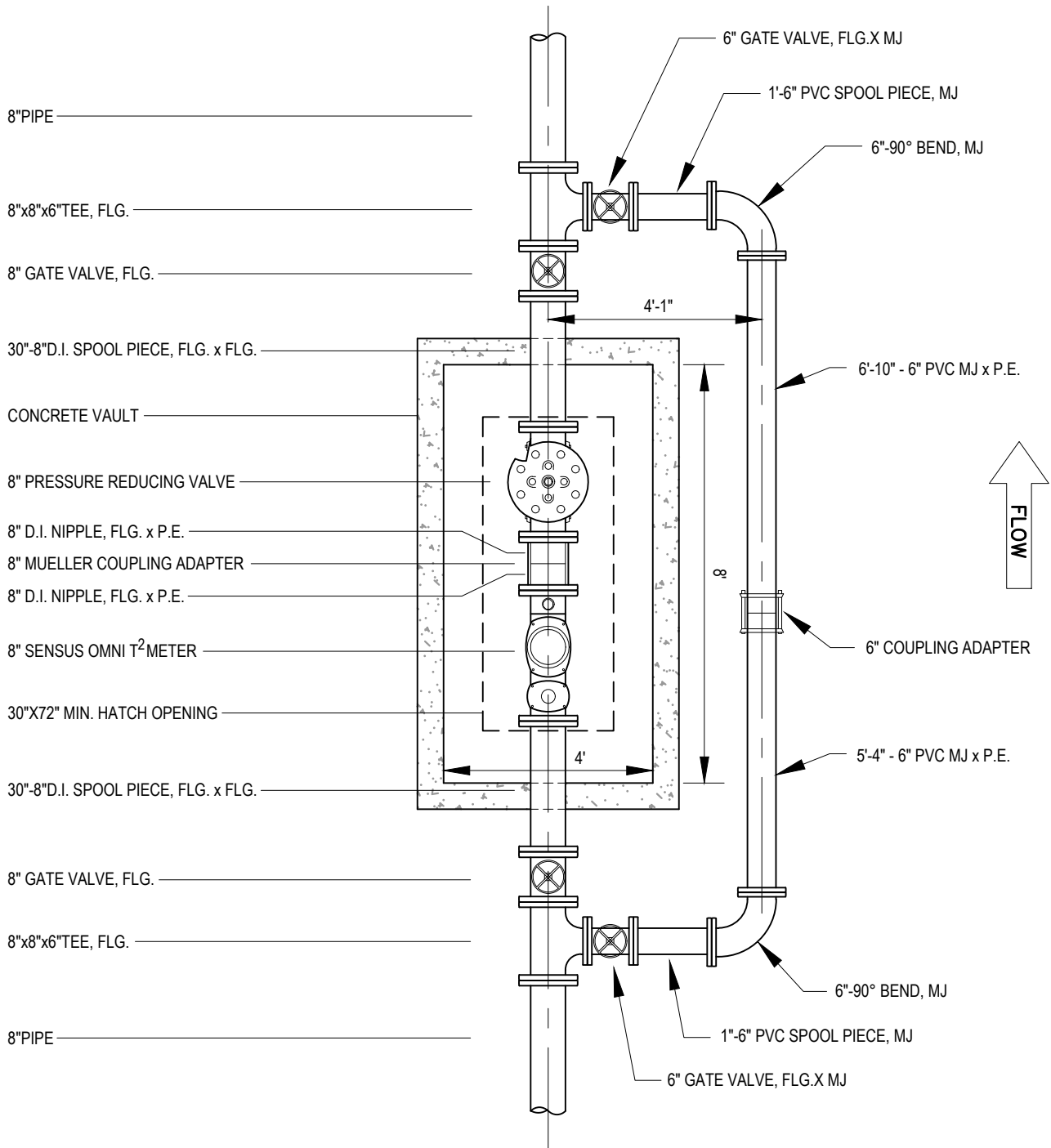
**6" TURBO METER DETAIL  
WITH 4'x8' CONCRETE VAULT BOX**

APPROVED  
APRIL 2026

REVISED

**DET-825-01**

SHEET  
1 OF 1



SCALE:1"=3'



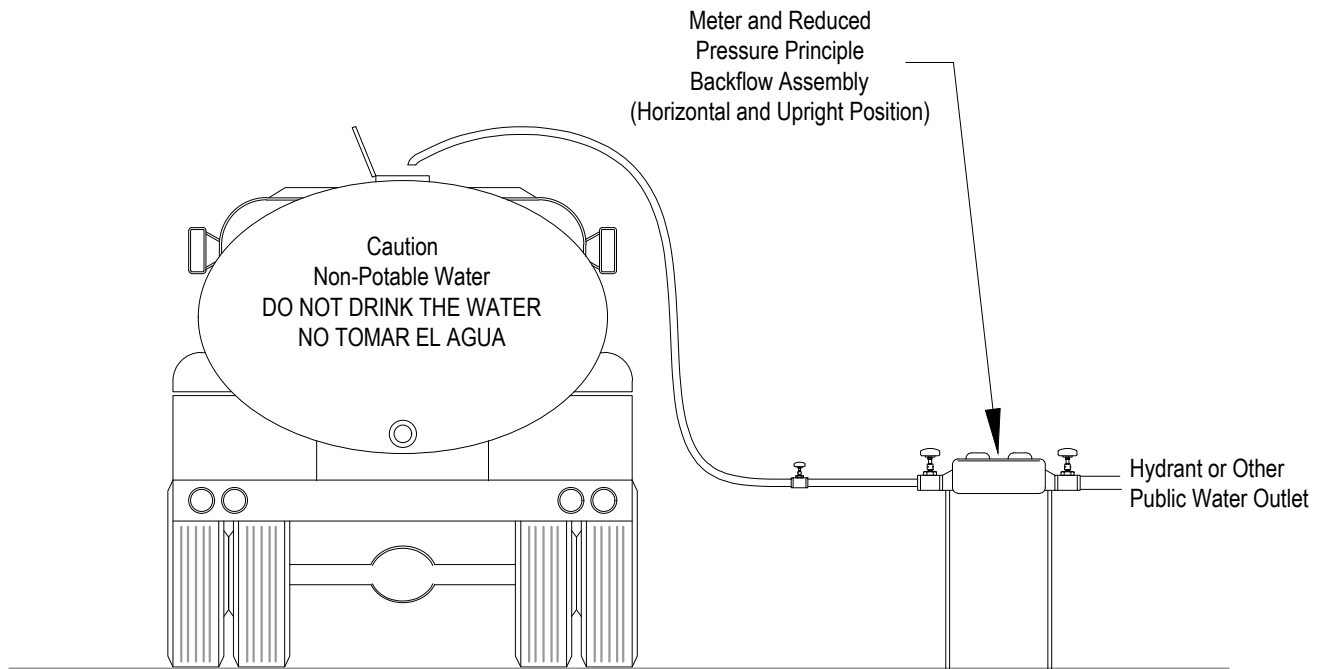
**8" TURBO METER DETAIL  
WITH 4'x8' CONCRETE VAULT BOX**

APPROVED  
APRIL 2026

REVISED

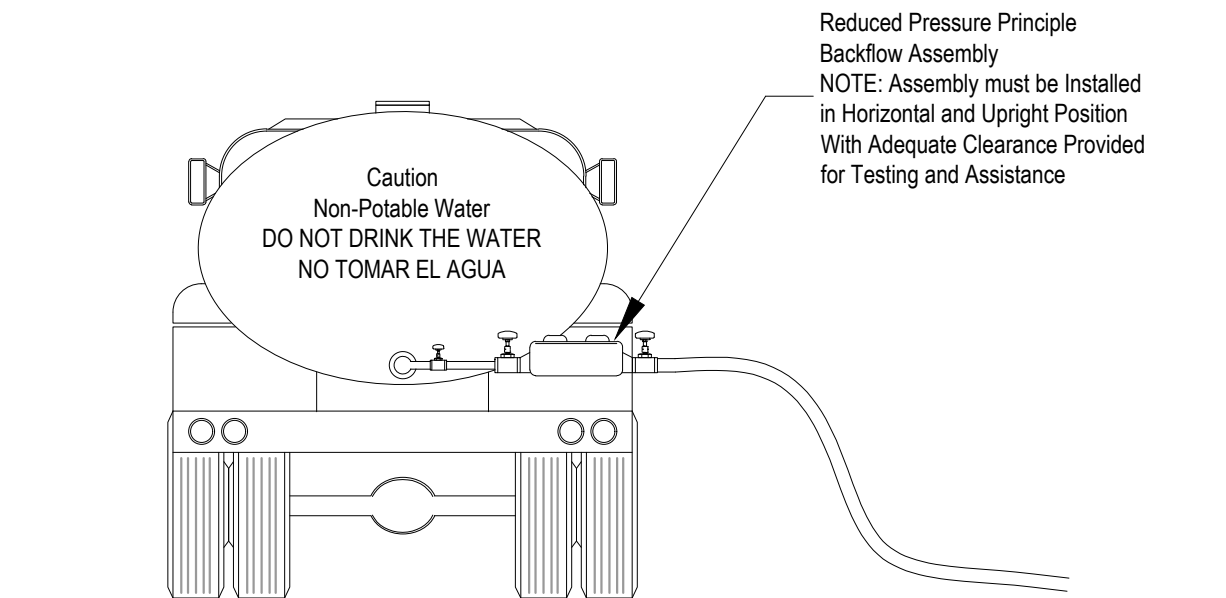
**DET-825-02**

SHEET  
1 OF 1



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

**METHOD 1**



**METHOD 2**

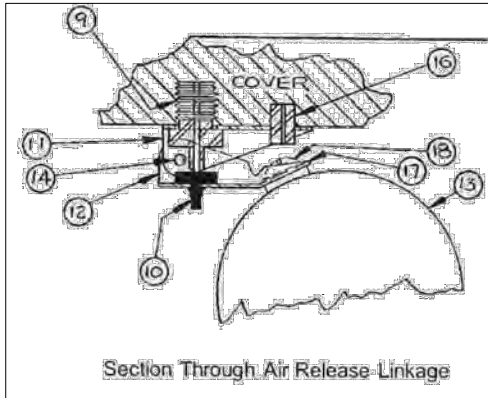
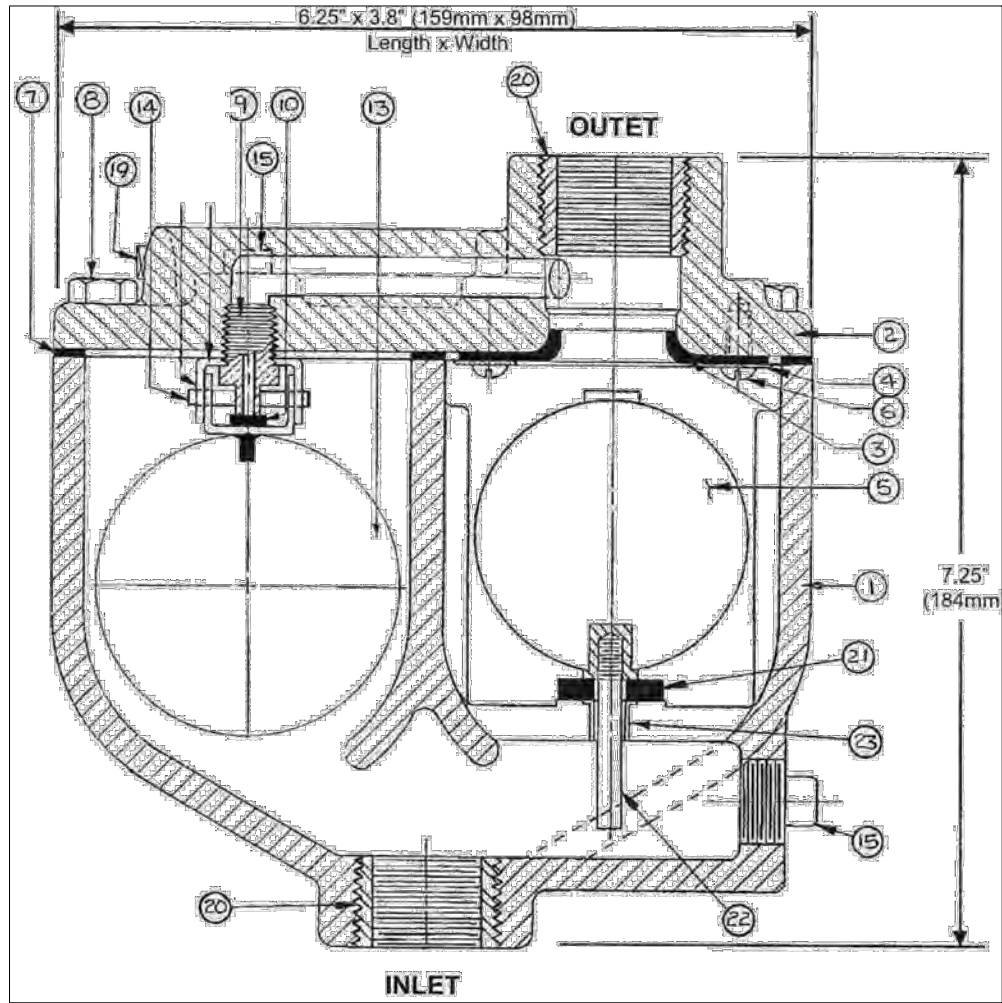


FIGURE 945 COMBINATION AIR VALVES ARE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA C512

FIGURE NUMBER	SIZE (INLET & OUTLET)	AIR RELEASE ORIFICE	MAX WORKING PRESSURE	WEIGHT
945-H	$\frac{1}{2}$ \"/>			

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



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

APPROVED

APRIL 2026

REVISED

**DET-827-01**

SHEET  
1 OF 1

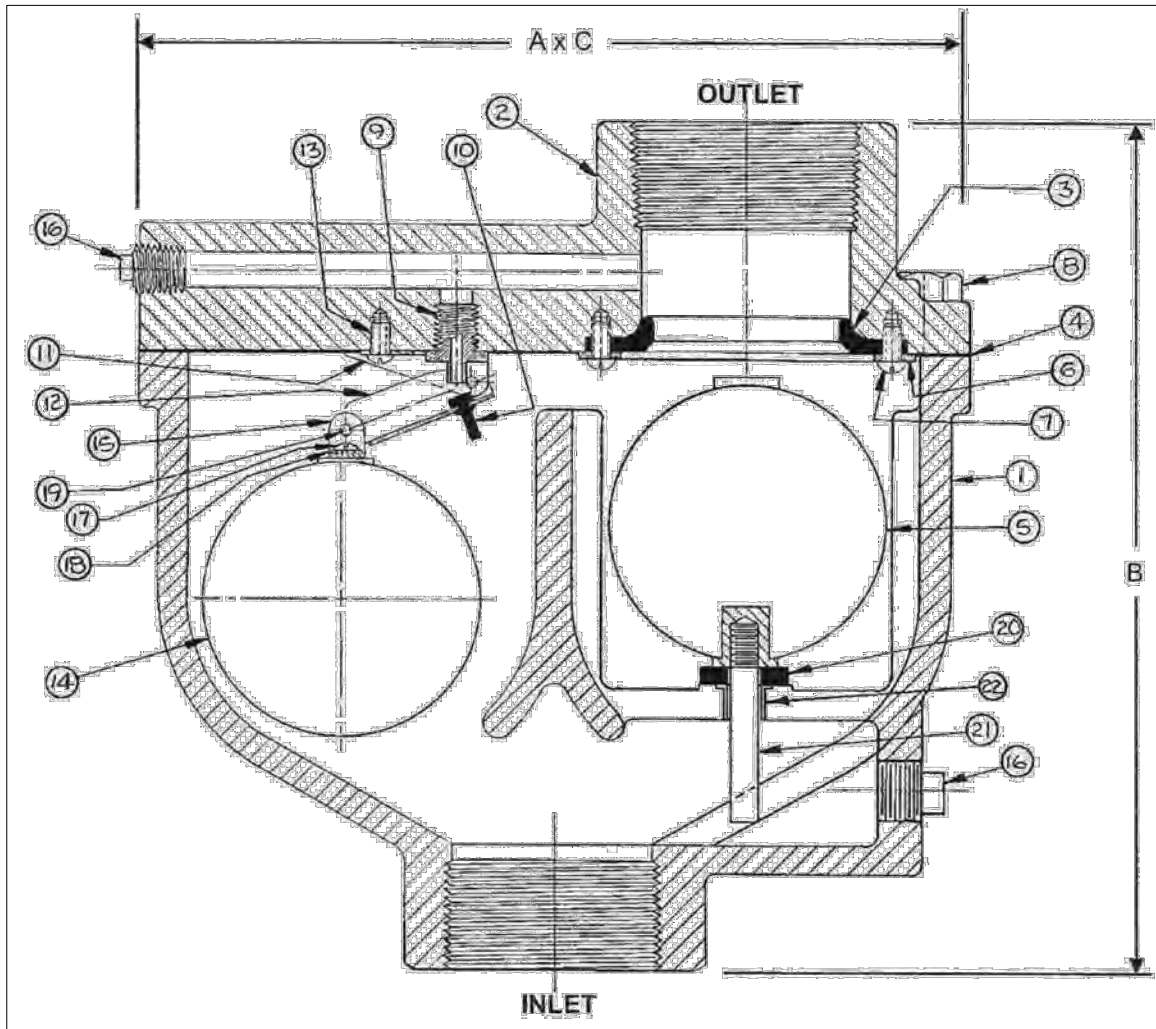


FIGURE 945 COMBINATION AIR VALVES ARE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA C512

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)

**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



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

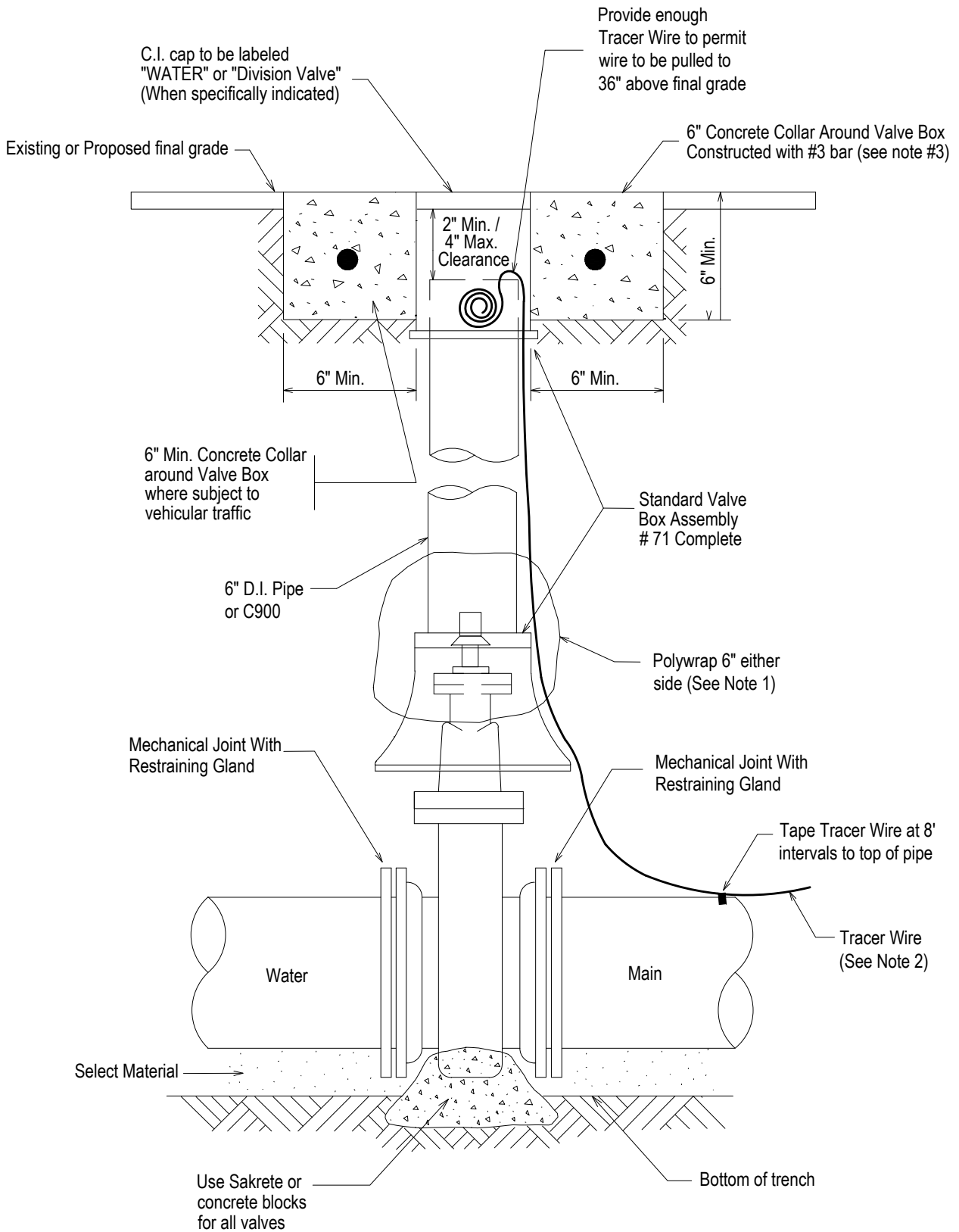
APPROVED

APRIL 2026

REVISED

**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.



**INSTALLATION OF NON-GEARED  
GATE VALVE WITH VALVE BOX  
AND EXTENSION**

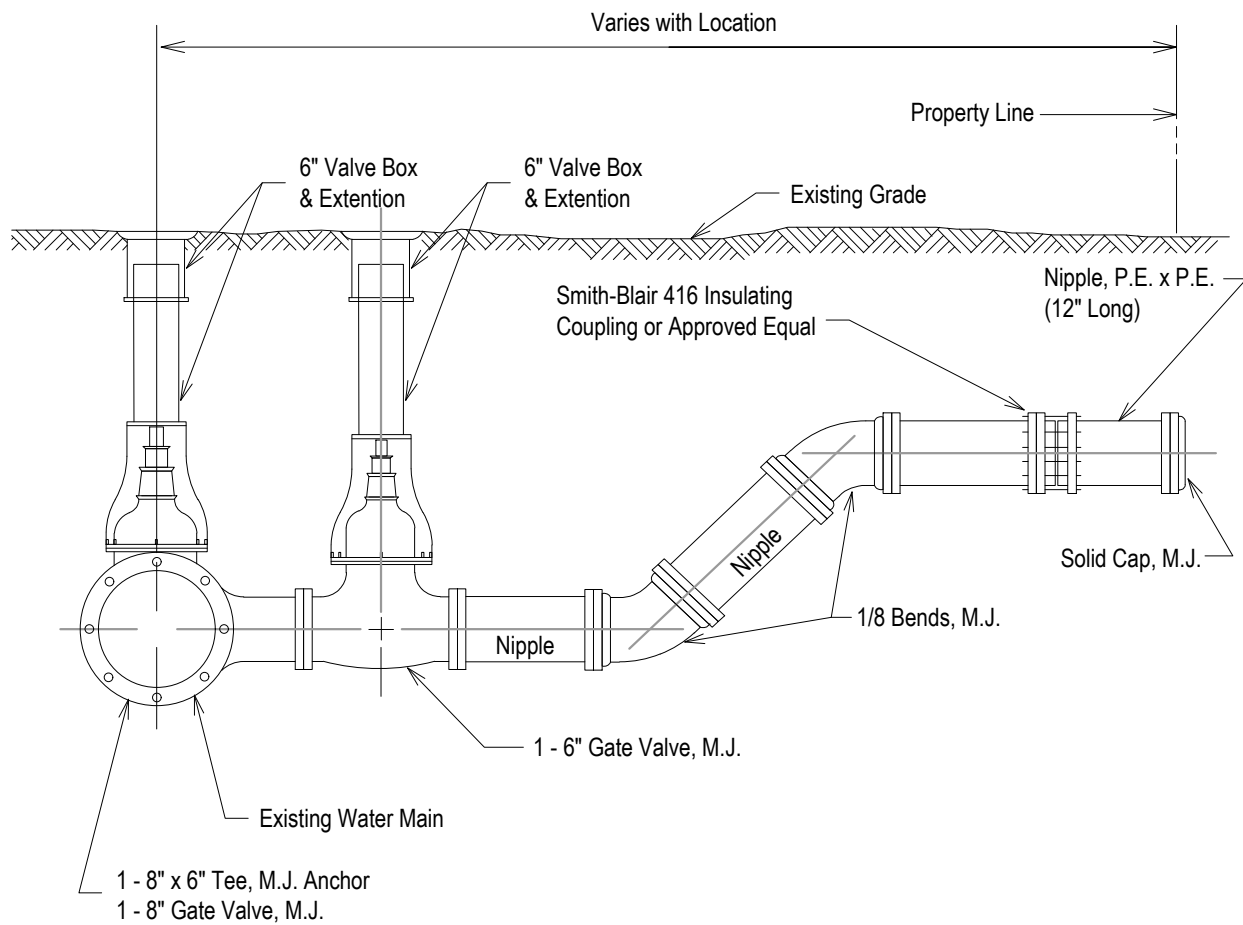
APPROVED

APRIL 2026

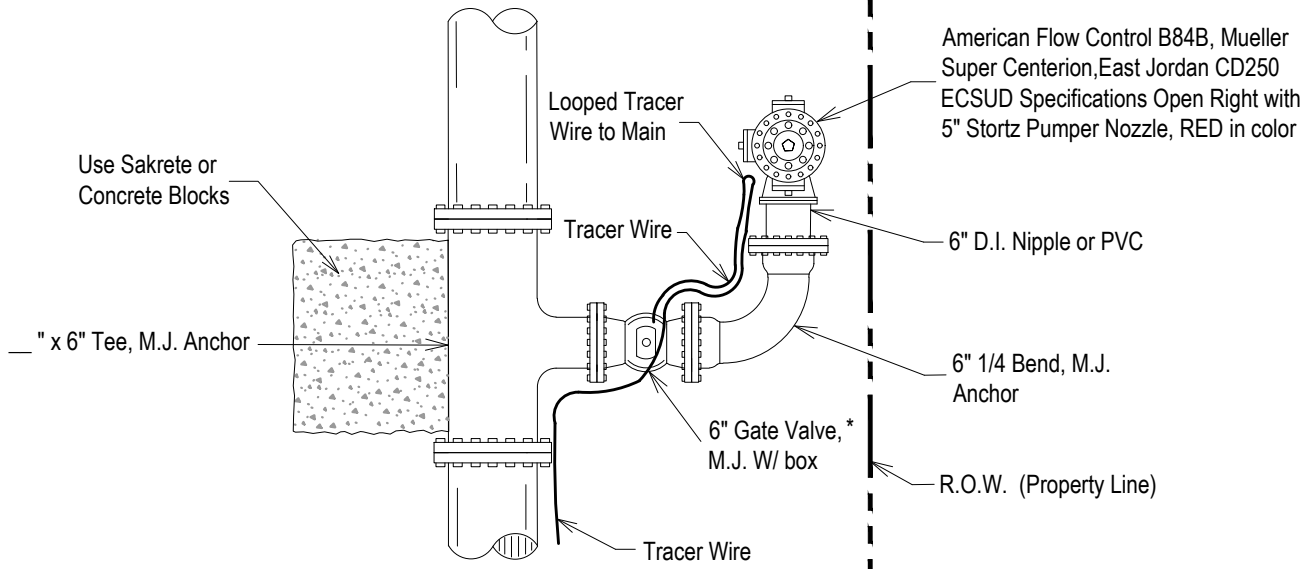
REVISED

**DET-828-01**

SHEET  
1 OF 1



\* Resilient Seat



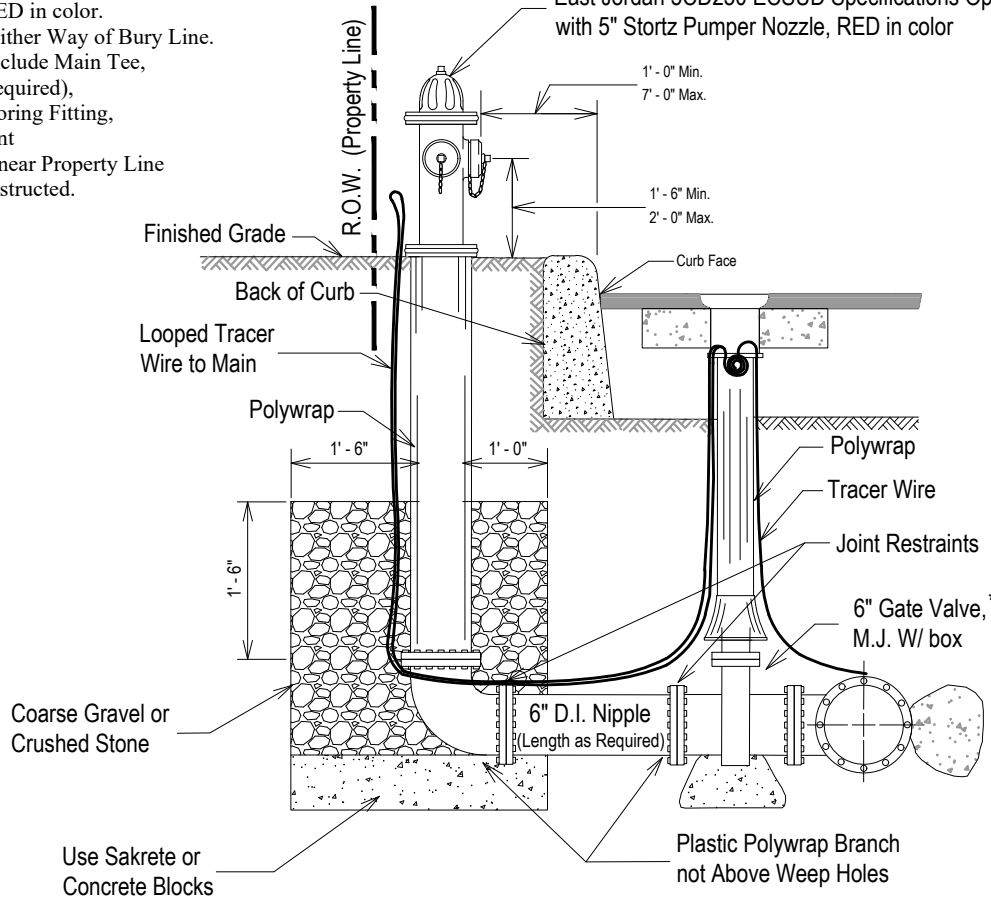
**PREFERRED INSTALLATION**

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 Assembly to Include Main Tee, 2 - D.I. Nipples (Length as Required), Anchoring Coupling or Anchoring Fitting, 6" - 90° Bend and Fire Hydrant
8. Fire Hydrant Shall be Placed near Property Line Unless other wise noted or Instructed.

American Flow Control B84B, Mueller Super Centerion, East Jordan 5CD250 ECSUD Specifications Open Right with 5" Stortz Pumper Nozzle, RED in color



**ALTERNATE INSTALLATION**

Profile shown, without Horizontal Bend



**FIRE HYDRANT  
INSTALLATION**

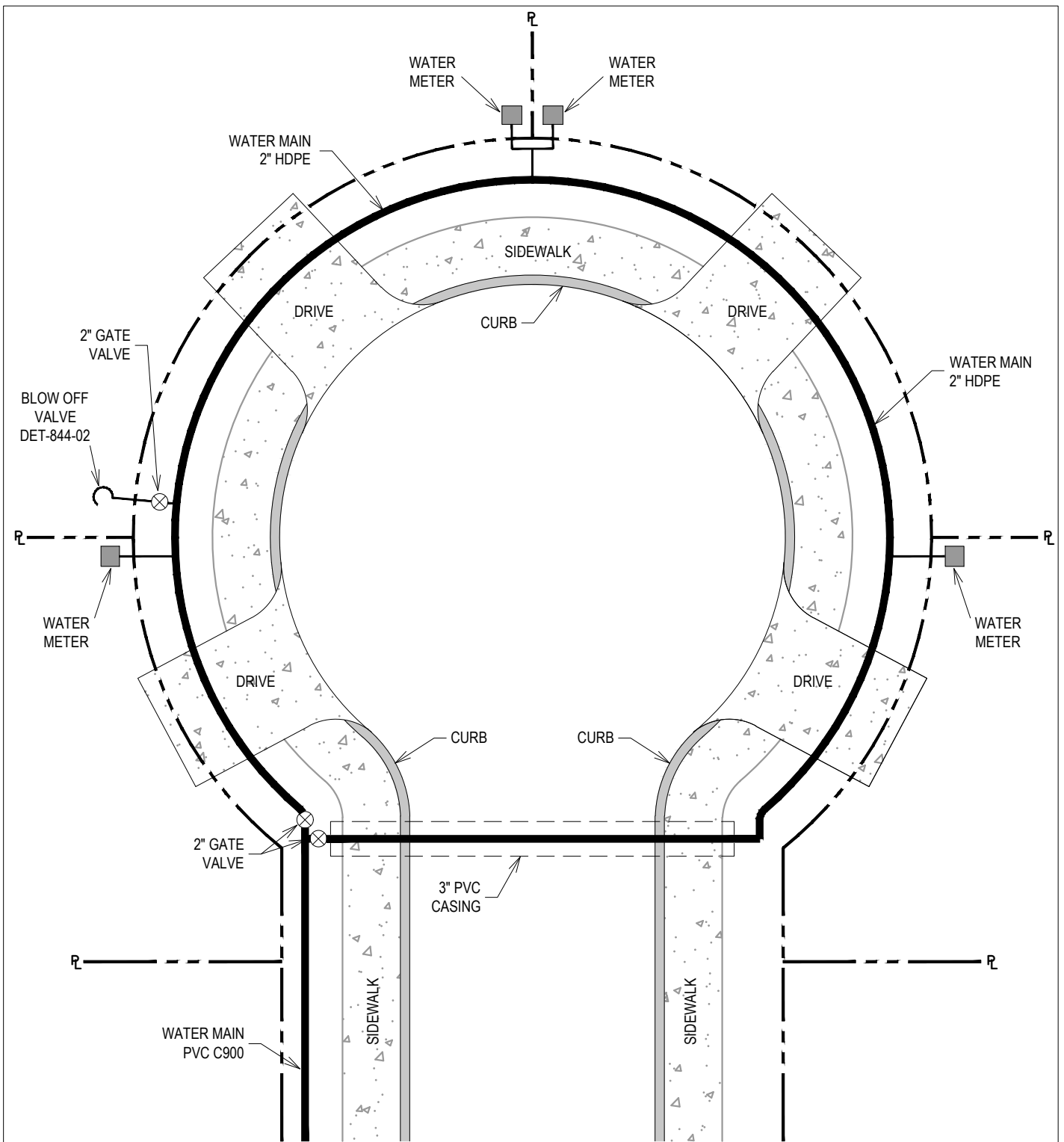
APPROVED

APRIL 2026

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**DET-834-01**

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



TYPICAL CUL-DE-SAC LAYOUT  
WITH 2" HDPE WATER LINE

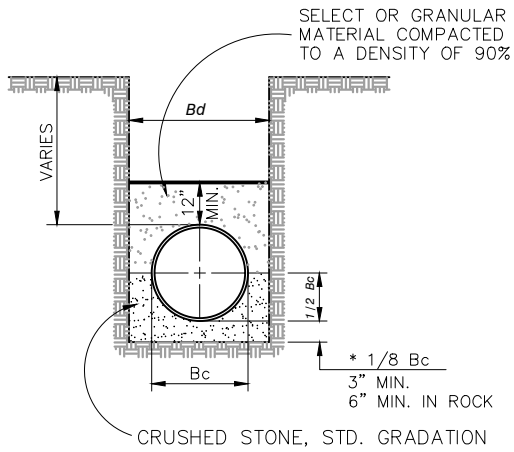
APPROVED

APRIL 2026

REVISED

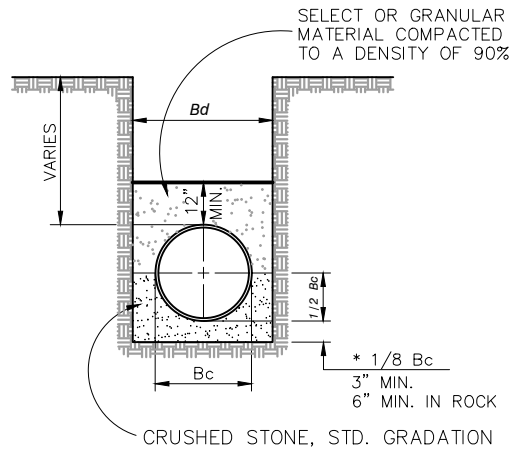
**DET-835-01**

SHEET  
1 OF 1



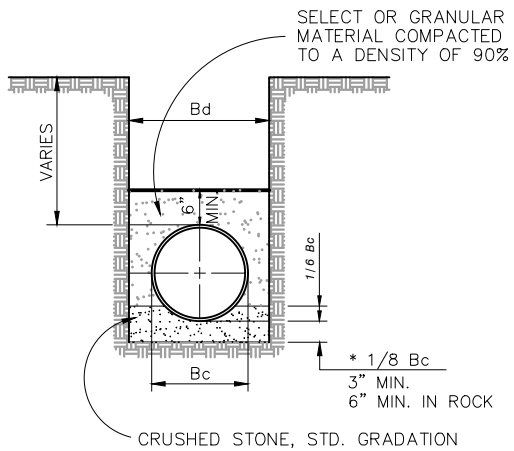
**CLASS "B"**

BEDDING ANGLE 150°, L.F. 1.9, E'=700



**CLASS "B+"**

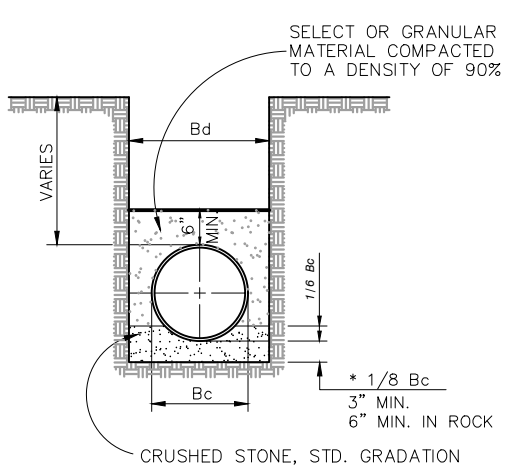
BEDDING ANGLE 150°, L.F. 1.9, E'=700



**CLASS "C"**

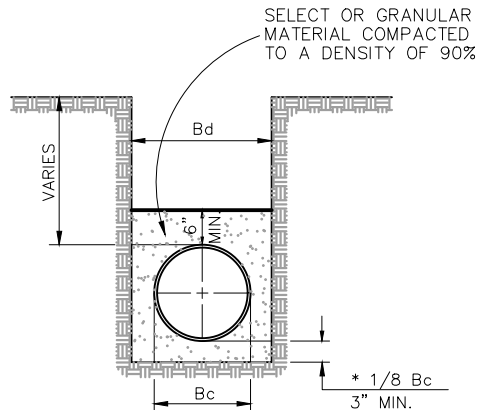
BEDDING ANGLE 75°, L.F. 1.5, E'=300

EMBEDMENT FOR WATER CONDUITS						
TYPE OF PIPE	IN EARTH			IN ROCK		
	0' - 8'	8' - 16'	>16'	0' - 8'	8' - 16'	>16'
ALL PVC WATER PIPE	C+	B+	B+	C+	B+	B+
16" & SMALLER DUCTILE IRON WATER PIPE	D+	C	B	C	C	B
18" & LARGER DUCTILE IRON WATER PIPE	B	B	B	B	B	B



**CLASS "C+"**

BEDDING ANGLE 75°, L.F. 1.5, E'=300



**CLASS "D+"**

BEDDING ANGLE 30°, L.F. 1.3, E'=200

EMBEDMENT DIMENSIONS			
PIPE DIAMETER (INCHES)	KIND OF PIPE	EXTERNAL DIAMETER Bc (INCHES)	TRENCH WIDTH Bd (INCHES)
6"	PVC	6.90	24
6"	DI	6.90	24
8"	PVC	9.05	25
8"	DI	9.05	25
10"	PVC	11.10	27
10"	DI	11.10	27
12"	PVC	13.20	29
12"	DI	13.20	29
16"	DI	17.40	33
18"	DI	19.50	36
20"	DI	21.60	38



**EMBEDMENT DETAILS**

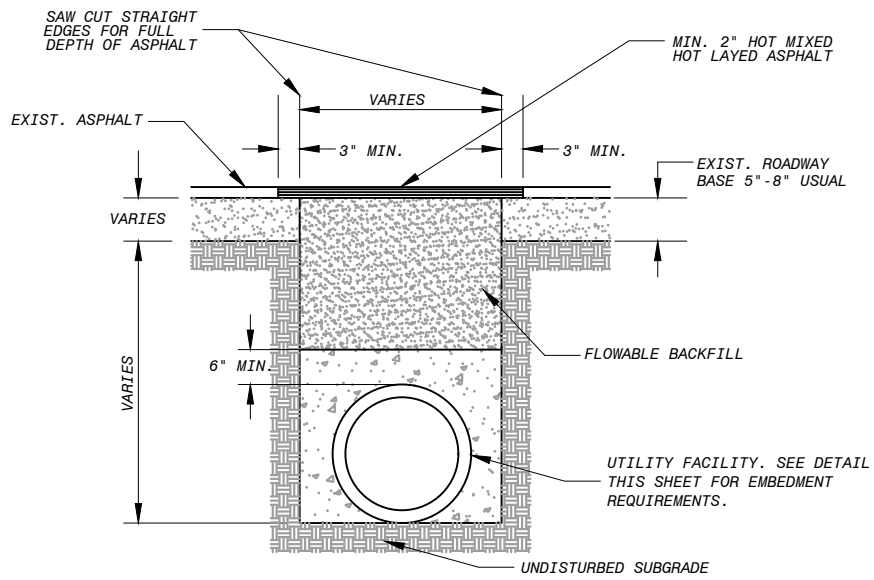
APPROVED

APRIL 2026

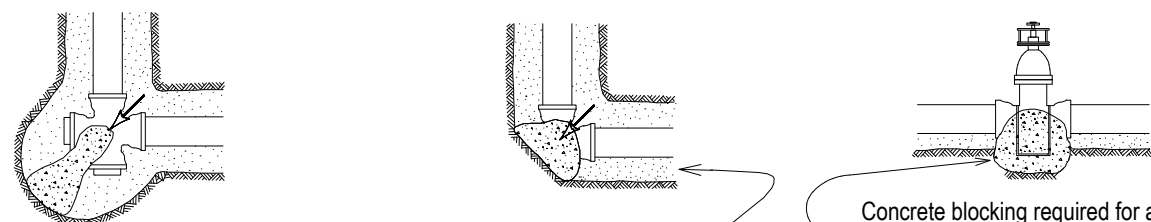
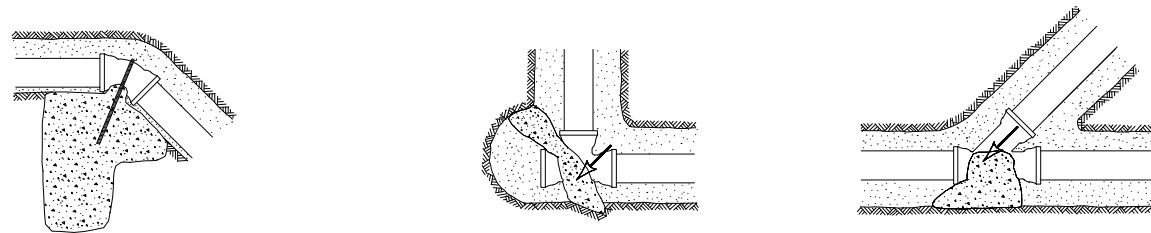
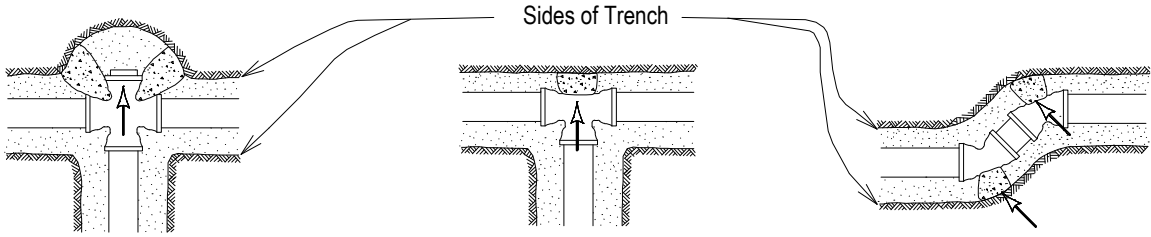
REVISED

**DET-837-01**

SHEET  
1 OF 1

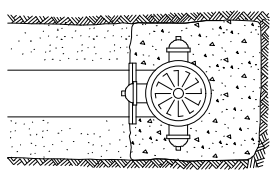


- NOTE:
1. All Fittings Shall be Mega Lug
  2. Dry Bags of Sakrete Shall be Placed as Thrust Blocking.



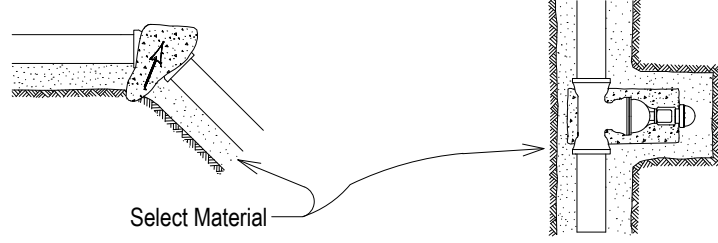
Concrete blocking required for all 12" & larger, except in high pressure distribution system where blocking is required for all valves

Select Material



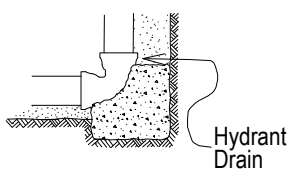
**PLAN**

Pour base after Hydrant has been placed

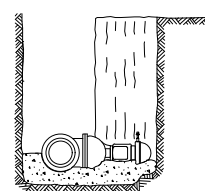
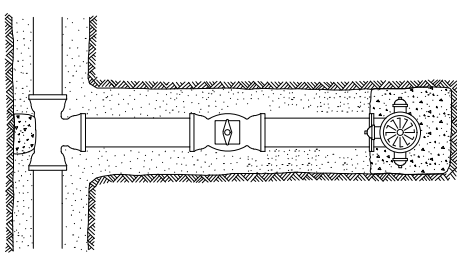


Select Material

**PLAN**



**ELEVATION**



**ELEVATION**



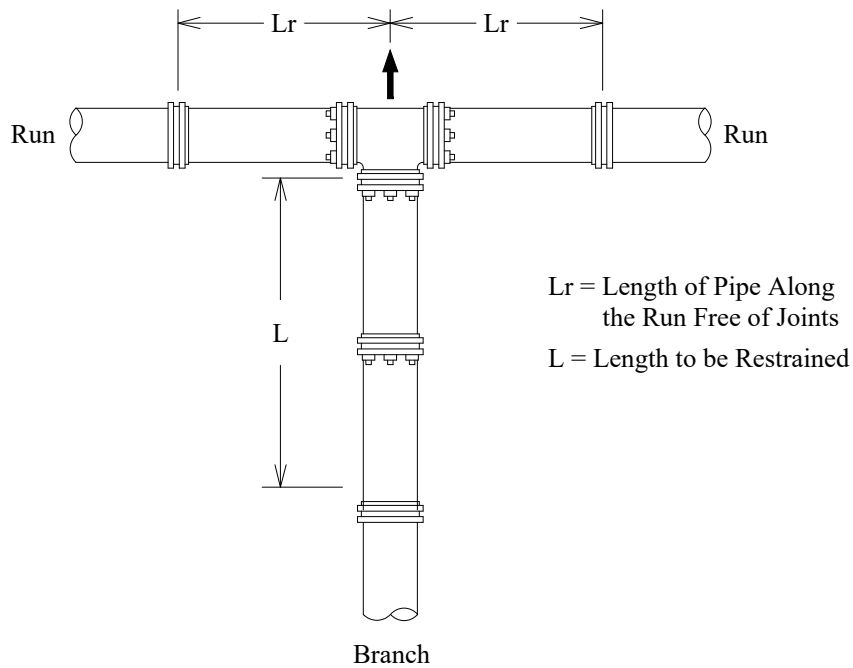
**THRUST BLOCKS FOR FITTINGS (WATER ONLY)**

APPROVED  
APRIL 2026

REVISED

**DET-839-01**

SHEET  
1 OF 1



<b>RESTRAINED LENGTH FOR TEES</b>			
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.



**RESTRAINED LENGTHS  
FOR TEES INSTALLED ON  
6" TO 8" MAINS**

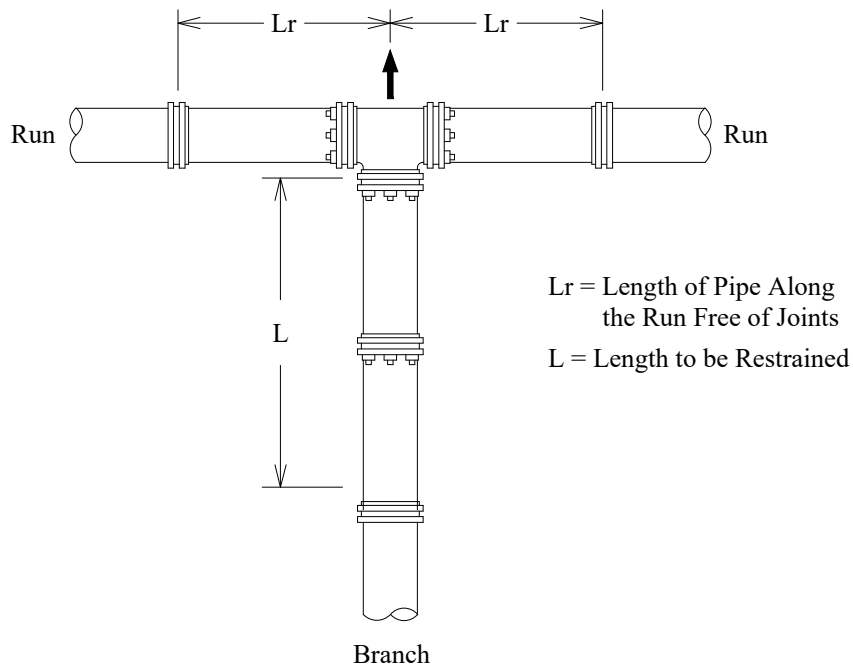
APPROVED

APRIL 2026

REVISED

**DET-839-02**

SHEET  
1 OF 4



<b>RESTRAINED LENGTH FOR TEES</b>			
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.



**RESTRAINED LENGTHS  
FOR TEES INSTALLED ON  
12" MAINS**

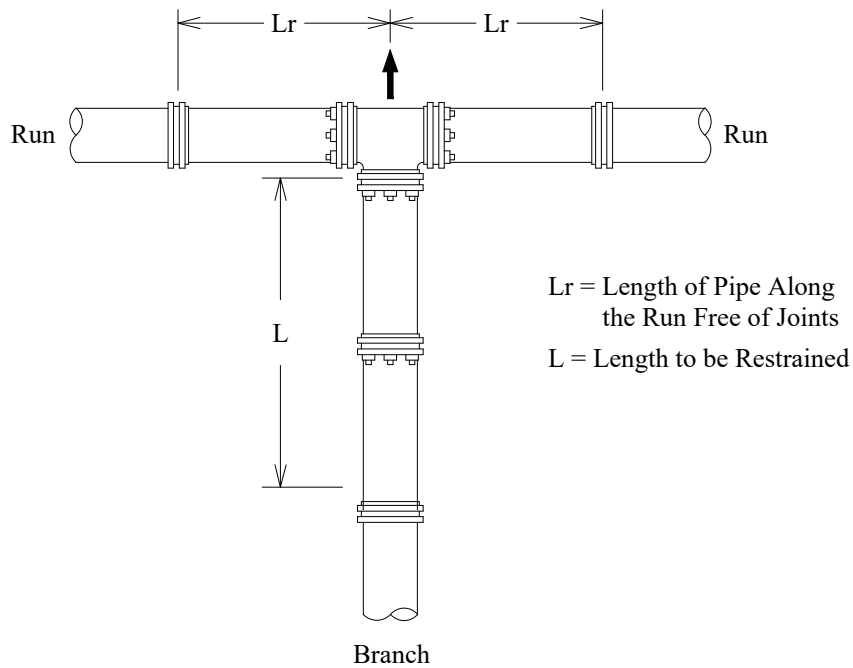
APPROVED

APRIL 2026

REVISED

**DET-839-02**

SHEET  
2 OF 4



<b>RESTRAINED LENGTH FOR TEES</b>			
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.



**RESTRAINED LENGTHS  
FOR TEES INSTALLED ON  
16" MAINS**

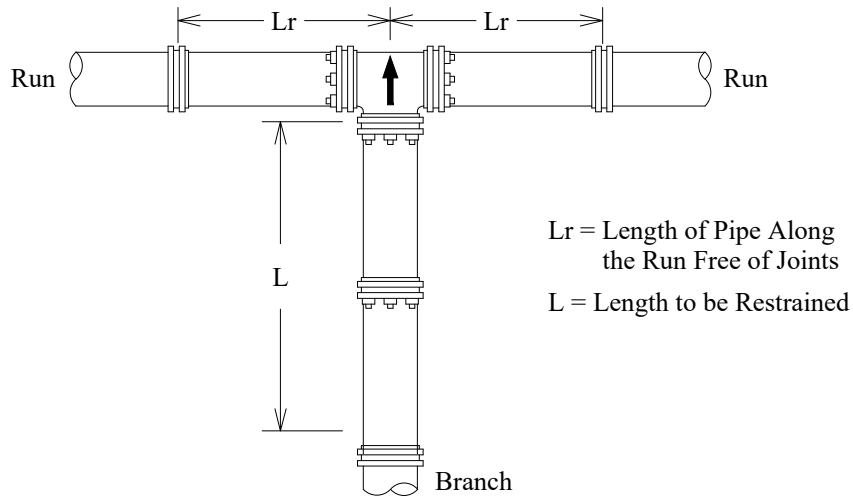
APPROVED

APRIL 2026

REVISED

**DET-839-02**

SHEET  
3 OF 4



<b>RESTRAINED LENGTH FOR TEES</b>			
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.



**RESTRAINED LENGTHS  
FOR TEES INSTALLED ON  
24" MAINS**

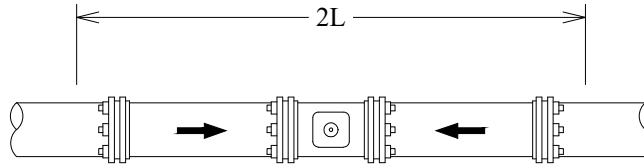
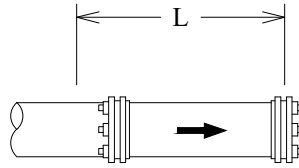
APPROVED

APRIL 2026

REVISED

**DET-839-02**

SHEET  
4 OF 4



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.



**RESTRAINED LENGTHS FOR  
DEAD ENDS / INLINE VALVES  
ON 6" THRU 24" MAINS**

APPROVED

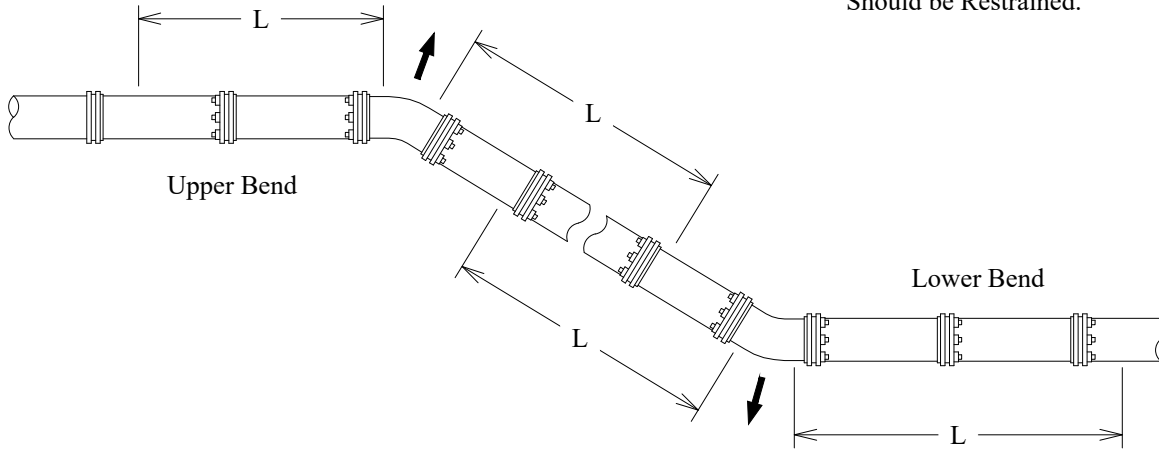
APRIL 2026

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.



**RESTRAINED LENGTHS  
VERTICAL OFFSETS INSTALLED ON  
6" THRU 12" MAINS**

APPROVED

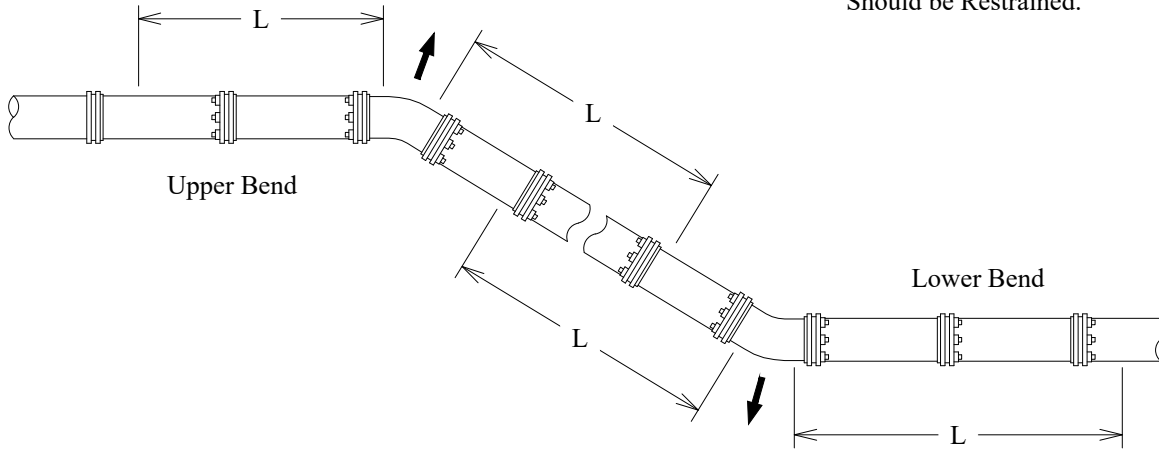
APRIL 2026

REVISED

**DET-839-04**

SHEET  
1 OF 2

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.



**RESTRAINED LENGTHS  
VERTICAL OFFSETS INSTALLED ON  
16" THRU 24" MAINS**

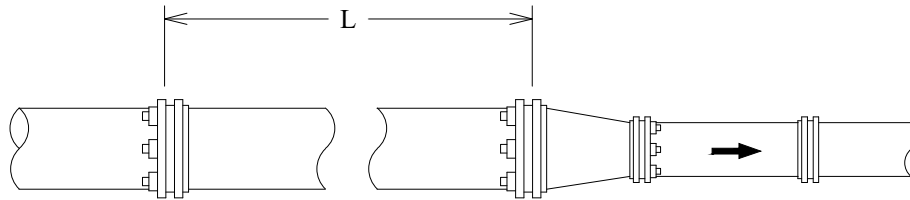
APPROVED

APRIL 2026

REVISED

**DET-839-04**

SHEET  
2 OF 2



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.



**RESTRAINED LENGTHS  
FOR REDUCERS  
ON 6" THRU 24" MAINS**

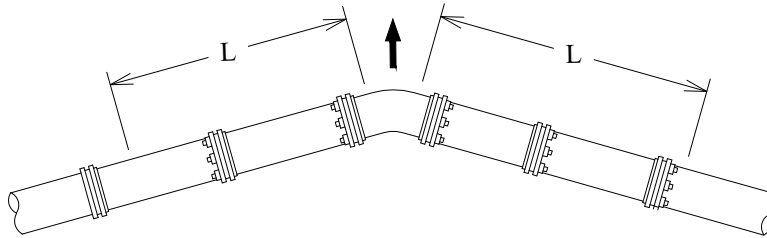
APPROVED

APRIL 2026

REVISED

**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.



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

APPROVED

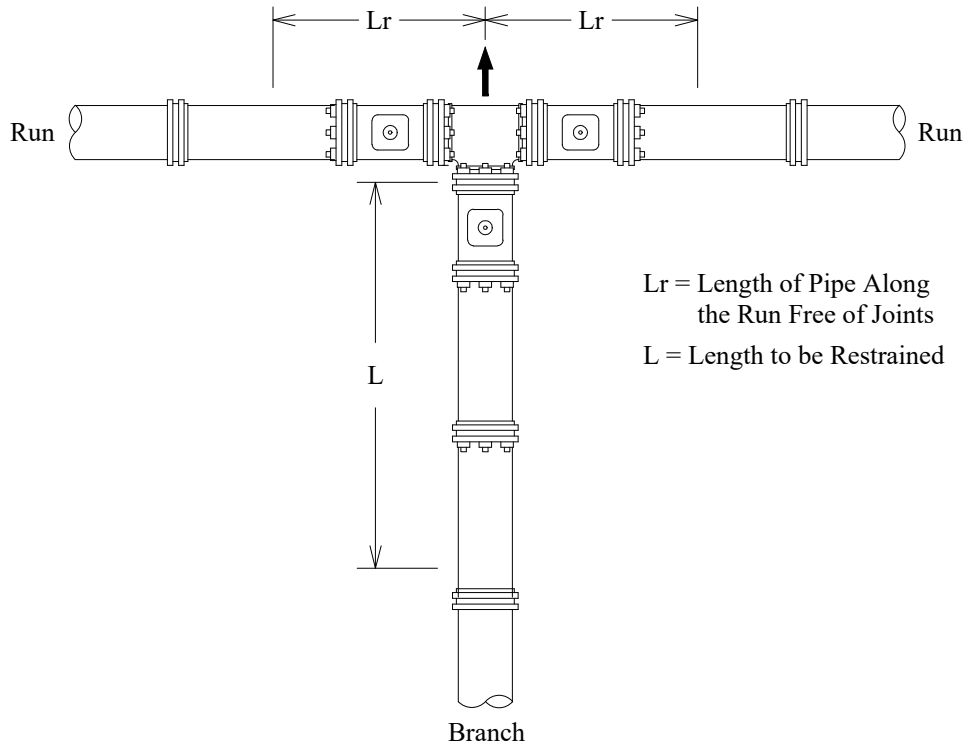
APRIL 2026

REVISED

**DET-839-06**

SHEET  
1 OF 1





<b>RESTRAINED LENGTH FOR TEES</b>			
PIPE SIZE (Inch)	BRANCH SIZE (Inch)	LENGTH OF RUN (Feet)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE=200 psi
12	4	0	35
12	4	5	1
12	6	0	52
12	6	5	8
12	6	10	1
12	8	0	72
12	8	5	37
12	8	10	5
12	8	15	1
12	12	0	100
12	12	5	80
12	12	10	55
12	12	15	32

**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.



**RESTRAINED LENGTHS FOR TEES  
WITH 3 VALVES  
ON 12" MAINS**

APPROVED

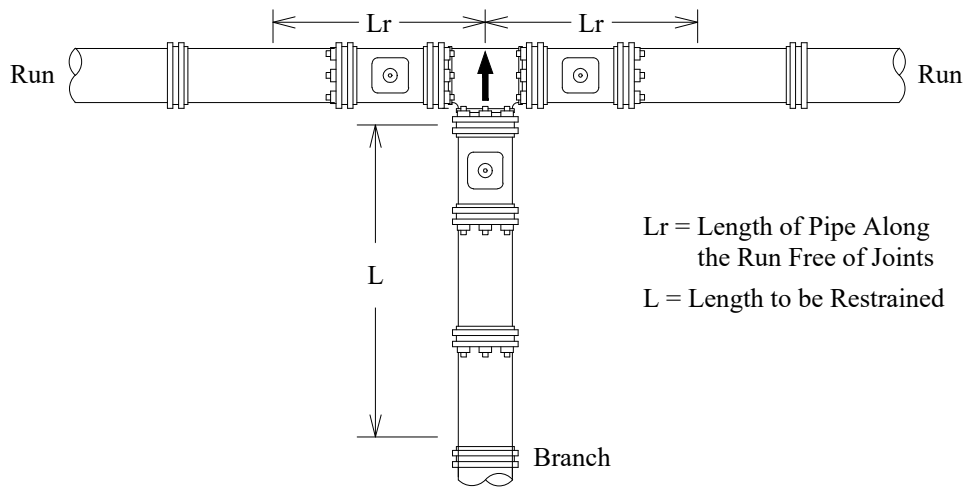
APRIL 2026

REVISED

**DET-839-07**

SHEET  
2 OF 4





### 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	44
24	6	5	1
24	6	10	1
24	6	15	1
24	8	0	59
24	8	5	5
24	8	10	1
24	8	15	1
24	12	0	88
24	12	5	49
24	12	10	14
24	12	15	1
24	16	0	108
24	16	5	81
24	16	10	50
24	16	15	22
24	20	0	139
24	20	5	115
24	20	10	90
24	20	15	68
24	24	0	168
24	24	5	147
24	24	10	128
24	24	15	108

### 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.



### RESTRAINED LENGTHS FOR TEES WITH 3 VALVES ON 24" MAINS

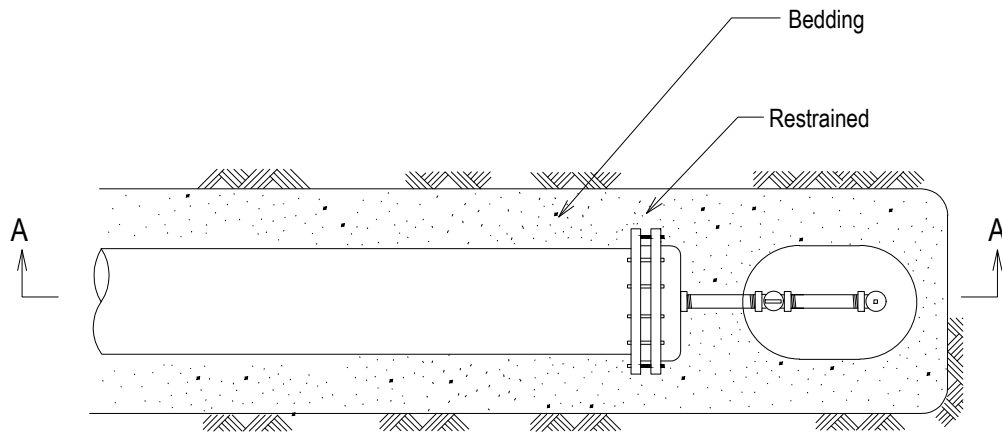
APPROVED

APRIL 2026

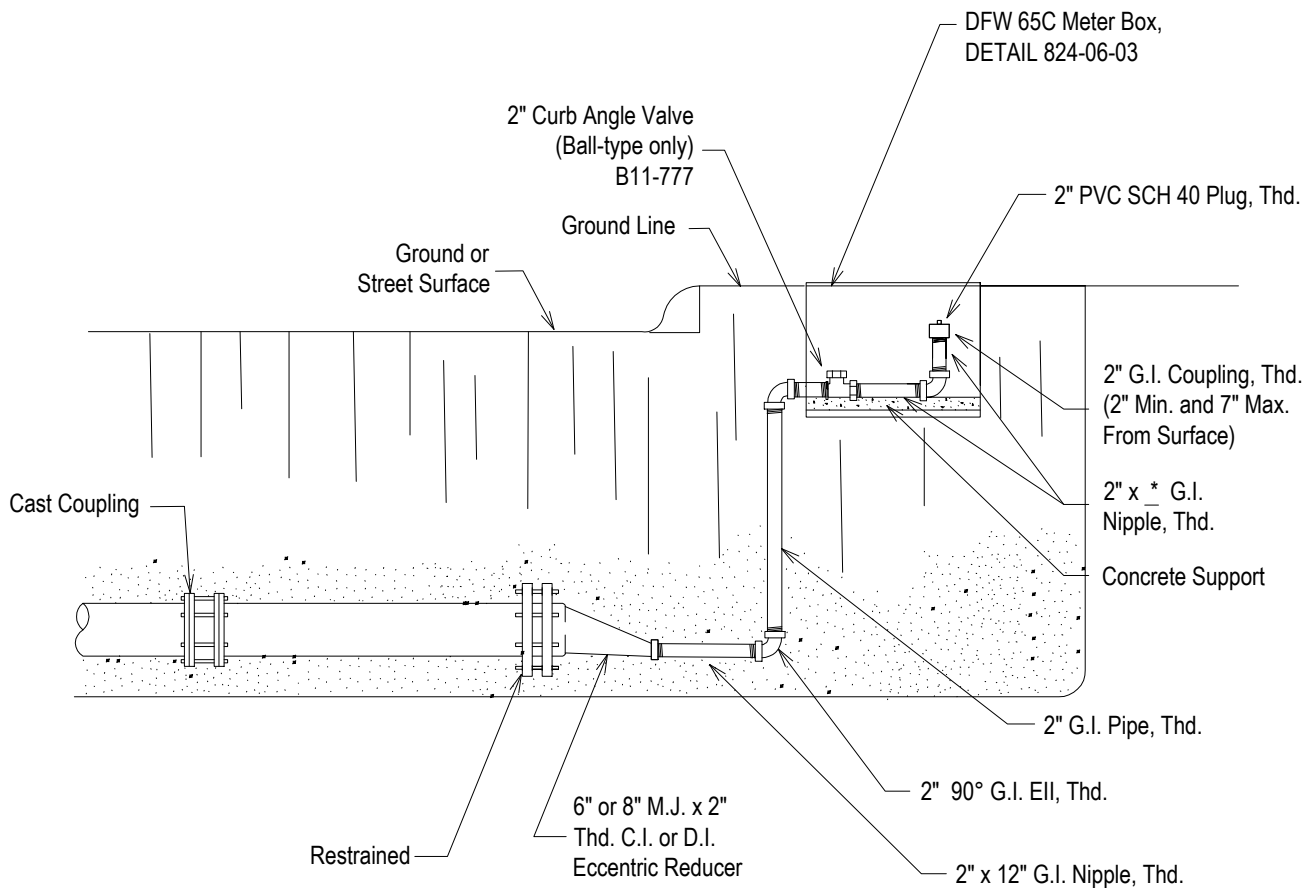
REVISED

**DET-839-07**

SHEET  
4 OF 4



PLAN



SECTION A - A

\* Cut to Fit in Meter Box



**2" PERMANENT  
BLOW-OFF ASSEMBLY  
ON 6" AND 8" MAINS**

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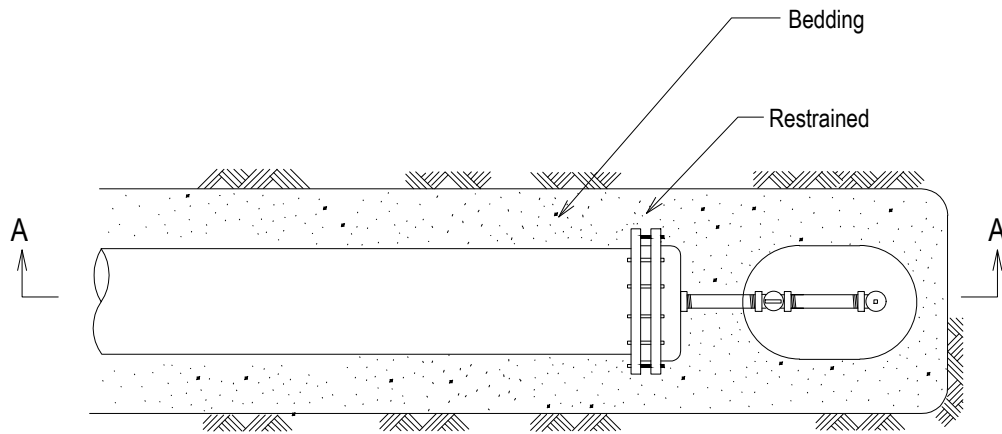
APRIL 2026

REVISED

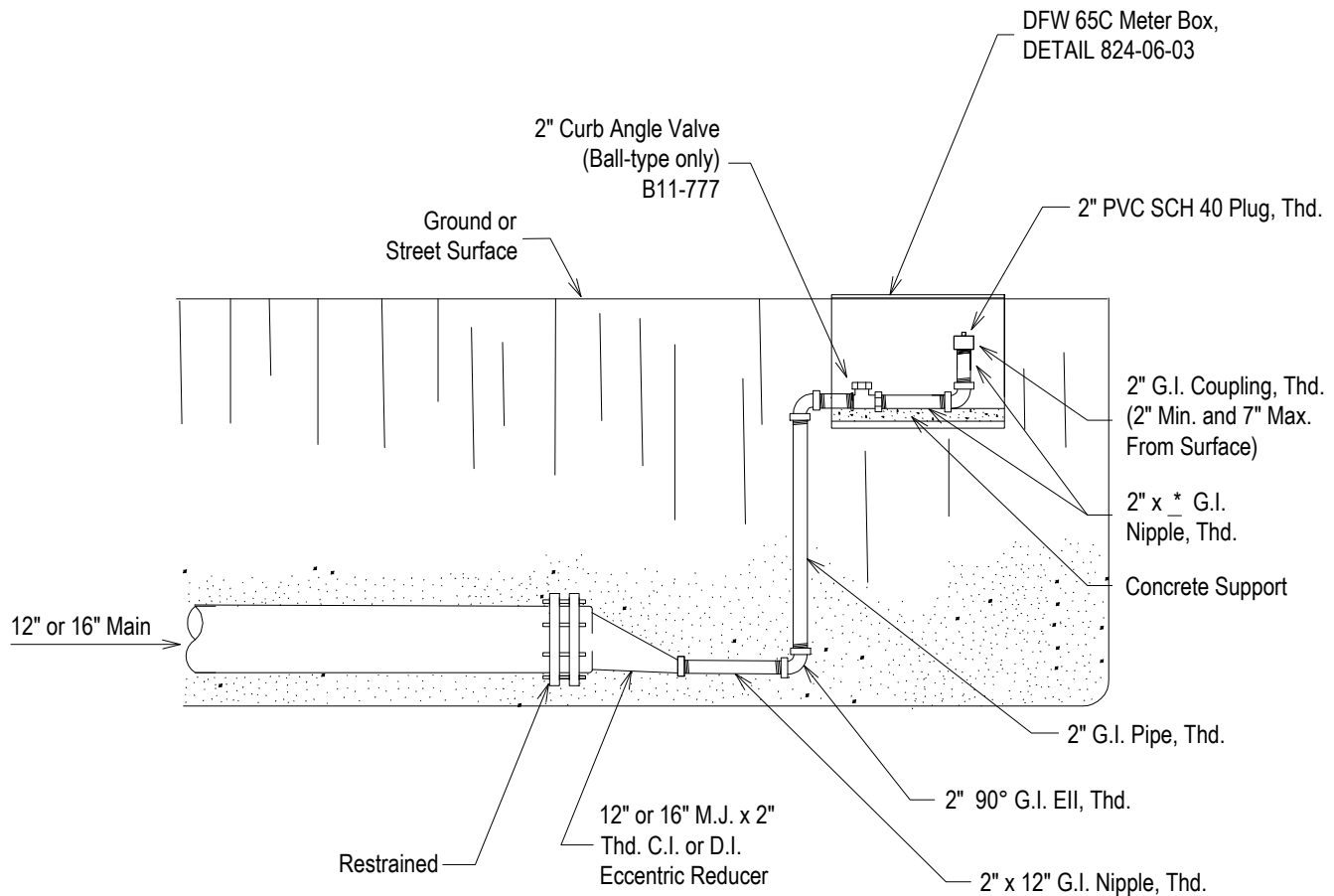
JULY 2025

**DET-844-02**

SHEET  
1 OF 2



PLAN



SECTION A - A

\* Cut to Fit in Meter Box



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

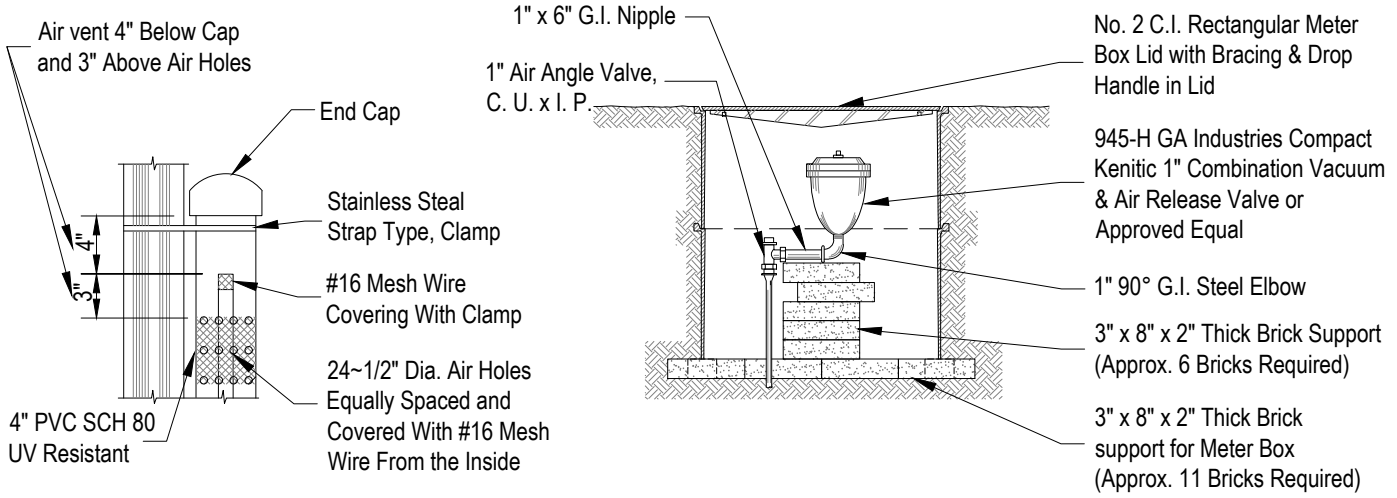
APPROVED

APRIL 2026

REVISED

**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

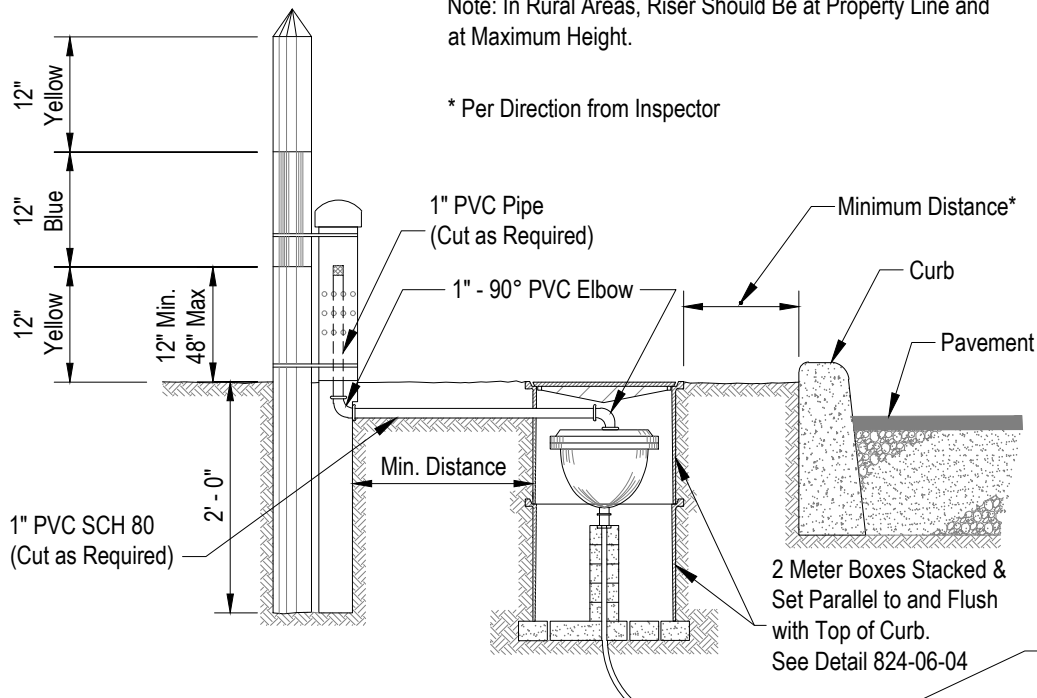
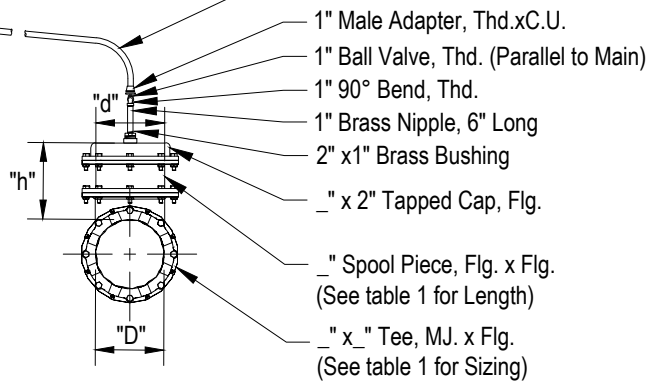


TABLE 1 - Enlarged Pipe Riser for Potable Mains 6" and Larger

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

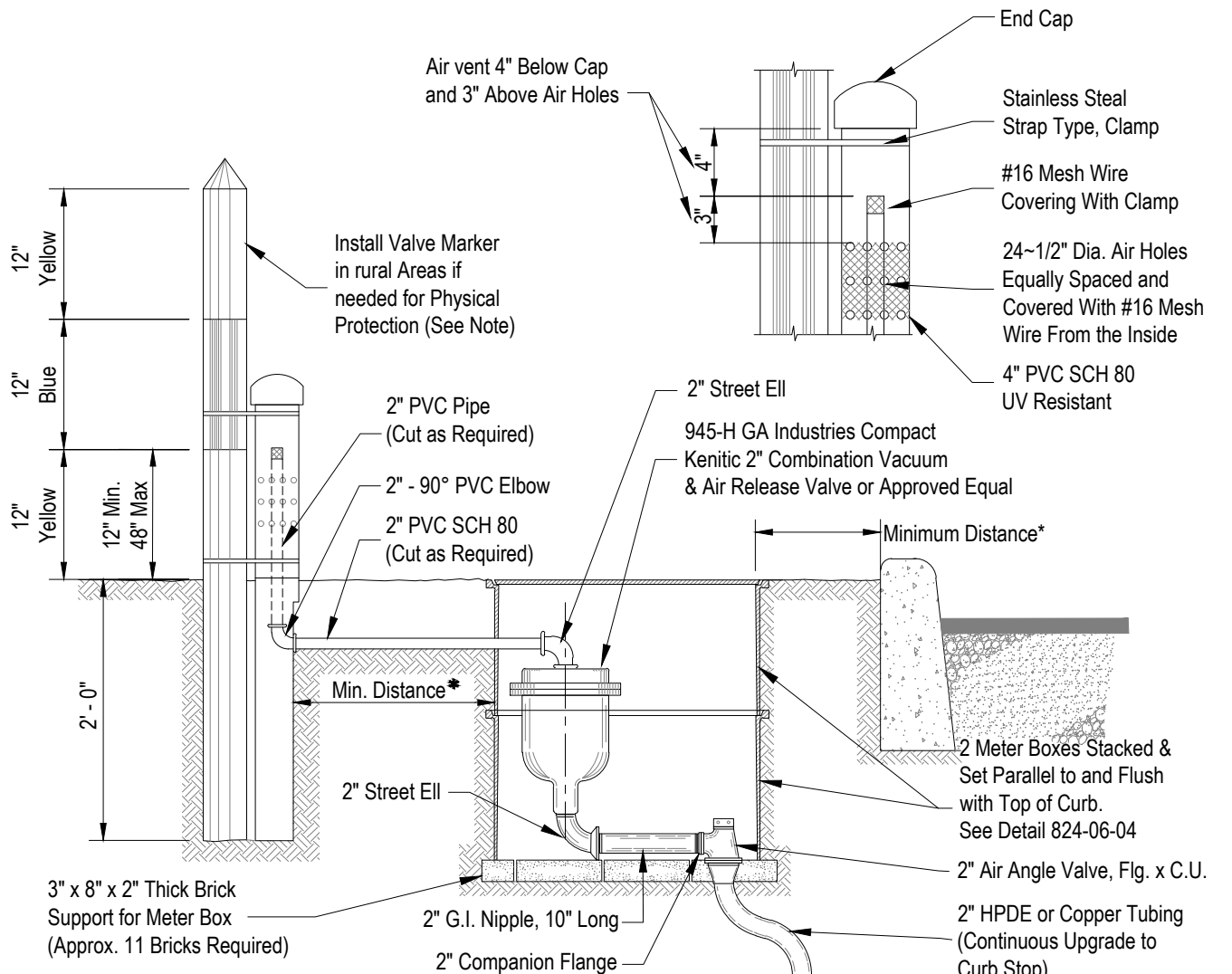


Air Collection Traps in Air Valve Piping Notes:  
 1. Dimensions Derived from AWWA Manual 2nd Edition:  
 Chapter 6 M51 Air Valves:  
 Air-Release, Air/Vacuum & Combination



**INSTALLATION OF  
 1" AIR RELEASE VALVE**

APPROVED	REVISED
APRIL 2026	
<b>DET-846-01</b>	SHEET 1 OF 1

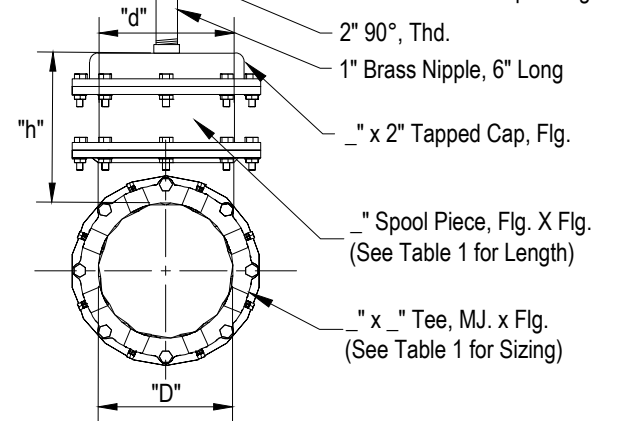


Note: In Rural Areas, Riser Should Be at Property Line and at Maximum Height.

\* 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



**INSTALLATION OF  
2" AIR RELEASE VALVE**

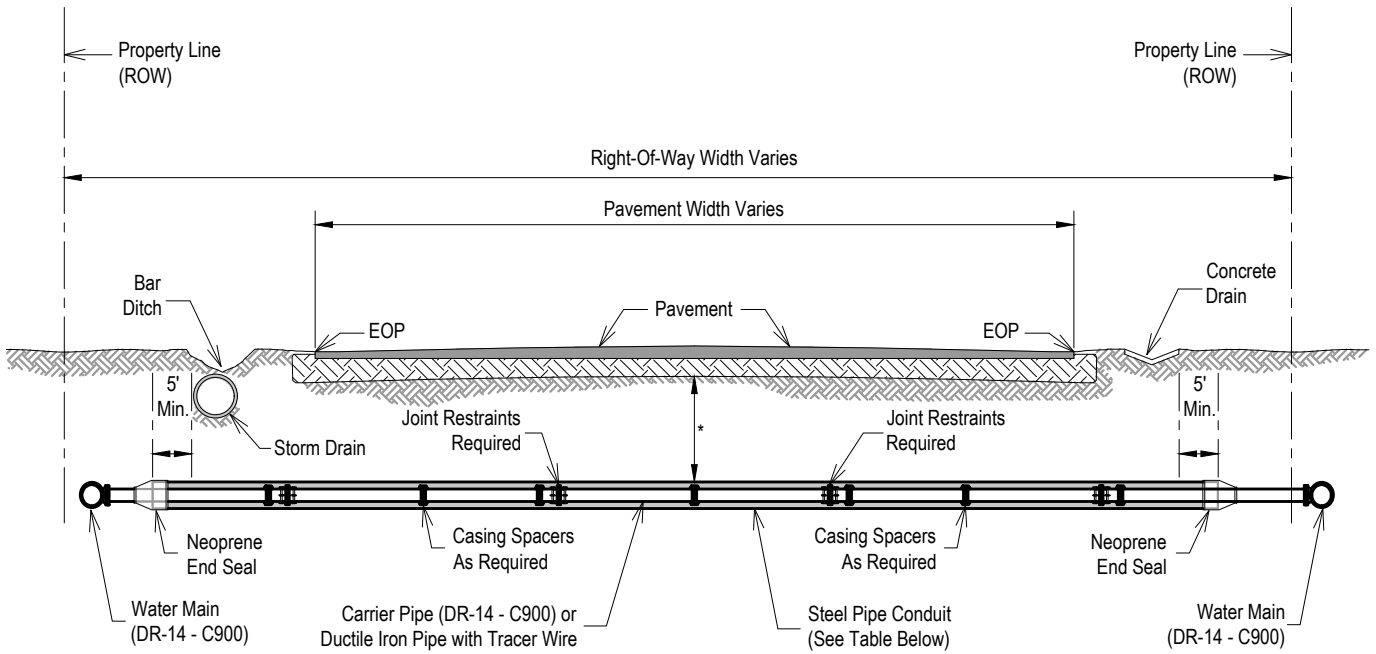
APPROVED

APRIL 2026

REVISED

**DET-846-02**

SHEET  
1 OF 1



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

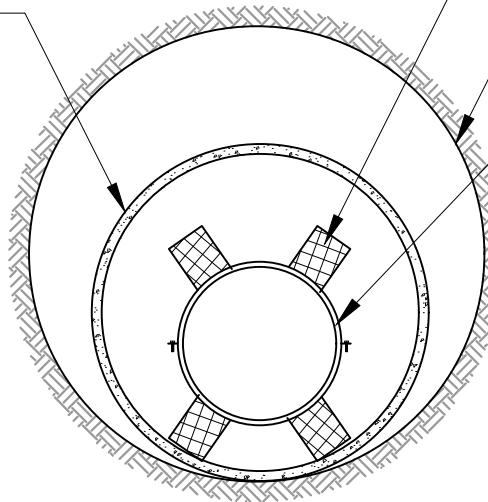
RESTRAINED JOINTS ARE REQUIRED FOR EACH JOINT WITH IN CASSING CARRIER PIPE.

Casing Spacer Shall be Stainless Steel and Installed Per Manufacturers Spacing and Specifications Manufactured by CCI Pipeline Systems (or Approved Equal)

Steel Pipe Conduit

Bore

Carrier Pipe Shall be PVC Pipe (DR-14 - C900) or Ductile Iron Pipe with Tracer Wire



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASSING 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"



TYPICAL BORE CROSSING UNDER ROAD

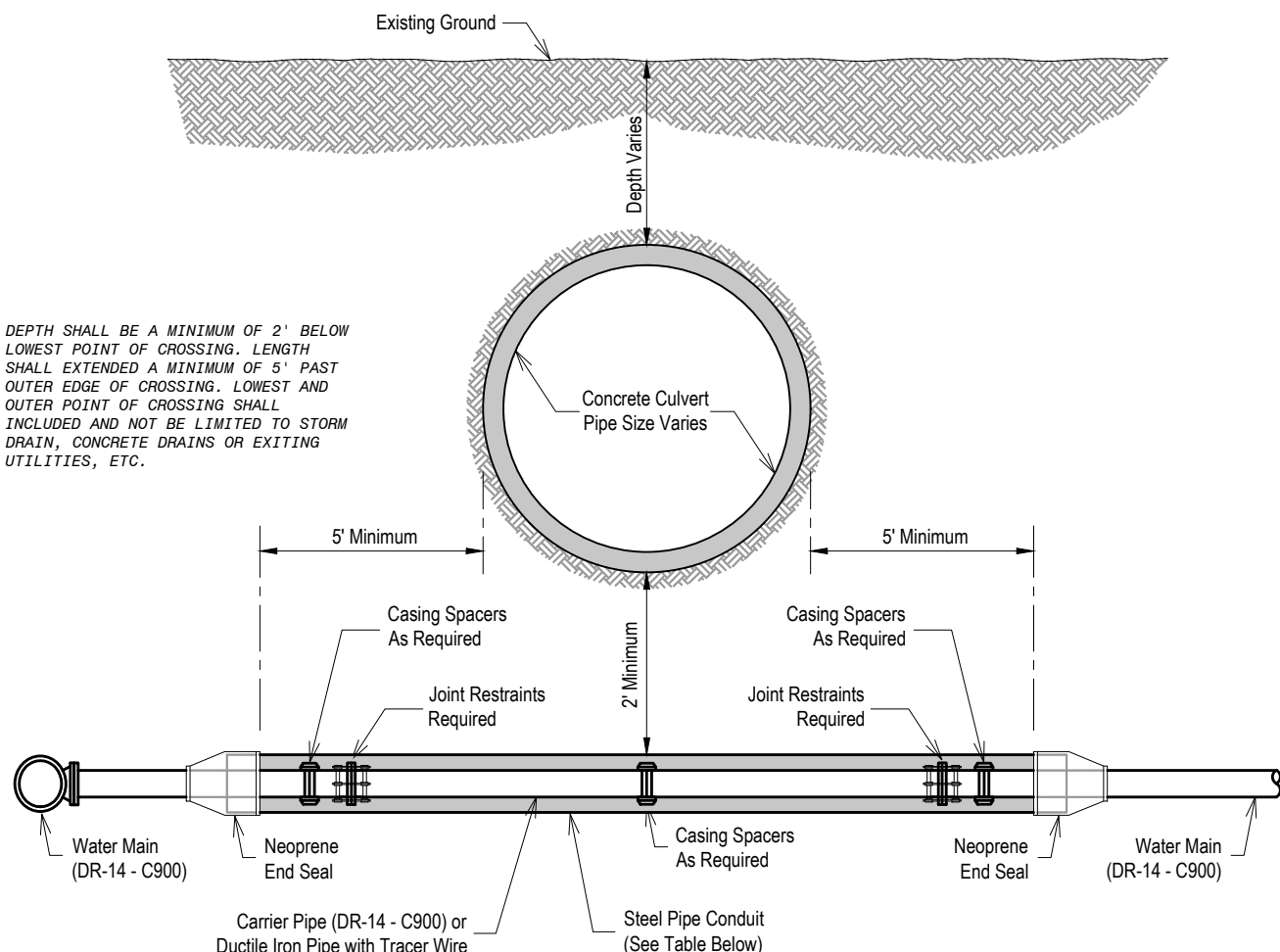
APPROVED

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APRIL 2026

DET-847-01

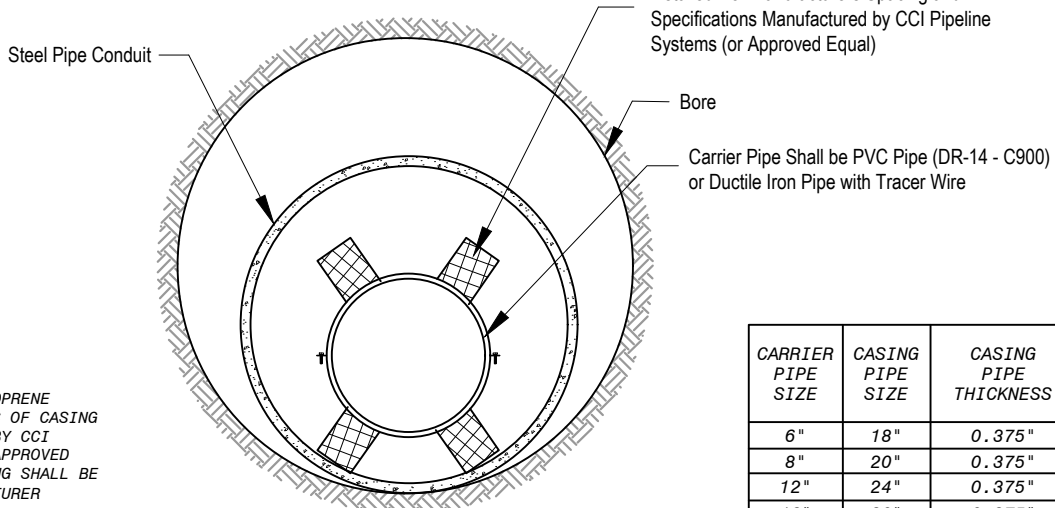
SHEET  
1 OF 5



DEPTH SHALL BE A MINIMUM OF 2' 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.

RESTRAINED JOINTS ARE REQUIRED FOR EACH JOINT WITH IN CASSING CARRIER PIPE.

Casing Spacer Shall be Stainless Steel and Installed Per Manufacturers Spacing and Specifications Manufactured by CCI Pipeline Systems (or Approved Equal)



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

**SECTION THROUGH  
PIPE IN CONDUIT**

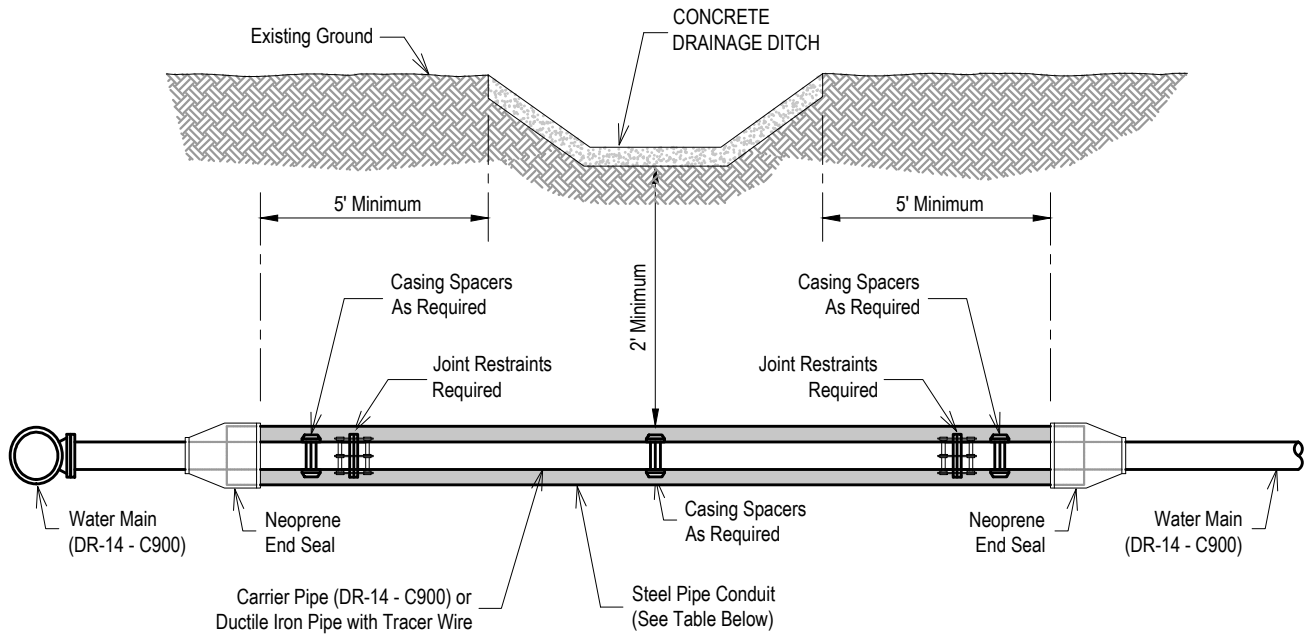
CARRIER PIPE SIZE	CASSING PIPE SIZE	CASSING PIPE THICKNESS
6"	18"	0.375"
8"	20"	0.375"
12"	24"	0.375"
16"	30"	0.375"
20"	36"	0.438"
24"	42"	0.438"
30"	48"	1/2"
36"	54"	9/16"



TYPICAL BORE CROSSING UNDER  
CONCRETE CULVERT / STORM SEWER

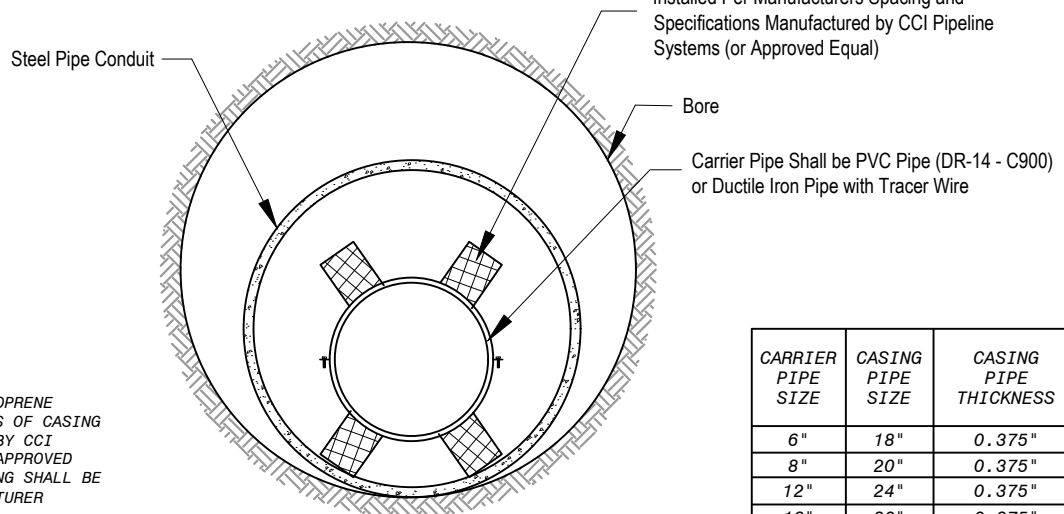
APPROVED	REVISED
APRIL 2026	
<b>DET-847-01</b>	SHEET 2 OF 5

DEPTH SHALL BE A MINIMUM OF 2' 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.



RESTRAINED JOINTS ARE REQUIRED FOR EACH JOINT WITH IN CASSING CARRIER PIPE.

Casing Spacer Shall be Stainless Steel and Installed Per Manufacturers Spacing and Specifications Manufactured by CCI Pipeline Systems (or Approved Equal)



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**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"



TYPICAL BORE CROSSING UNDER DITCH WITH CONCRETE BOTTOM

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APRIL 2026

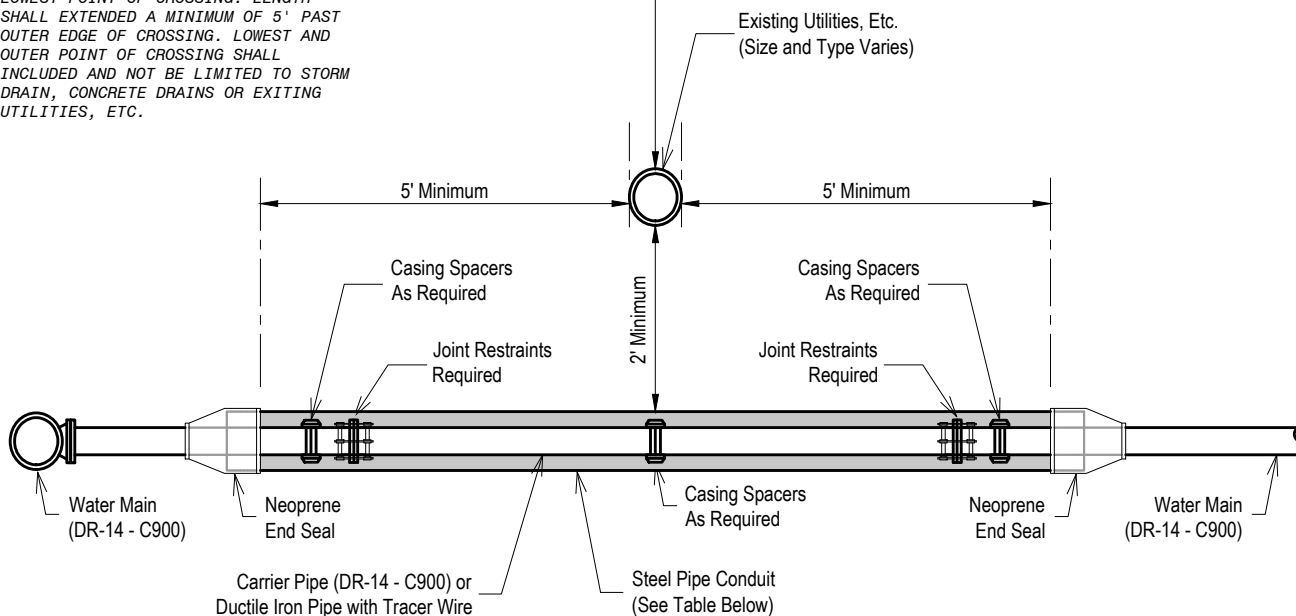
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**DET-847-01**

SHEET  
3 OF 5

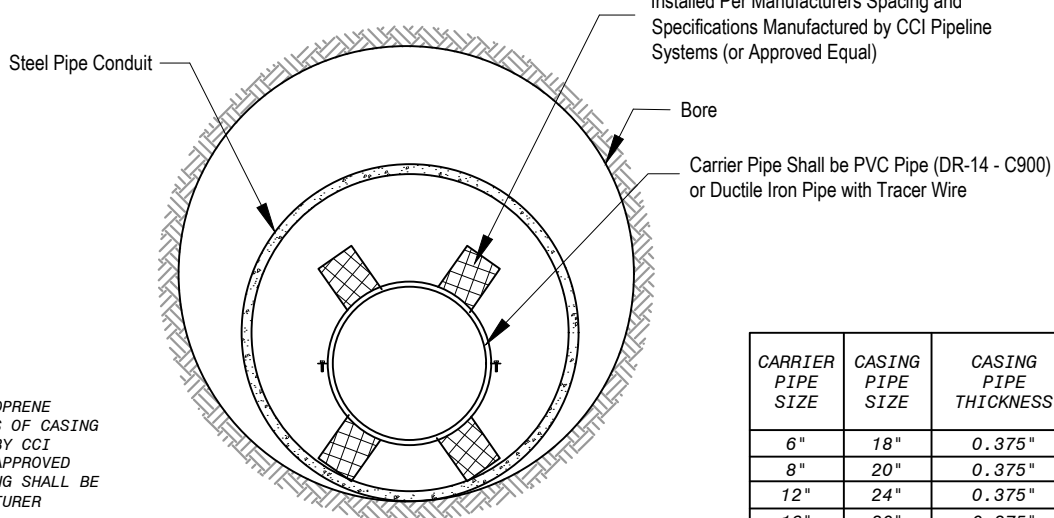
Existing Ground

DEPTH SHALL BE A MINIMUM OF 2' 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.



RESTRAINED JOINTS ARE REQUIRED FOR EACH JOINT WITH IN CASSING CARRIER PIPE.

Casing Spacer Shall be Stainless Steel and Installed Per Manufacturers Spacing and Specifications Manufactured by CCI Pipeline Systems (or Approved Equal)



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASSING 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	CASSING PIPE SIZE	CASSING PIPE THICKNESS
6"	18"	0.375"
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TYPICAL BORE CROSSING UNDER  
CONCRETE CULVERT / STORM SEWER

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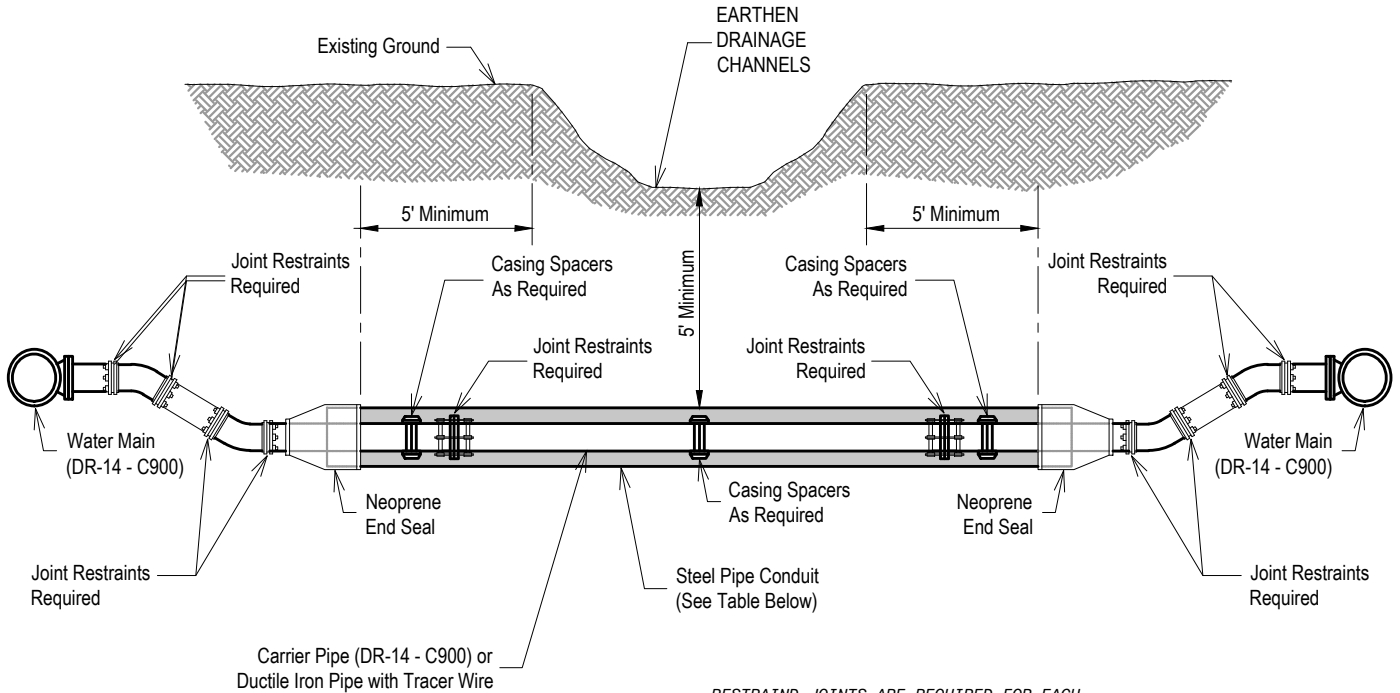
REVISED

**DET-847-01**

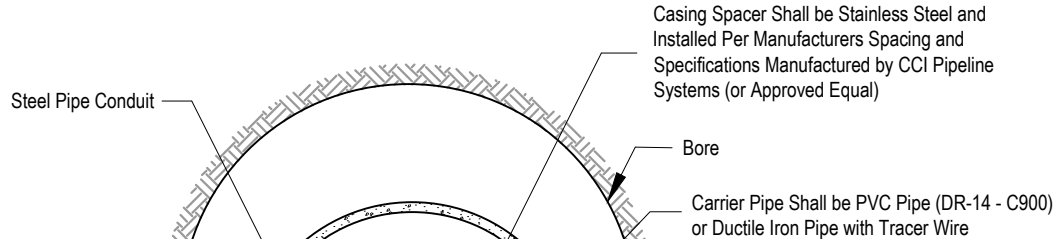
SHEET  
4 OF 5

DEPTH SHALL BE A MINIMUM OF 5' 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, EARTHEN DRAINAGE CHANNELS OR EXITING UTILITIES, ETC.

RESTRAINED JOINTS ARE REQUIRED FOR VERTICAL OFFSETS SEE DETAIL 839-04 SHEET 01 FOR PIPE SIZES 6" - 12" AND DETAIL 839-04 SHEET 02 FOR PIPE SIZES 16" - 24".



RESTRAINED JOINTS ARE REQUIRED FOR EACH JOINT WITH IN CASSING CARRIER PIPE.



END SEALS SHALL BE NEOPRENE INSTALLED ON BOTH ENDS OF CASSING 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	CASSING PIPE SIZE	CASSING PIPE THICKNESS
6"	18"	0.375"
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24"	42"	0.438"
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36"	54"	9/16"



TYPICAL BORE CROSSING UNDER  
EARTHEN DRAINAGE CHANNEL

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APRIL 2026

REVISED

**DET-847-01**

SHEET  
5 OF 5