Standards and Specifications for the Design and Construction of Public and Private Improvements



CITY OF THORNTON

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CITY OF
THORNTON

Standards and Specifications Updates

Addendum	Addendum Description	2012 Section/Detail	Effective Date
Detail 500-1A-F, 2A-2C, 3A-G and 4	Updated Roadway Cross Sections per TMMP adopted in 2022 and Code Adopted on Sept. 1, 2025	Detail 500-1 to 500-4	August 2025
Detail 200-16, 200-17A	Updated the meter pit lid requirements and provided minor clarifications	Detail 200-16, 200-17A	August 2025
Detail 200-21	New Water Sampling Station Detail	NA	April 2026
Section 203.15	New Water Sampling Station Standard	NA	April 2026

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SECTION 200 - WATER SYSTEM STANDARDS

201 GENERAL PROVISIONS

These standards are promulgated by the Utilities Director of the City in accordance with the authority contained in the Thornton City Code. Improvements shall also be in conformance with Chapter 74 of the Thornton City Code.

Interpretation, revision, and authority to grant variances and enforcement of these standards has been delegated by the Utilities Director to the Development Engineering Manager.

202 GENERAL SPECIFICATIONS

202.1 Granting of Service

Water services shall be extended at the requestor's expense when it has been determined that the City has the capability and capacity to serve the area, provided that the area to be served is located within the Thornton water service area, and provided that the applicant can show evidence of fee ownership of the property to be serviced. The request for service must be in compliance with stipulations contained in all utility agreements entered into by the City and said applicant as well as in compliance with all applicable City ordinances, codes, and charter principles.

202.2 Application, Permit, Construction, and Acceptance Procedure

Refer to Section 100 for City application, permitting, construction, and acceptance procedures.

Private contractors installing fire sprinkler system water mains (from the water supply to the sprinkler system riser) must be registered with the Colorado Division of Fire Safety as a Fire Suppression System Contractor – Underground. All fire sprinkler mains shall be designed, constructed, and tested in accordance with the City's currently adopted and effective International Fire Code.

203 WATER DISTRIBUTION SYSTEM DESIGN CRITERIA

203.1 General

Water mains and appurtenances shall be in conformance with these Standards and Specifications and shall be designed by or under the direct supervision of a registered PE licensed to practice in the State of Colorado.

203.2 Demand Factors/Allowed Flows

A. Water mains shall be designed to supply the projected demands of the proposed development as set forth herein. Water main sizing shall be in conformance with the current water system master plan. The Development Engineering Manager reserves the right to size mains to provide service for future needs.

B. The following water flow parameters shall serve as minimum guidelines to determine the estimated flows. Water distribution systems shall be designed using the following scenarios:

1. The High HGL of the zone with no demands on the system. The maximum pressure in this scenario is 100 psi.
2. The Low HGL of the zone with no demands on the system. The minimum pressure in this scenario is 50 psi.
3. The Low HGL of the zone with the peak hour demands (Demand Factor of 3.24 for commercial and 5.76 for residential development) added to the system. The minimum pressure under this scenario shall be 40 psi, with a maximum velocity permitted is 5 fps.
4. The Low HGL of the zone with the maximum daily demands (Demand Factor of 1.8 shall be utilized for Office /Commercial and 3.2 for Residential developments) in addition to the required fire flow. The minimum pressure under this scenario is 20 psi. The maximum velocity under this scenario shall not exceed 11.2 fps for eight (8) inch lines, and 10 fps for all other lines.

C. Pumping facilities may be allowed on mains or service lines only where specifically authorized by the Development Engineering Manager.

D. Water Demand

1. Average Day Demands: 150 GPD per person
2. Densities:
   a. Low = <5 (DU/Ac.)
   b. Mid = 5 – 12 (DU/Ac.)
   c. High = >12 (DU/Ac.)
3. Residential:
   a. Low = 3.45 (Persons/Unit)
   b. Mid = 2.45 (Persons/Unit)
   c. High = 2.20 (Persons/Unit)
4. Office: 240 gallons per 1,000 square feet of building area per day
5. Commercial:
   a. Shopping Center: 680 gallons per 1,000 square feet of building area per day
   b. Restaurants and Fast Food: 1,000 gallons per 1,000 square feet of building area per day
   c. Professional Centers: 800 gallons per 1,000 square feet of building area per day
6. Industrial:
   a. Warehouse: 240 gallons per 1,000 square feet of building area per day
   b. Factory: 680 gallons per 1,000 square feet of building area per day

203.3 Sizing of Distribution Mains

A. Sizing of on-site mains shall be accomplished by utilizing WaterCAD or approved equal. Results shall be submitted to Development Engineering together with engineered drawings.

B. The minimum diameter for water mains shall be six (6) inches where no hydrants are connected to the mainline, otherwise a minimum diameter of eight (8) inches shall be installed. No more than one (1) hydrant shall be located on dead-end water lines. All hydrant branch lines over 50 feet shall be modeled to show that the required fire flow will be met.

C. Water services and fire sprinkler lines for non-residential facilities and high-density residential areas shall be constructed from looped mains. No more than 18 single family units shall be located off of a dead end main.

D. Distribution mains connected to transmission mains greater than 16 inches are required to be a minimum of eight (8) inches in diameter.

E. Oversized mains (all mains that are greater than 16 inches in diameter) may be required by the City. Reimbursement agreements may be entered into so that the Responsible Party may recover up to 50% of the costs incurred for the first 16 inches of pipe diameters, in accordance with Chapter 74 of the Thornton City Code.

203.4 Materials

A. Materials for constructing water mains shall conform to the material requirements as set forth in Subsection 204.1 of these Standards and Specifications.

203.5 Ground Cover

Mains shall be designed so that a minimum of four and one-half (4½) feet of cover exists over the top of the pipe after final grade has been established. No main shall have more than five and one-half (5½) feet of cover.

203.6 Location

A. Water mains shall be installed in exclusive easements granted to the City when, as determined by the Development Engineering Manager, it is not practical to install water mains in the dedicated street. City water mains shall not cross through residential lots, and shall be a minimum of 5 feet from any property line. Under no circumstances shall any structures be constructed within these easements or right-of-way where these mains are installed, without prior approval including terms and conditions, as set by the City. The minimum width requirements for water easements are 20 feet with the pipe centered in the easement, and the easement shall extend 10 feet beyond all side of fire hydrants. In the event two (2) utility mains share the same easement, the minimum width for the easement shall be 30 feet, and for three (3) pubic utilities the width shall be 40 feet, etc. Water mains shall be in an easement of a width at least two (2) times the depth to the invert. Valves shall be located at each end of the easement in order to isolate that

portion of the line if necessary. All easements in residential areas shall be in a dedicated tract with a minimum width of 40 feet.

B. Water main installations shall conform to specifications as described in "Design Criteria for Potable Water Systems" as published by the Colorado Department of Health - Water Quality Control Division. The minimum vertical separation shall be 18 inches (refer to details 200-3A and 200-3B for watermain lowering requirements), and horizontal separation shall be a minimum of 10 feet from the edge of any waterline to any sewer. Location for these water mains shall be 10 feet from the center line on the north or east side of the street.

C. When a water main crosses underneath a stream, irrigation ditch, or storm drainage ditch, casing of the facility is required. The type of the material and class of the pipe shall be determined by the engineer. If steel casing pipe is used, then corrosive protection shall be required based on a recommendation from the soils report. Valves are to be located in such a manner that the water main at such crossings can be completely isolated. The casing shall extend to a minimum of 40 feet from the edge of the ditch/bank. Refer to Detail 200-4 for casing requirements.

D. Water mains shall not be installed within five (5) feet of any concrete such as sidewalks, curb, gutter, or cross pans (except for crossings).

203.7 Gate Valves

A. Valves installed in residential distribution systems shall be located in such a manner as to ensure that no more than 600 feet of main or 18 residential units may be out of service for any one (1) single break. Valves installed in commercial and other distribution systems shall be located in such a manner as to ensure that no more than 300 feet of main may be out of service for any one (1) single break.

B. Valve placement shall be such that there are at least two (2) valves at every tee and three (3) valves at every cross. Valves are required between fire hydrants. Valves shall be no further than 1,200 feet apart on transmission mains. The Responsible Party may be required to install a tee and valves on the existing mainline to meet this requirement.

C. When water mains are designed in such a way that a dead end exists at the edge of a subdivision or at the boundary of a filing within a subdivision, the main shall be terminated with a temporary blowoff valve. Where future connections are to be made to temporary dead ends, at least three (3) lengths of pipe are required beyond the valve and before the temporary blowoff valve. For all temporary dead ends the valve shall be restrained back to the mainline or in such a manner as to allow shut-off and connection without impacting the remainder of the distribution system. When a new extension shall connect to an existing main not terminated with a valve, the new main must be valved at the connection in order that the entire, newly constructed system may be pressure tested and chlorinated.

D. The City permits the use of Hydra-Stop, EZ Valve or approved equal for valve installation.

E. Valves larger than 12 inches shall be of butterfly style. Butterfly valve operators shall be located on the north or east side of the water main. Refer to Detail 200-8 for butterfly valve requirements.

F. Whenever possible, water main valves shall be located at a point on the main which is outside of an intersection. Under no circumstances, however, shall a valve be located in concrete areas, such as sidewalks, cross pans, aprons, curbs, or gutters. Any valve located in a green belt area shall have a concrete collar around the valve box as shown in Detail 200-7.

G. All valves shall be installed at a location where they will be accessible by a maintenance vehicle. All access roads shall be designed to carry an H-20 loading, with a maximum grade of seven (7) % and maximum cross slope of four (4) %.

203.8 Blowoff Valves

Blowoff valves are required at the end of water mains which terminate at the subdivision boundary in streets that will be extended at a future date. Blowoffs are also required at low points in waterlines less than 12 inches in diameter. Hydrants shall be utilized as blow-offs for lines 12 inches and larger.

203.9 Fire Hydrants

A. The number, location and spacing of fire hydrants shall be determined by the City of Thornton Fire Department in accordance with the City's currently adopted and effective International Fire Code. In cul-de-sacs, hydrants shall be located a minimum 150 feet, and maximum 200 feet from the end of the cul-de-sac. If hydrants are to be installed at locations other than street intersections, they shall be located on lines which are established by extending property lot side lines into the streets. Fire hydrants shall be provided at a spacing not to exceed 1200 feet in areas not requiring fire protection. Fire hydrants shall be located a minimum of five (5) feet from driveways to the center of the hydrant. The fire hydrant shall be located within the ROW and on the same side of the street as the water main. Installation of fences, landscaping or other obstructions shall in no way hinder the operation of the fire hydrant.

B. Fire hydrant branch mains shall be set at 90° to street mains. The maximum length of a fire hydrant branch main shall be 100 feet. The hydrant shall be set at the end of the branch main and shall face the branch main. No horizontal bends or offsets shall be used in installing fire hydrant branch mains. Under no circumstances shall any size or manner of tap be made on a fire hydrant branch main. Hydrants shall be plumbed vertically with the pumper nozzle facing the street and traffic safety flange not less than two (2) inches nor more than three (3) inches above final grade. A six (6) inch gate valve shall be flanged or rodded to the tee on the main in order that the hydrant may be removed from the system for maintenance without affecting the distribution system. No water service main taps shall be made to a distribution main within five (5) feet of a fire hydrant branch main.

203.10 Thrust Block

Bends, tees, plugs, dead ends, wet taps, hydrants, and blowoffs shall be designed and constructed with concrete thrust blocks as set forth in Detail 200-11.

203.11 Pressure Regulating Stations

A. PRV installations are used to control pressures between distribution zones and along transmission mains where pressure fluctuations may occur. When main extension plans are submitted for review, the need for a pressure regulating valve installation shall be determined based on existing pressure zones and the existing distribution system. Plans shall be submitted indicating size, type, and location for the PRV installation. Calculations shall be submitted and approved by the Development Engineering Manager. Shop drawings for the vault and cut sheets for all installed equipment shall be submitted for approval prior to construction. The low flow PRV shall be sized for the max day flow.

B. PRV's shall be located within landscaping or other areas outside of the roadway section as approved by the Development Engineering Manager.

C. Individual PRV installations to bring operating pressures below 100 psi on residential and commercial services shall not be permitted as an alternative to a system PRV.

203.12 Air Release Valves

Air valves shall be installed at each highpoint in all water mains of 12-inch diameter and larger. One (1) inch air valves shall be installed on eight (8) inch mains at high points.

203.13 Water Service Lines

A. Location

1. That portion of the service pipe between the main and the curb stop and/or meter when installed must be in a continuous straight line with no joints and perpendicular with the exception of reducers/expansions, if possible, to the line of the main. A minimum separation of 10 feet is required to any sewer service, and a minimum of five (5) feet to any other water service or fire sprinkler line.

2. Residential meter pits shall be located in a landscaped portion of the right-of-way as per Detail 200-2. Locations for special residential installations, such as multi-family housing and churches, as well as commercial meter locations shall be easily accessible and located within landscaped areas. If, due to limitations, a meter pit needs to be installed elsewhere, Development Engineering will establish the necessary additional measures required. Under no circumstances shall any meter pit/vault be located inside any building, a drainage area, or an area for which access may be difficult such as drive lanes or parking areas.

3. Separate services and meters are required for each single-family dwelling (detached/duplex units), multifamily and apartment-style condominium foundation, and commercial/office foundation. All meters utilized for single

family applications shall be located in right-of-way or exclusive easements. Accessory dwelling units, which are in compliance with City Code, shall be exempt from the requirements for a separate and independent building sewer and a separate water service connection to the main, with a separate water meter.

4. Separate services are required for each individual townhome-style condominium and townhome.
5. All irrigation connections require a minimum size of a four (4) inch tap, four (4) inch DIP, or C900 PVC service line, and a four (4) inch gate valve with five and one-fourth (5¼) inch valve box placed behind the curb. Refer to Section 800 of these Standards and Specifications for irrigation meter size requirements and details.

B. Meter Sizes

Meter sizes for residential, commercial or industrial use shall be determined by the consulting engineer and calculations submitted to the Building Division for review and approval.

The meter and the tap on the City's main shall be the same size.

203.14 Abandonment

The abandonment of water mainlines shall require physical removal of the abandoned section(s) if required by the Development Engineering Manager, or be filled with flash or flow fill if permitted to be abandoned in place.

203.15 Water Sampling Stations

A. Water sampling stations shall be required in all new residential developments to facilitate distribution system water quality monitoring. For developments with fewer than 100 dwelling units, a minimum of one (1) sampling station shall be installed. For developments with 100 or more dwelling units, three (3) sampling stations shall be installed per 100 to 500 dwelling units and an additional sampling station per 200 dwelling units thereafter at locations approved by the City.

B. All sampling stations shall be NSF/ANSI 61 certified, constructed in accordance with manufacturer recommendations and City standards, and shall be located in the public right-of-way for City access and maintenance. Sampling stations shall be installed on the same side of the street as the water main, and installation of fences, landscaping, or other obstructions shall in no way hinder the operation of the sampling station. Additional requirements are listed below.

1. Must have a minimum of five (5) service connections upstream and downstream.
2. Maintain at least 60 inches of separation between this system and other service lines or fire hydrants.
3. Installed on the north or east side of the street to prevent icing in winter.

4. Not located in roadway intersection.
5. No bends or offsets shall be used in installing the water sampling station off branch main.
6. The service line to each sampling station shall be ¾ inch.
7. Each sampling station shall include, at a minimum, the following components: curb stop, valve box, valve body, packing nut, and 1-inch stainless steel barrel, and sampling enclosure.
8. The basis of design for water sampling stations shall be Kupferle Eclipse 24, or City-approved equal.

204 WATER DISTRIBUTION SYSTEM CONSTRUCTION SPECIFICATIONS

204.1 Materials

Materials furnished shall be new and undamaged. Everything necessary to complete all installations shall be furnished and installed whether shown on approved drawings or not, and all installations shall be completed as fully operational.

Acceptance of materials or the waiving of inspection thereof shall in no way relieve the Responsible Party of the obligation to furnish materials meeting the requirements of these Standards and Specifications.

The City reserves the right to direct or deny use of certain types of materials in specific circumstances. Materials delivered to the job site shall be adequately housed and protected so as to ensure the preservation of their quality and fitness for the work.

A. Ductile Iron Pipe

DIP shall be manufactured in accordance with AWWA Standard C-150 and C-151, "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds for Water or Other Liquids", with the following additional requirements or exceptions:

1. "Push-on single gasket" type conforming with applicable requirements of AWWA Standard C-111, "Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings".
2. The grade of iron shall be 60-42-10 having a minimum tensile strength of 60,000 psi, minimum yield strength of 42,000 psi, and a minimum % of elongation of 10%.
3. Pipe furnished under this specification shall conform to AWWA C-150 and C-151, and have nominal laying lengths of either 18 or 20 feet. Random lengths are not acceptable.
4. Pipe furnished shall have standard thickness cement mortar linings in accordance with AWWA Standard C-104, "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water", and the exterior coating shall be the standard outside bituminous coating as specified in AWWA C-151.

5. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager upon request.
6. Ductile iron water pipe shall be installed per AWWA C-600.
7. Refer to Detail 200-15 for corrosion protection.

B. Polyvinyl Chloride Pressure Pipe

1. All polyvinyl pipe for water mains 12 inches and less, except that 10 inch diameter is not permitted, shall be manufactured in accordance with AWWA Standard C-900-07, "Polyvinyl Chloride (PVC) Pressure Pipe.", and shall meet the requirements for DR-25 for all distribution mains, and shall meet the requirements of DR-18 for hydrant leads. All PVC pipe larger than 12 inches shall meet C-905-97, and shall be DR-21 or DR-18 as determined by the Development Engineering Manager.
2. Solvent cement joints are strictly prohibited.
3. Each length of pipe shall be a standard laying length of 20 or 12 feet. Random lengths shall only be acceptable at fittings and hydrant branch lines. PVC pipe must be laid with tracer wire (16-gauge wire only).
4. PVC must conform to cast iron outside diameters. Pipe stored outside which may be exposed to sunlight for more than 30 days, shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover the pipe. Air circulation shall be provided under the covering. Sunburned pipe shall not be permitted for installation and shall be removed from the job site immediately. Pipe must be UL approved.
5. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager.

C. Fittings

Cast iron fittings shall be manufactured in accordance with the following AWWA standards: C-104, "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water," C-150, "Ductile Iron Fittings" and C-111, "Rubber Gasket Joints for Ductile Iron Pressure for Pipe and Fittings," with the following additional requirements or exceptions:

1. Fittings shall be furnished with a cement mortar lining of standard thickness as defined in referenced specifications and given a seal coat of bituminous material.
2. Fittings shall be furnished with mechanical joint, ring tite or flanged ends conforming to referenced specifications and, in addition, the tee-head mechanical joint bolts and hexagon nuts shall be fabricated from a high

strength, stainless steel or approved equal. Swivel fittings as approved by the Development Engineering Manager may also be utilized. Under no circumstances shall repair clamps be permitee don new installations.

3. Fittings shall be of the 250-psi pressure rating and shall conform to the dimensions and weights shown in the tables of referenced specifications.
4. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager.
5. Refer to Detail 200-15 for corrosion protection.

D. Gate Valves

Refer to Detail 200-6A and 200-6B for gate valve requirements, and Detail 200-15 for corrosion protection.

E. Valve Boxes

Refer to Detail 200-6B for valve box requirements, and Detail 200-15 for corrosion protection.

F. Butterfly Valves

Refer to Detail 200-8 for butterfly valve requirements.

G. Pressure Reducing and Regulating Valves

1. PRV's shall be Cla-Val 90-01 series or an approved equivalent. The valve shall be designed to reduce a high upstream pressure to a constant downstream pressure by way of a pilot control system. The pilot system shall control the main valve which shall be of the single seated, hydraulically operated, diaphragm, globe valve type. The valve seats shall be stainless steel.
2. Material shall be cast iron for valve body. Flanges and covers shall conform to ASTM Standard Designation A-48. Bronze castings or parts for internal trim shall conform to ASTM Standard B-61.
3. Valves shall be furnished with flanged ends and drilled in accordance with ANSI B-16.1 Class 125 specifications. Flanges shall be machined to a flat face or machined to a flat surface with a serrated finish in accordance with AWWA Standard C-207.
4. The pilot valve for controlling operation of the main valve shall be a single seated, diaphragm operated, spring loaded type. The pilot valve shall be attached to the main valve with piping and isolation valves so arranged for easy access in making adjustments and also for its removal from the main valve while the main valve is under pressure. Pilot control system shall be stainless steel with 316 stainless steel trim.
5. The needle valve shall be bronze and included with the main valve to control the speed of piston travel.
6. The operating pressure shall be 150 psi.

7. The body of the PRV shall be given a hydrostatic test of 50% more than the operating pressure specified herein. A second test to check seating of the cylinder shall be made at the operating pressure.
8. Pressure reducing and regulating valves shall be installed in factory built steel vaults as specified in Detail 200-12. There shall be no dissimilar metals allowed in the piping in the PRV vaults without proper insulation.
9. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager.
10. After approved factory assembly, each valve shall be given the operation and hydrostatic tests in accordance with the referenced specifications.
11. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager.

H. Air Valves

Refer to Details 200-13A and 13B for air valve requirements.

I. Blowoff Assemblies

Refer to Detail 200-9 for blowoff assembly requirements.

J. Vaults

1. Vaults shall be fabricated steel and shall be factory built for underground use as manufactured by Engineered Fluid, Inc., or approved equal. Field welding to complete the structure shall not be allowed.
2. The vault shall have a protective coating for corrosion protection and shall be equipped with packaged magnesium anodes for cathodic protection. The anodes shall be buried equally spaced around the vault and connected by heavy copper wire to bags on the vault provided for that purpose.
3. Vaults shall be designed with wall sleeves and link seal and be capable of handling thrusts caused by operating valves.
4. The designing engineer shall submit shop drawings along with design calculations including the electric layout to the Development Engineering Manager for approval prior to the installation.

K. Thrust Blocks

Refer to Detail 200-11 for thrust block requirements.

L. Concrete

Refer to Section 600 of these Standards and Specifications for all concrete work requirements.

M. Mechanically Restrained Joints

Megalugs, Cam-Lok or approved equal shall be used. Tie rods may be used as approved by the Development Engineering Manager. If tie rods are used, they shall be mild steel, ASTM Standard Designation A-36. Hex nuts shall be ASTM Standard Designation A-307, grade A or B, Hexagon Heavy series. Tie rods shall be used at bends and fittings where thrust blocks cannot be used due to existing field conditions or where harness rods are specifically required by the Development Engineering Manager. Harness rods shall have a bituminous coating for corrosion protection.

N. Fire Hydrants

Refer to Detail 200-10 for fire hydrant requirements.

204.2 Corrosion Protection

DIP, steel pipe, steel casing pipe, harness rods, fittings, valves, and valve boxes shall be protected as specified in Detail 200-15.

204.3 Installation of Pipe

A. Refer to Section 100 for excavation, dewatering, pipe bedding, testing, backfill, and compaction requirements.

B. Pipe shall be installed in accordance with AWWA C-900 along with the following provisions:

1. Pipe and fittings shall be loaded and unloaded by lifting so as to avoid shock or damage. Under no circumstances shall such material be dropped. Before the placing of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of foreign material, kept clean, and examined for cracks or defects before installation. No pipe shall be installed that is damaged by prolonged exposure to the sun or adverse weather conditions.
2. Joint lubricant shall be as supplied by the pipe manufacturer.
3. When laying pipe on curves, the pipe shall be kept in alignment by deflecting joints or using short lengths of pipe. If using deflecting joints, recommended practices and allowances as stipulated by the manufacturer must be adhered to. Pipe shall be laid with the bell ends facing in the direction of laying unless directed otherwise by the Development Engineering Manager.
4. Whenever the pipe is left unattended, temporary plugs shall be installed at openings. Temporary plugs shall be watertight, standard cast iron, and of such design as to prevent children and animals from entering the pipe. Temporary plugs shall be subject to approval by the Development Engineering Manager.
5. Pipe and appurtenant structures shall not be installed upon a foundation into which frost has penetrated or at any time when the Inspector deems there is a danger of ice formation or frost penetration at the bottom of the excavation. Pipe and appurtenant structures shall not be installed unless backfilling can be completed before the formation of ice and frost.
6. Immediately before joining two (2) lengths of pipe, the inside of the bell and the outside of the spigot end and the gasket shall be thoroughly cleaned.

Caution shall be exercised to ensure that the correct type of gasket is used. A thin film of gasket lubricant shall be applied according to the manufacturer's recommended practices to either the inside face of the gasket or the spigot end of the pipe or both.

7. The spigot end of the pipe shall be placed in the socket with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow steady pressure, without jerky or jolting movements. Stabbing shall not be permitted. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion to the full depth of the joint.
8. Extra care should be used in handling PVC pipe during cold weather due to the reduced flexibility and impact resistance as temperatures approach and drop below freezing.
9. Non-disinfected mains which cannot be isolated shall not be connected to an existing, disinfected main. The Responsible Party shall assume any and all responsibility for damage done by heavily chlorinated water entering existing facilities due to negligence on his part. Water mains shall adhere to the following sequence of tests: (1) chlorine, (2) pressure tests, and (3) clearwater test.

204.4 Installation of Valves and Valve Boxes

Refer to Detail 200-6A & 200-6B for installation requirements for valves and valve boxes.

204.5 Testing

Refer to Subsection 206 of these Standards and Specifications.

205 WATER SERVICES AND APPURTENANCES CONSTRUCTION SPECIFICATION

205.1 General

Water services construction connecting to the City water system shall be done in accordance with these Standards and Specifications, which shall cover new water services construction from the water main to the meter pit or vault. Refer to Sections 100, 204, and 206 for installation and testing procedures for water services and appurtenances.

205.2 Materials

A. Materials furnished shall be new and undamaged. Everything necessary to complete installations shall be furnished and installed whether shown on the approved drawings or not and installations shall be completed as fully operational.

B. Acceptance of materials or the waiving of inspection thereof shall in no way relieve the Responsible Party of the obligation to furnish materials meeting the requirements of these Standards and Specifications.

C. The City reserves the right to direct or deny use of certain types of materials in specific circumstances.

D. Materials delivered to the job site shall be adequately housed and protected so as to ensure the preservation of their quality and fitness for the work.

E. The minimum size allowable for a water service shall be three-fourths (3/4) inch diameter.

1. Copper Service Pipe - Type "K" only

   Type "K" copper shall be used for service lines three-fourths (3/4) inch through three (3) inch diameter. Type “K” copper shall be utilized from the main through the meter pit on residential applications (single family and duplex services). Materials in conformance with the most currently adopted version of the International Plumbing Code (including all adopted amendments) are permitted from the meter to the building for residential applications (single family and duplex services) and from the main to the building for non-residential services.

2. Ductile Iron Service Pipe

   DIP shall be used for services larger than three (3) inches.

3. Corporation and Curb Stops

   a. A curb stop or valve of the same size as the service pipe and conforming to the following standards shall be installed on every commercial service larger than one (1) inch between the water main and the meter which is at a point at or near the property line.

   b. Water service saddles shall be cast bronze with double silicone bronze straps, Type 325 or 327 by Smith-Blair Inc., or an approved equal.

   c. Corporation stops shall be AWWA taper thread to copper connection of pack joint and shall be a Ford Type F600 or an approved equal.

   d. Curb stops shall be compression to compression connections and shall be Ford Ball Valves, B44-666M (one and one-half (1-1/2) inches) or B44-777M (two (2) inches) or approved equal.

   e. Curb stops are set in the service on the inlet side, a minimum of two (2) feet upstream of the vault and provide a means to shut off the service for repairs inside the meter vault.

   f. Curb stop service boxes shall be a cast iron box, Minneapolis pattern, extension type. The curb stop box shall be centered over the curb stop valve and in a vertical position. The top lid of the curb stop box shall be installed a maximum of one (1) inch above the final grade.

205.3 Location

Refer to Detail 200-2 for service location requirements

205.4 Depth

Refer to Detail 200-14 for service depth requirements

205.5 Connections

Refer to Detail 200-14 for service connection requirements

205.6 Abandonment

Only one (1) domestic tap is allocated per single family residence. If it is required by the Development Engineering Manager to abandon an existing water tap, it shall be turned off, the connection threads destroyed, and disconnected at the main. City shall inspect disconnection prior to backfilling. If the City does not inspect prior to backfilling the contractor will be required to re-excavate affected area for inspection. A compression fitting shall be utilized if necessary to relocate a meter pit from a driveway area, only if the installation of a new service line would require the cutting and patching of asphaltic concrete surfacing.

206 WATER MAIN ACCEPTANCE PROCEDURE

206.1 Scope

This procedure is to be followed when releasing a newly installed water main or releasing a repaired pre-existing water main. It covers disinfection, bacteriological sampling, and reporting of results.

206.2 New Mains

Installation shall be in accordance with established AWWA standards (AWWA C-600 or C-603) with particular attention paid to the provision for cleanliness within the pipe itself. Flushing and disinfection shall be performed by the Responsible Party in accordance with AWWA Standard C-601 (more detailed instructions shall be found below). Sampling (bacteriological and chlorine residual) shall be performed by personnel from the Thornton Water Quality Control Laboratory. Chlorine residual analysis shall be performed using accepted test procedures in Standard Methods for the Examination of Water and Wastewater's most recent edition. Bacteriological testing shall be performed by personnel from the Thornton Water Quality Control Laboratory. The release form shall be initiated by personnel from the Thornton Water Quality Control Laboratory with copies to Tri-County Health Department and the Colorado Department of Health (with the Water Quality Control Laboratory being responsible for forwarding copies to the health departments and being responsible for notifying the Responsible Party).

206.3 Repaired Mains

After a main has been repaired and flushed, personnel from the Thornton Water Quality Control Laboratory or Operations Department shall inspect the water for color, turbidity, and chlorine residual, prior to restoring the repaired main into service.

206.4 Disinfection

Disinfection shall be accomplished using tablet form Hypochlorite. These shall be affixed to the inside (top) with an approved food grade adhesive such as Permatex Form-A-Gasket No. 2 and Permatex Clear RTV silicone adhesive sealant, or approved equivalent. Dosage shall be calculated for a 100 mg/liter chlorine concentration for volume of installed pipe (this is to allow for the refilling of pre-existing pipe attached to the installed

sections). For calculating the weight of chlorine required, see Table 200-2. The chlorine solution shall remain in contact with the piping for a minimum of 24 hours.

Table 200-1: Minimum Number of Hypochlorite Tablets
Tablets of 7 Gram Strength (5 Grams Available Chlorine) For a Dose of 100 MG/L

Diameter of Pipe (inches)	13-foot Section of Pipe	18-foot Section of Pipe	20-foot Section of Pipe	30-foot Section of Pipe	40-foot Section of Pipe
4	1	1	1	2	2
6	2	2	3	2	5
8	3	3	4	6	8
12	6	8	9	14	18
16	11	15	16	24	32
18	13	18	20	30	40
20	16	23	25	37	50
24	24	32	36	54	71
30	36	50	56	83	111
36	52	72	80	120	160

206.5 Flushing

After chlorination or disinfection of the pipeline, flushing shall commence to remove the chlorine solution. Flushing shall continue for a minimum of five (5) minutes beyond the time when chlorine residual is present at the same levels as normal distribution system residuals.

206.6 Fire Sprinkler Main Testing

Fire sprinkler system water mains (from the water supply to the system riser) and lead-in connections to sprinkler system risers shall be completely flushed before connection is made to sprinkler piping. The flushing operation shall be continued for a sufficient time to ensure thorough cleaning. The minimum rate of flow shall be not less than one of the following:

A. The hydraulically calculated water demand rate of the system including any hose requirements;

B. That flow necessary to provide a velocity of 10 ft/sec (see Table 200-2);

C. The maximum flow rate available to the system under fire conditions.

TABLE 200-2: Minimum Rate of Flow
Flow Required to Produce A Velocity of 10 FT/S (3 M/S) In Pipes

Pipe Size (inches)	Flow Rate (GPM)
4	390

Pipe Size (inches)	Flow Rate (GPM)
6	880
8	1560
10	2440
12	3520

206.7 Hydrostatic Testing

A. No hydrostatic tests shall be made on any portion of the pipeline until field placed concrete has had adequate curing time as defined for thrust blocks in Detail 200-11 and compaction test results have been submitted to and approved by the Development Engineering Manager. Only potable water may be used in testing procedures.

B. The pipeline shall be tested in accordance with AWWA C-600 or C-900 except as follows:

C. The pipeline shall be tested with water at a pressure of 150 psi or 50 psi above working pressure, whichever is greater.

D. The Development Engineering Manager shall be notified 24 hours in advance of testing. Acceptance testing shall be made in the presence of the Development Engineering Manager only after the pipeline is in a state of readiness for testing.

E. Air in the line shall be properly purged. Where blowoffs or hydrants are not available or effective in purging air from the line, the Development Engineering Manager may require a tap to purge the line. The location and size of the tap shall be at the Development Engineering Manager's discretion. The cost for such a tap shall be borne by the Responsible Party.

F. No leakage is allowed through the bonnet of the line valve. Any valve leaking through the bonnet shall be removed and replaced.

G. The pressure test shall be a two (2) hour test taken at the high point in the line. Every time the water line pressure drops five (5) psi, the pump shall be started to bring the line pressure back to the initial pressure.

H. PVC or DIP shall be considered to have passed the pressure test when the total leakage in (24) hours is less than 11.5 gallons per inch of inside diameter per mile of pipeline. The Development Engineering Manager shall direct the Responsible Party to repair specific leaks regardless of test results, if in his opinion they are serious enough to endanger the future service of the pipeline. Pipelines shall be tested in sections as rapidly as such section may be isolated. Should any leakage of the pipeline become apparent during the one (1) year warranty period, the City shall perform the necessary repairs. The Responsible Party shall be invoiced for all work performed during the one (1) year warranty period. Blowoffs, pressurizing pump, corporation stops, and water measuring apparatus shall be provided by the Responsible Party, or at his expense. At the Development Engineering Manager's discretion, measuring apparatus may be required to be calibrated by Thornton personnel at the Responsible Party expense.

I. The City shall not be held responsible for water tightness of its valves on existing facilities. If existing valves leak, the City shall assist in reducing the influx of water, but the Responsible Party must use methods at his own disposal to work with the resulting leakage.

J. Maximum Permissible Leakage Loss from Water Mains (Adapted from AWWA C-601 – Formula – Permissible Leakage Loss = 11.5 gal/Inch Dia/Mile/24 hrs.)

TABLE 200-3a: 6-Inch Diameter Pipe Permissible Leakage Loss

Pipe Length (Feet)	0.5 Hours	1 Hour	1.5 Hours	2 Hours	24 Hours
50	0.01	0.03	0.04	0.05	0.65
100	0.03	0.05	0.08	0.11	1.31
200	0.05	0.11	0.16	0.22	2.61
300	0.08	0.16	0.25	0.33	3.92
400	0.11	0.22	0.33	0.44	5.23
500	0.14	0.27	0.41	0.54	6.53
600	0.16	0.33	0.49	0.65	7.84
700	0.19	0.38	0.57	0.76	9.15
800	0.22	0.44	0.65	0.87	10.45
900	0.25	0.49	0.74	0.98	11.76
1000	0.27	0.54	0.82	1.09	13.07

TABLE 200-3b: 8-Inch Diameter Pipe Permissible Leakage Loss

Pipe Length (Feet)	0.5 Hours	1 Hour	1.5 Hours	2 Hours	24 Hours
50	0.02	0.04	0.05	0.07	0.87
100	0.04	0.07	0.11	0.15	1.74
200	0.07	0.15	0.22	0.29	3.48
300	0.11	0.22	0.33	0.44	5.23
400	0.15	0.29	0.44	0.58	6.97
500	0.18	0.36	0.54	0.73	8.71
600	0.22	0.44	0.65	0.87	10.45
700	0.25	0.51	0.76	1.02	12.20
800	0.29	0.58	0.87	1.16	13.94
900	0.33	0.65	0.98	1.31	15.68

Pipe Length (Feet)	0.5 Hours	1 Hour	1.5 Hours	2 Hours	24 Hours
1000	0.36	0.73	1.09	1.45	17.42

TABLE 200-3c: 12-Inch Diameter Pipe Permissible Leakage Loss

Pipe Length (Feet)	0.5 Hours	1 Hour	1.5 Hours	2 Hours	24 Hours
50	0.03	0.05	0.08	0.11	1.31
100	0.05	0.11	0.16	0.22	2.61
200	0.11	0.22	0.33	0.44	5.23
300	0.16	0.33	0.49	0.65	7.84
400	0.22	0.44	0.65	0.87	10.45
500	0.27	0.54	0.82	1.09	13.07
600	0.33	0.65	0.98	1.31	15.68
700	0.38	0.76	1.14	1.52	18.30
800	0.44	0.87	1.31	1.74	20.91
900	0.49	0.98	1.47	1.96	26.14
1000	0.54	1.09	1.63	2.18	26.14

TABLE 200-3d: 16-Inch Diameter Pipe Permissible Leakage Loss

Pipe Length (Feet)	0.5 Hours	1 Hour	1.5 Hours	2 Hours	24 Hours
50	0.04	0.07	0.11	0.15	1.74
100	0.07	0.15	0.22	0.29	3.48
200	0.15	0.29	0.44	0.58	6.97
300	0.22	0.44	0.65	0.87	10.45
400	0.29	0.58	0.87	1.16	13.94
500	0.36	0.73	1.09	1.45	17.42
600	0.44	0.87	1.31	1.74	20.91
700	0.51	1.02	1.52	2.03	24.39
800	0.58	1.16	1.74	2.32	27.88
900	0.65	1.31	1.96	2.61	31.36
1000	0.73	1.45	2.18	2.90	34.85

206.8 Bacteriological Sampling

24 hours after flushing, personnel from the City shall sample fire hydrants, fire lines, and blowoffs for bacteriological contamination. A minimum of two (2) samples shall be analyzed. Samples shall be collected in duplicate, that is, two (2) samples from each hydrant tested. If the samples show no bacteriological growth and are free from excessive turbidity, the Thornton Water Quality Control Laboratory shall release the main for service and shall initiate the required forms. If samples do not warrant approval for main release from the Thornton Water Quality Control Laboratory, lines must be re-flushed. If again, samples do not warrant approval for main release after flushing, re-chlorination shall be required.

207 WATER METER INSTALLATION STANDARD SPECIFICATIONS

207.1 General Information

A. Jumper Pipes

Jumper pipes are permitted during the construction phase for the purpose of checking the water service and interior plumbing for leaks. The jumper pipe is to be removed from the water meter yoke prior to the request for inspection.

B. Meter Setting Requirements

Prior to a meter setting:

1. Rough plumbing is required to be installed, and required backflow prevention devices and all other plumbing inspections shall be inspected and passed by the City.
2. Grading is required to be completed.
3. All development fees shall be paid to the City’s Finance Department.

C. Water Meters

Water meters, regardless of size, connected to the City's utility system, shall be purchased from and remain the property of the City. Under no circumstances shall anyone other than City personnel remove a water meter once the pit or vault has been inspected and approved.

D. Special Meter Installations

For any installation where special or unusual conditions might exist, detailed drawings, accompanied by a letter of explanation, shall be submitted to the City for approval.

E. Water Meters Over Four (4) Inches in Size

For any water meter installation over four (4) inches in size, detailed drawings of the proposed installation shall be submitted to the Development Engineering Manager for approval prior to any construction.

F. Easements

The City shall be provided easements for water meter installations if required. The width of easements shall be determined dependent upon the circumstances (i.e., line depth).

G. Electrical Wiring

There shall be no electrical wiring allowed in any water meter pit or vault with the exception of remote wiring.

H. Tagging

At the time of final building inspection approval, the meter pit/vault shall be tagged in the off position. The tag shall be removed by the City after the meter is set. It is unlawful for unauthorized individuals to remove the tag.

207.2 Meter Installations

A. 5/8-inch, 3/4-inch, and 1-inch Water Meter Vaults

Water meter vaults for five-eighths (5/8) inch x three-fourths (3/4) inch, three-fourths (3/4) inch x three-fourths (3/4) inch, one (1) inch water meter installations shall be as shown on Detail 200-16. The design of this vault must be submitted by a registered PE to the Development Engineering Manager.

B. 1-1/2-inch and 2-inch Water Meter Vaults

Water meter vaults for one and one-half (1½) inch and two (2) inch water meter installations shall be as shown on detail drawings 200-17A, 200-17B, and 17C. The design of this vault must be submitted by a registered PE to the Development Engineering Manager.

C. 3-inch and 4-inch Water Meter Vaults

Water meter vaults for three (3) inch and four (4) inch water meter installations shall be as shown on Details 200-18A and 200-18B. The design of the vault must be submitted by a Colorado registered PE to the Development Engineering Manager.

D. Galvanized Pipe

Galvanized pipe and fittings are specifically prohibited.

207.3 Commercial Meter Release Policy

The following procedure shall be adhered to for the installation of commercial meters:

A. The City shall inspect all meter installations.

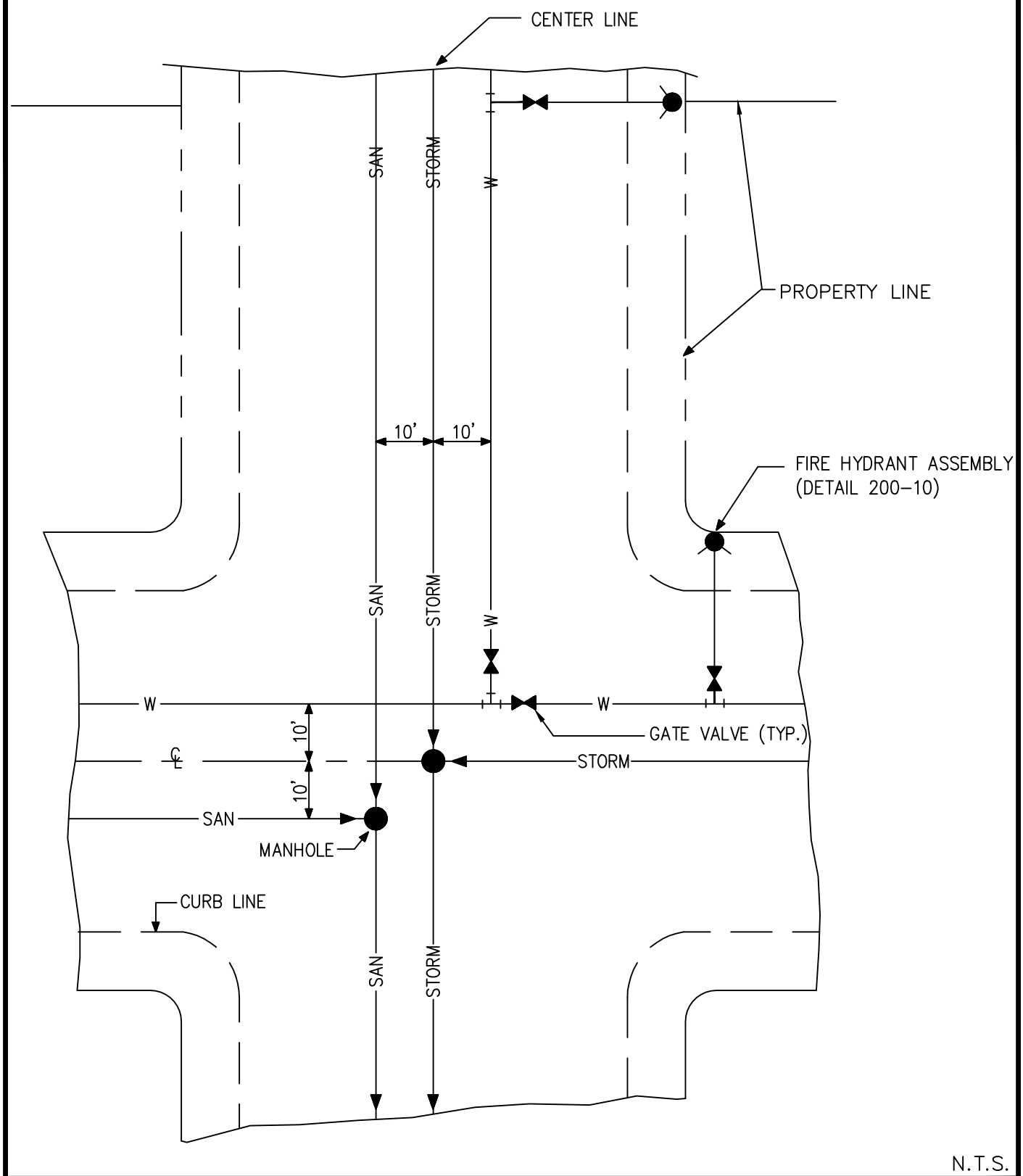
B. The City may conduct a general courtesy inspection of the meter pit/vault prior to the issuance of the meter to assure that facilities conform to their specifications.

C. The City shall conduct cross connection inspections through the Building Division prior to any meter being set.

D. If the meter pit or vault passes an inspection, the meter shall be set. If the meter vault fails inspection, the installation shall be tagged with a rejection tag with discrepancies noted on the back of the tag as well as time and date of inspection.

E. All meters will be installed by the City with the exception of meters three (3) inches and larger which are required to be installed by a licensed plumber.

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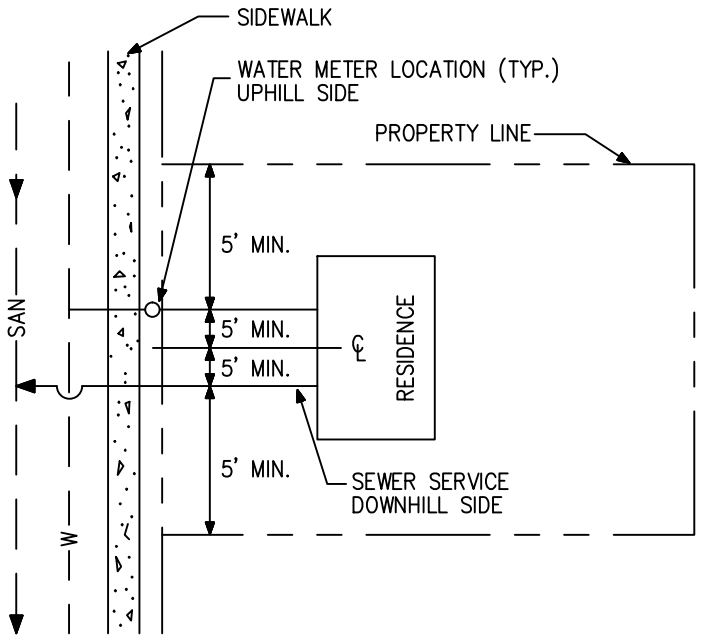
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CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

TYPICAL UTILITY LAYOUT DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-1



TYPICAL HOUSE SERVICE

ALSO REFER TO DETAIL 200-16

SEWER AND WATER SERVICES SHALL BE A MINIMUM OF TEN (10) FEET APART HORIZONTALLY.

SANITARY SEWER SERVICES SHALL BE CONSTRUCTED ON THE SHORTEST AND STRAIGHTEST ROUTE POSSIBLE. NO MORE THAN TWO 1/4 BENDS SHALL BE PERMITTED IN A SANITARY SEWER SERVICE.

SERVICES SHALL NOT BE ANY CLOSER THAN FIVE (5) FEET TO THE SIDE PROPERTY (EXCEPT ON CUL-DE-SACS), AND NO SERVICE MAY BE CONSTRUCTED THROUGH OR IN FRONT OF ANY ADJOINING PROPERTY.

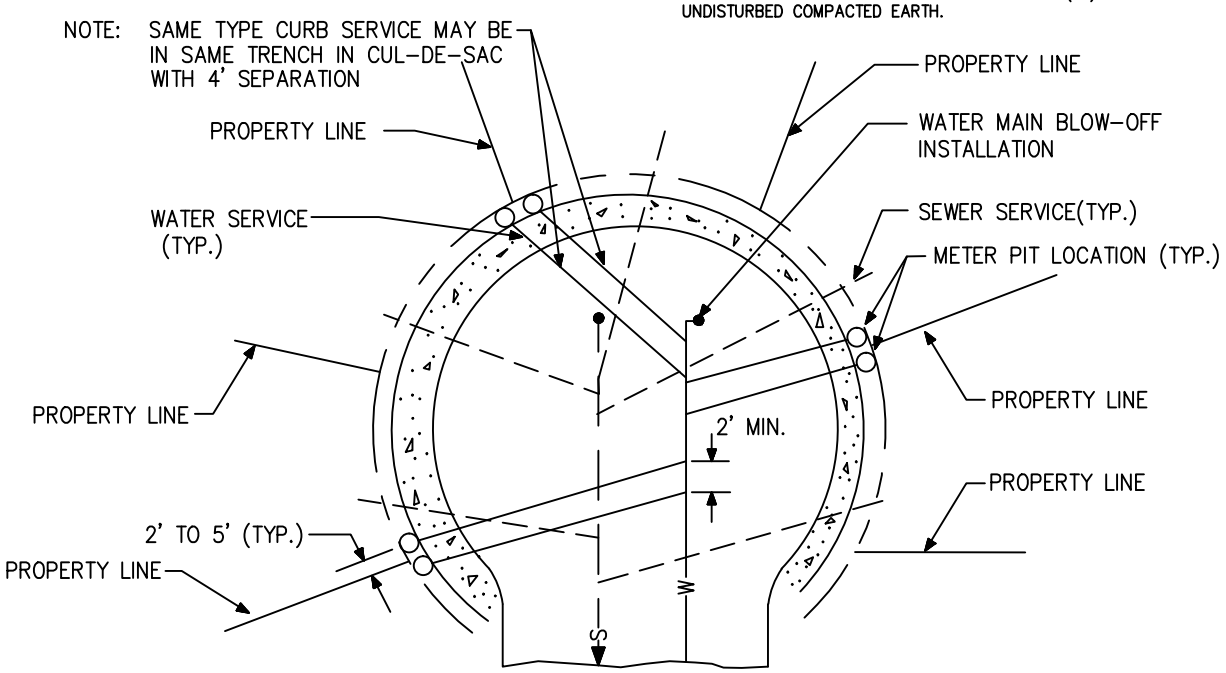
IF SERVICE IS REQUESTED FOR A LOT AT THE END OF A CUL-DE-SAC STREET, THE MAIN TO BE TAPPED MUST NOT BE MORE THAN TWENTY-FIVE (25) FEET FROM THE CURB LINE OR THE PROPOSED CURB LINE AT THE END OF THE CUL-DE-SAC. THE SERVICE PIPE BETWEEN THE MAIN AND THE PROPERTY LINE IN CUL-DE-SACS SHALL BE IN A CONTINUOUS STRAIGHT LINE AND SHALL ENTER THE PROPERTY A DISTANCE OF TWO (2) FEET TO FIVE (5) FEET FROM THE NEAREST LOT CORNER.

WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB. SANITARY SEWER SERVICE LOCATIONS SHALL BE MARKED WITH AN "X" ON THE CURB. MARKINGS SHALL BE NEATLY STAMPED, CHISELED OR SAWCUT, NOT PAINTED.

THAT PORTION OF THE SERVICE PIPE BETWEEN THE MAIN AND THE CURB STOP AND/OR METER WHEN INSTALLED MUST BE IN A CONTINUOUS STRAIGHT LINE, WITH NO JOINTS, EXCEPT REDUCTIONS AND ENLARGEMENTS, AND PERPENDICULAR, IF POSSIBLE, TO THE LINE OF THE MAIN. SERVICES STUBBED INTO THE PROPERTY LINE SHALL BE OF SUFFICIENT LENGTH TO ALLOW DIRECT CONNECTION TO THE METER YOKE.

THE MAIN TO BE TAPPED MUST EXTEND ALONG THE ENTIRE LENGTH OF THE FRONT LOT LINE OF THE PROPERTY TO BE SERVED.

EXCEPT AS HEREINAFTER PROVIDED, SERVICE PIPE SHALL NOT BE INSTALLED IN A TRENCH CONTAINING OTHER CONDUITS WHICH CONVEY ANY SUBSTANCE OTHER THAN POTABLE WATER. THE TRENCH CONTAINING THE SERVICE PIPE SHALL BE SEPARATED LATERALLY FROM TRENCHES CONTAINING OTHER CONDUITS BY AT LEAST TEN (10) FEET OF UNDISTURBED COMPACTED EARTH.



TYPICAL HOUSE SERVICE CONNECTION IN CUL-DE-SACS

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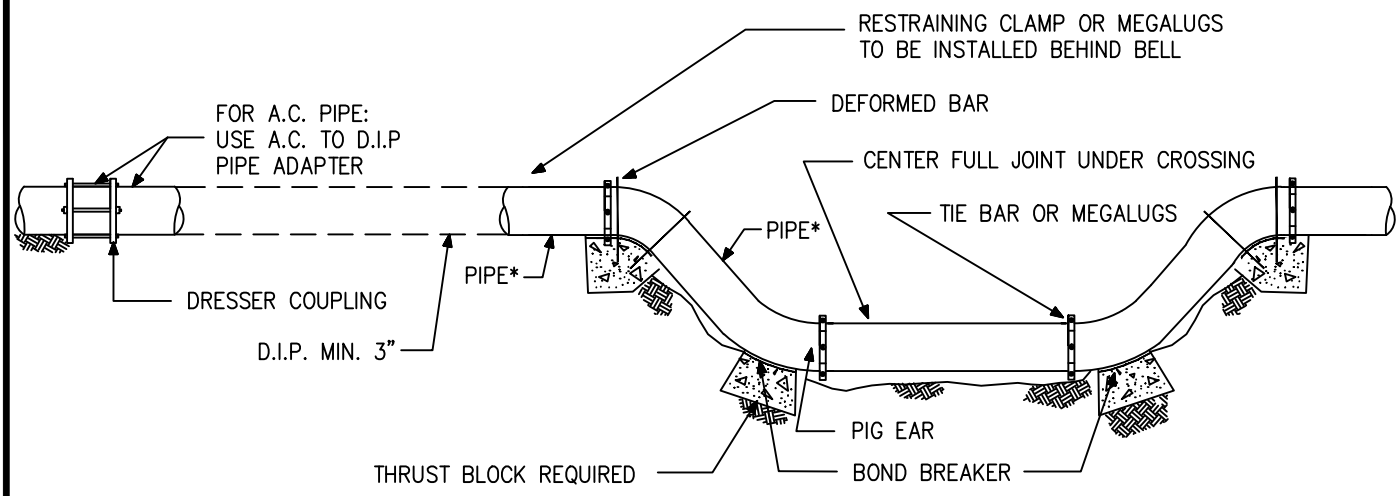
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

SERVICE DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-2

WATERMAIN LOWERING



PIPE* : D.I.P. OR PVC C-900 DR-14

DIP, STEEL PIPE, HARNESS RODS, STEEL CASING PIPE, FITTINGS, VALVES, AND VALVE BOXES SHALL BE HAND WRAPPED USING POLYETHYLENE WITH A MIN. THICKNESS OF EIGHT (8) MILS AND TWO (2) INCH WIDE, TEN (10) MIL THICK POLYETHYLENE PRESSURE SENSITIVE TAPE TO CLOSE SEAMS OR HOLD OVERLAPS. THE POLYETHYLENE SHALL BE APPLIED TO PREVENT THE CONTACT OF BACKFILL MATERIAL WITH THE FITTING. THE RAW MATERIAL USED TO MANUFACTURE POLYETHYLENE FILM SHALL BE TYPE 1, CLASS A, GRADE E-1 IN ACCORDANCE WITH ASTM STANDARD DESIGNATION D-1248. POLYETHYLENE ENCASEMENT MATERIAL SHALL BE MANUFACTURED IN ACCORDANCE WITH AWWA STANDARD C-105.

BITUMINOUS MATERIAL IS TO BE USED FOR CORROSION PROTECTION ON ALL STEEL CASING PIPES. INSTALLATION SHALL BE IN ACCORDANCE WITH ESTABLISHED AWWA STANDARDS (AWWA C-600 OR C-603).

PIPE SHALL BE INSTALLED IN ACCORDANCE WITH AWWA C-900. BEFORE THE PLACING OF PIPE IN THE TRENCH, EACH PIPE OR FITTING SHALL BE THOROUGHLY CLEANED OF FOREIGN MATERIAL, KEPT CLEAN AND EXAMINED FOR CRACKS OR DEFECTS BEFORE INSTALLATION. THE DEVELOPMENT ENGINEERING MANAGER MAY REJECT ANY PIPE WHICH SHOWS DISCOLORATION DUE TO THE SUN.

JOINT LUBRICANT SHALL BE SUPPLIED BY THE PIPE MANUFACTURER.

WHEN LAYING PIPE ON CURVES, THE PIPE SHALL BE KEPT IN ALIGNMENT BY DEFLECTING JOINTS OR USING SHORT LENGTHS OF PIPE. IF USING DEFLECTING JOINTS, RECOMMENDED PRACTICES AND ALLOWANCES AS STIPULATED BY THE MANUFACTURER MUST BE ADHERED TO. PIPE SHALL BE LAID WITH THE BELL ENDS FACING IN THE DIRECTION OF LAYING UNLESS DIRECTED OTHERWISE BY THE DEVELOPMENT ENGINEERING MANAGER.

WHENEVER THE PIPE IS LEFT UNATTENDED, TEMPORARY PLUGS SHALL BE INSTALLED AT OPENINGS. TEMPORARY PLUGS SHALL BE WATERTIGHT, STANDARD CAST IRON AND SHALL BE SUBJECT TO APPROVAL BY THE DEVELOPMENT ENGINEERING MANAGER.

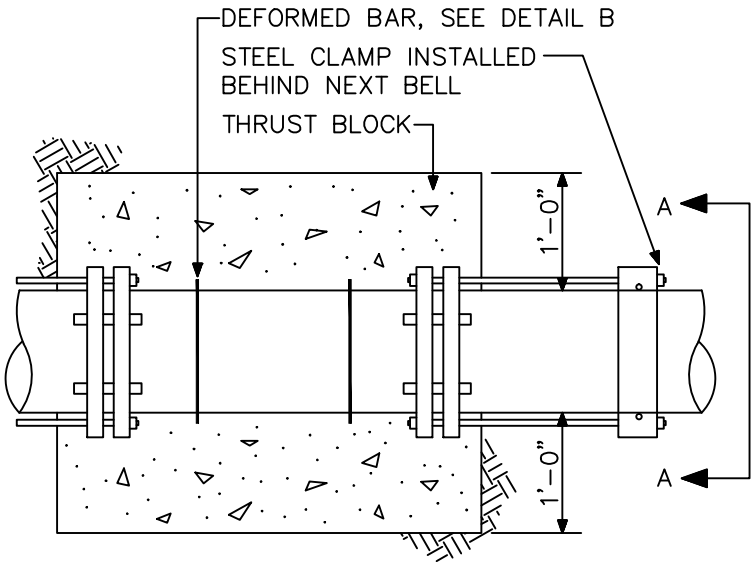
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CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

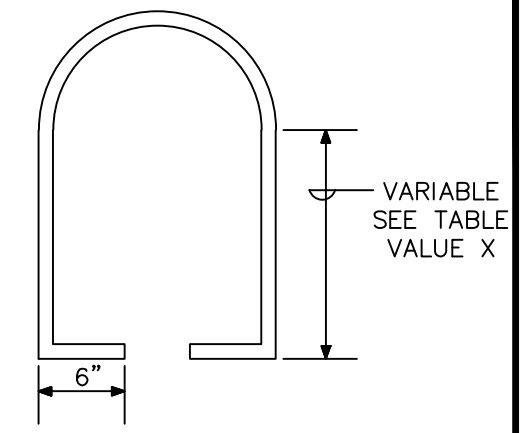
WATERMAIN LOWERING DETAIL

ISSUED:
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DRAWING NO.
200-3A

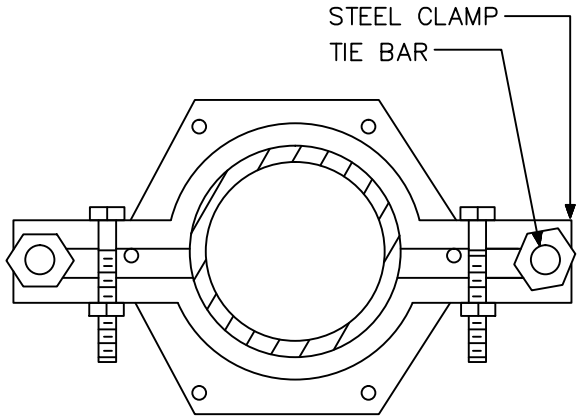


PLAN VIEW A



DETAIL B

MAIN SIZE	DEFORMED BAR		TIE BAR	
	DIA.	X	DIA.	AMOUNT
8"	–	–	.375	2
12"	.500	18"	.500	2
16"	.750	20"	.750	2
24"	1.000	24"	1.000	2



SECTION A–A

NOTES:
1. PIPE USED IN LOWERING SHALL BE DUCTILE IRON PIPE WITH EIGHT (8) MIL POLYWRAP.
2. FITTINGS, PIPES & TIE BARS TO BE WRAPPED SEPARATELY IN POLYETHYLENE.
3. 45° FITTINGS SHALL BE USED.
4. FITTINGS SHALL BE RODDED TO NEXT BELL & NO JOINTS ARE ALLOWED BETWEEN FITTINGS OR UTILIZE MEGALUG CONNECTIONS.
5. FITTINGS SHALL BE M.J.
6. MEGALUG CONNECTIONS OR PIGEARS SHALL BE USED ON RODDING FOR FITTINGS UNLESS OTHERWISE APPROVED BY THE DEVELOPMENT ENGINEERING MANAGER.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

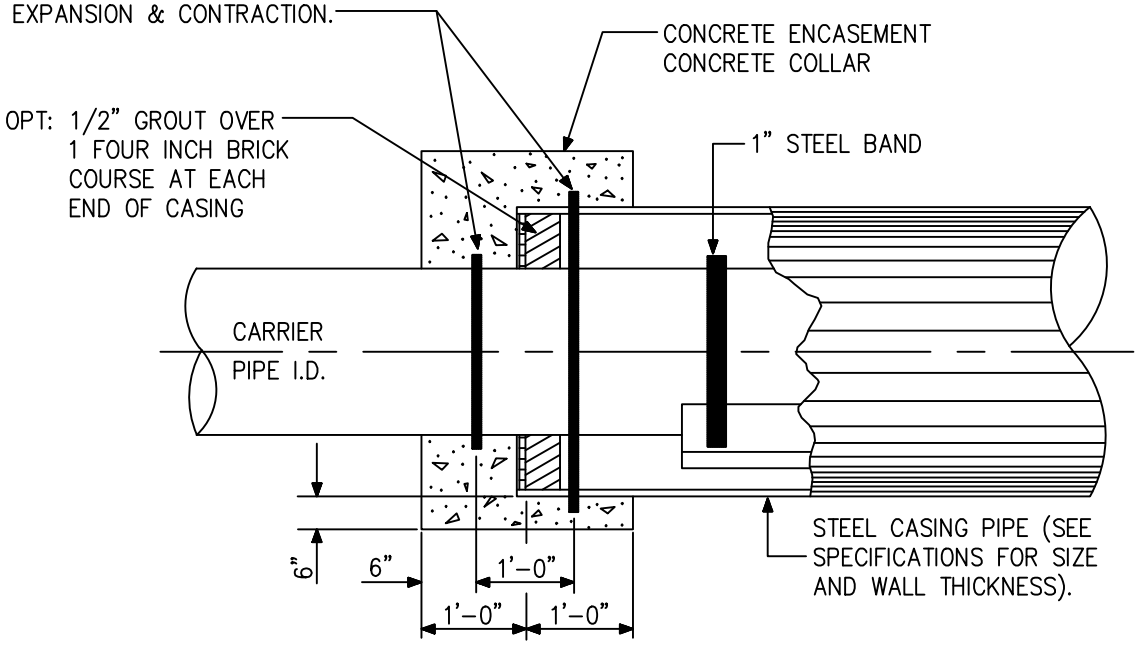
WATERMAIN LOWERING CROSS–SECTION DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

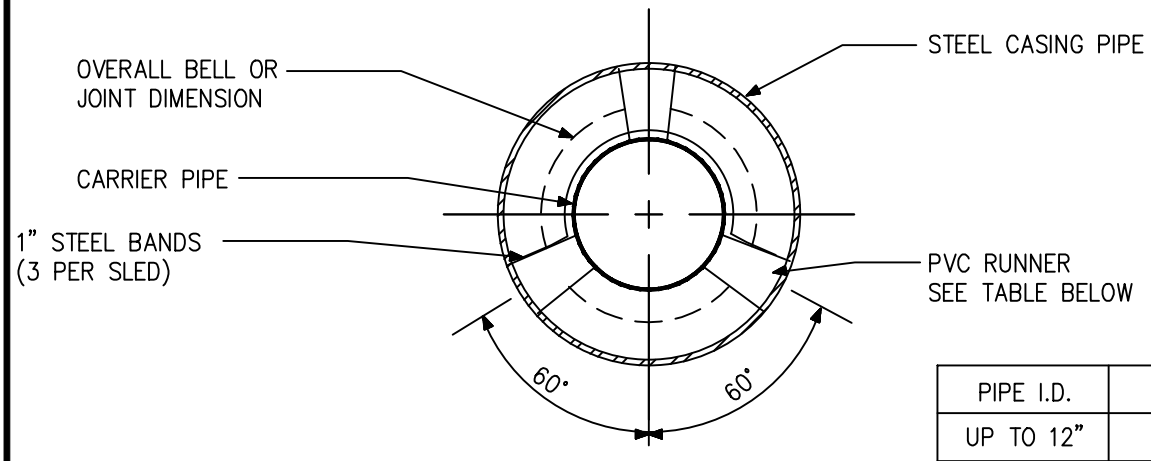
DRAWING NO.
200–3B

SEALING–INSTALL RUBBER O–RINGS OR GASKETS AROUND EACH PIPE (CASING CARRIER) TO PROVIDE CONTINUOUS WATERTIGHT SEAL, TO PREVENT EXPANSION & CONTRACTION.

NOTE:
SLED LENGTHS TO BE 75% OF PIPE LENGTHS.



SLED



PIPE I.D.	RUNNER SIZE
UP TO 12"	4"x 4"
15" – 21"	4"x 4"
24" – 30"	4"x 6"

PIPE CASING DETAIL

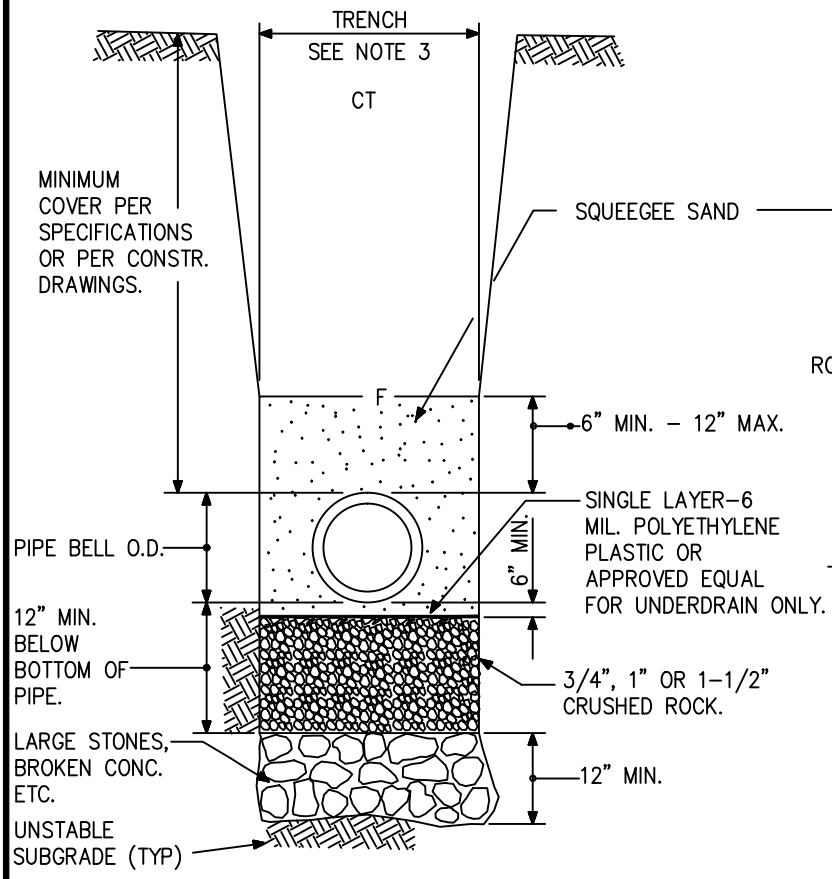
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

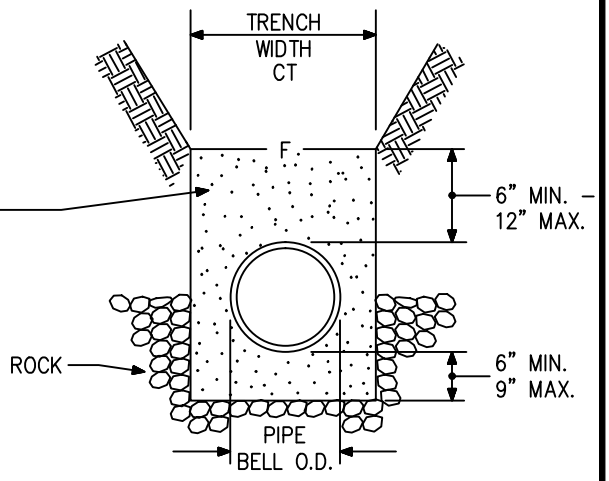
PIPE CASING AND SLED DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

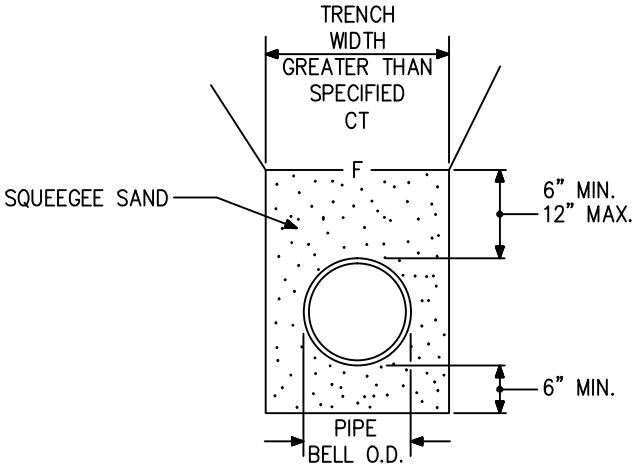
DRAWING NO.
200–4



UNSTABLE SUBGRADE



PIPE BEDDING IN ROCK



TRENCH OVERWIDTH

CT MACHINE COMPACTED TRENCH BACKFILL.

F LIMIT OF SLOPING OR BENCHING OF TRENCH WALLS.

UNDISTURBED GROUND

NOTES:

1. MIN. COVER TO BE BELOW FINAL STREET GRADE WHEN AVAILABLE.
2. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE PROTECTION OF OTHER UTILITIES AND TO MEET LOCAL, STATE & FEDERAL REQUIREMENTS.
3. TRENCH WIDTH SHALL NOT BE MORE THAN 16 INCHES NOR LESS THAN 12 INCHES WIDER THAN THE LARGEST OUTSIDE DIAMETER OF THE PIPE LAID THEREIN. (BELL OR COUPLING O.D., IF APPLICABLE).

N.T.S.

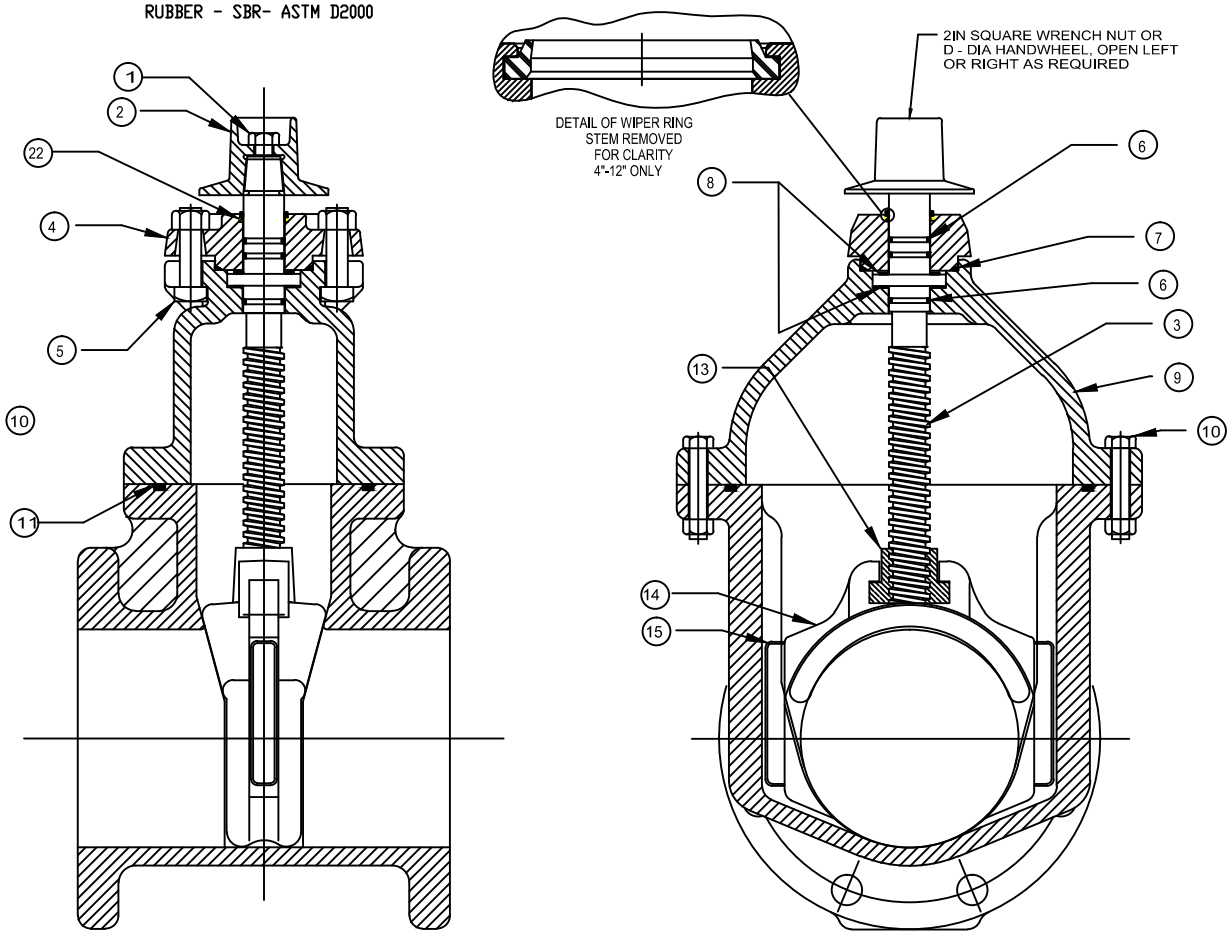
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

SPECIAL BEDDING DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200–5

NOTES:
1. RUBBER ENCAPSULATED CAST IRON DISC
   CAST IRON - ASTM A126 CLASS B
   RUBBER - SBR- ASTM D2000



PART LIST					
ITEM	DESCRIPTION	REQ'D	MATERIAL	ASTM	
1	CAP SCREW	1	304 STAINLESS STEEL	A193	GRADE B8
2	WRENCH NUT	1	CAST IRON	A126	CLASS B
3	STEM	1	BRONZE	B138	ALLOY C67600
4	STUFFING BOX	1	CAST IRON	A126	CLASS B
5	STUFFING BOX BOLTS STUFFING BOX NUTS	2	304 STAINLESS STEEL 304 STAINLESS STEEL	A193 F594	GRADE B8 GROUP 1
6	O-RING	3	RUBBER	D2000	NITRILE
7	O-RING	1	RUBBER	D2000	NITRILE
8	ANTI-FRICTION WASHER	2	CELCON		
9	BONNET	1	CAST IRON	A126	CLASS B
10	BONNET BOLTS BONNET NUTS	"Z"	304 STAINLESS STEEL 304 STAINLESS STEEL	A193 F594	GRADE B8 GROUP 1
11	BONNET GASKET (O-RING)	1	RUBBER	D2000	NITRILE
13	DISC NUT	1	BRONZE	B62	ALLOY C83600
14	DISC	1	SEE NOTE 1		
15	GUIDE CAP	2	CELCON		
16	BODY - FLANGE ENDS	1	CAST IRON		CLASS B
17	HANDWHEEL	1	CAST IRON	A126	CLASS B
18	BODY - MJ ENDS	1	CAST IRON	A126	CLASS B
19	BODY - SLIP-ON ENDS	1	CAST IRON	A126	CLASS B
20	BODY - FLANGE x MJ END	1	CAST IRON	A126	CLASS B
21	BODY - FLANGE x SLIP-ON END	1	CAST IRON	A126	CLASS B
22	WIPER RING	1	RUBBER		

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

GATE VALVE DETAIL

ISSUED:
APRIL 2010
REVISED:

DRAWING NO.
200-6A

GATE VALVES

VALVES SHALL BE MANUFACTURED AND TESTED IN ACCORDANCE WITH AWWA STANDARD C-500, "METAL-SEATED GATE VALVES FOR WATER", OR AWWA C-509 "RESILIENT-SEATED GATE VALVES, 3 THROUGH 12 NPS, FOR WATER AND SEWAGE SYSTEMS" WITH THE FOLLOWING ADDITIONAL REQUIREMENTS OR EXCEPTIONS:

VALVES MEETING AWWA STANDARD C-500 SHALL BE OF A MODIFIED WEDGE DISC CONSTRUCTION, COATED BOTH INSIDE AND OUT WITH A TOUGH, DURABLE EPOXY TO PREVENT CORROSION, CAST IRON BODY, FULLY BRONZE MOUNTED WITH NON-RISING STEMS.

VALVES SHALL BE SUITABLE FOR FREQUENT OPERATION, AS WELL AS SERVICE INVOLVING LONG PERIODS OF INACTIVITY. THE OPERATING PRESSURE FOR VALVES SIX (6) INCHES THROUGH TWELVE (12) INCHES SHALL BE 200 PSI.

VALVE STEMS SHALL BE MADE OF BRONZE AND THREADED SO THAT VALVES SHALL OPEN BY TURNING TO THE LEFT (COUNTERCLOCKWISE). EACH VALVE SHALL BE FURNISHED WITH A TWO (2) INCH SQUARE OPERATING NUT. THE OPERATING NUT SHALL HAVE AN ARROW SHOWING THE DIRECTION OF OPENING AND THE WORD "OPEN" CAST ON THE NUT. THE STEM SEAL SHALL CONSIST OF TWO (2) O-RINGS; ONE OR BOTH POSITIONED ABOVE THE THRUST COLLAR WITH THE VALVE UNDER PRESSURE IN THE FULL OPEN POSITION.

BOLTS AND HEX NUTS USED ON THE BONNET OF THE VALVE SHALL BE THE MANUFACTURER'S STANDARD FABRICATED FROM A LOW ALLOY STEEL FOR CORROSION RESISTANCE.

FLANGES SHALL BE SIZED AND DRILLED IN ACCORDANCE WITH ANSI B-16.1 CLASS 125 SPECIFICATIONS. FLANGES SHALL BE MACHINED IN A FLAT FACE OR MACHINED TO A FLAT SURFACE WITH A SERRATED FINISH IN ACCORDANCE WITH AWWA STANDARD C-207 "STEEL PIPE FLANGES."

THE COMPONENTS OF THE MECHANICAL JOINT SHALL CONFORM TO ANSI A-21.11 (AWWA STANDARD C-111). THE TEE-HEAD BOLTS AND HEXAGON NUTS SHALL BE FABRICATED FROM A HIGH STRENGTH, STAINLESS STEEL, OR AN APPROVED EQUAL.

AFTER APPROVED FACTORY ASSEMBLY, EACH VALVE SHALL BE GIVEN THE OPERATION AND HYDROSTATIC TESTS IN ACCORDANCE WITH THE REFERENCED SPECIFICATIONS.

WEDGE DISC VALVES SHALL BE LIMITED TO THE FOLLOWING MANUFACTURERS OR APPROVED EQUIVALENT: WATEROUS SERIES-500, MUELLER-A-2360, KENSEAL, CLOW R/N. RESILIENT-SEATED GATE VALVES SHALL BE LIMITED TO THE AMERICAN-80 "CRS" GATE VALVE OR THE U.S. PIPE "METROSEAL" GATE VALVE.

THE MANUFACTURER SHALL FURNISH A CERTIFIED STATEMENT THAT THE INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THE RESULTS THEREOF COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE STANDARD(S) HEREIN SPECIFIED. A COPY OF THE CERTIFICATION SHALL BE SENT TO THE DEVELOPMENT ENGINEERING MANAGER UPON REQUEST.

CORROSION PROTECTION SHALL BE COVERED IN SUBSECTION 204.2 OF THESE STANDARDS AND SPECIFICATIONS.

VALVES SHALL BE HANDLED IN SUCH A MANNER AS TO PREVENT ANY INJURY OR DAMAGE AND SHALL BE THOROUGHLY CLEANED BEFORE INSTALLATION. VALVES SHALL BE SET IN SUCH A MANNER THAT THE VALVE STEMS ARE PLUMB. VALVES SHALL BE LOCATED AT POINTS AS SPECIFIED IN SUBSECTION 203.8 OF THESE STANDARDS AND SPECIFICATIONS.

VALVE BOXES

VALVE BOX PARTS SHALL BE MANUFACTURED BY TYLER, SERIES 6860 OR AN APPROVED EQUIVALENT MANUFACTURER AND MADE OF GRAY CAST IRON, BUFFALO TYPE WITH NO. 160 OVAL BASE. A FIVE AND ONE-QUARTER (5 ¼) INCH SCREW-TYPE SHAFT SHALL BE ADJUSTABLE FROM 45 INCHES TO 66 INCHES. VALVE BOX LIDS SHALL BE MARKED WITH THE WORD "WATER" AND SHALL HAVE A LIP OR FLANGE EXTENDING INTO THE VALVE BOX SHAFT. NO SLIP-TYPE BOXES SHALL BE ALLOWED. THE VALVE BOX SHALL BE OF A DESIGN WHICH SHALL NOT TRANSMIT SHOCK OR STRESS TO THE VALVE AND SHALL BE CENTERED AND PLUMB OVER THE OPERATING NUT OF THE VALVE WITH THE BOX COVER FLUSH WITH THE SURFACE OF THE PAVEMENT. IN NON-PAVED AREAS, A 24 INCH SQUARE CONCRETE COLLAR IS REQUIRED AROUND VALVE BOX COVER AS PER THE STANDARD DETAIL IN SECTION 200 OF THESE STANDARDS AND SPECIFICATIONS. IN UNIMPROVED ROADWAYS THE VALVE BOX COVER SHALL BE SET SIX (6) INCHES BELOW FINAL GRADE WITH A MARKER POST INDICATING THE LOCATION AS PER THE STANDARD DETAIL DRAWING.

THE MANUFACTURER SHALL FURNISH A CERTIFIED STATEMENT THAT THE INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THE RESULTS THEREOF COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE STANDARD(S) HEREIN SPECIFIED. A COPY OF THE CERTIFICATION SHALL BE SENT TO THE DEVELOPMENT ENGINEERING MANAGER UPON REQUEST.

FOR VALVE BOXES ALONG FIRE SPRINKLER LINES THE LID SHALL BE LABELED “FIRE”.

CORROSION PROTECTION SHALL BE COVERED IN SUBSECTION 204.2 OF THESE STANDARDS AND SPECIFICATIONS.

FINAL ELEVATION OF VALVE BOXES SHALL BE LEFT TO THE DISCRETION OF THE DEVELOPMENT ENGINEERING MANAGER.

VALVE BOXES SHALL BE INSTALLED PLUMB.

VALVE BOXES WHICH HAVE SHIFTED DURING BACKFILL OPERATIONS AND ARE NO LONGER PLUMB, SHALL BE RE-EXCAVATED AND RE-ALIGNED TO THE SATISFACTION OF THE DEVELOPMENT ENGINEERING MANAGER.

FOR GREENBELT AREA APPLICATION, REFER TO DETAIL 200-7

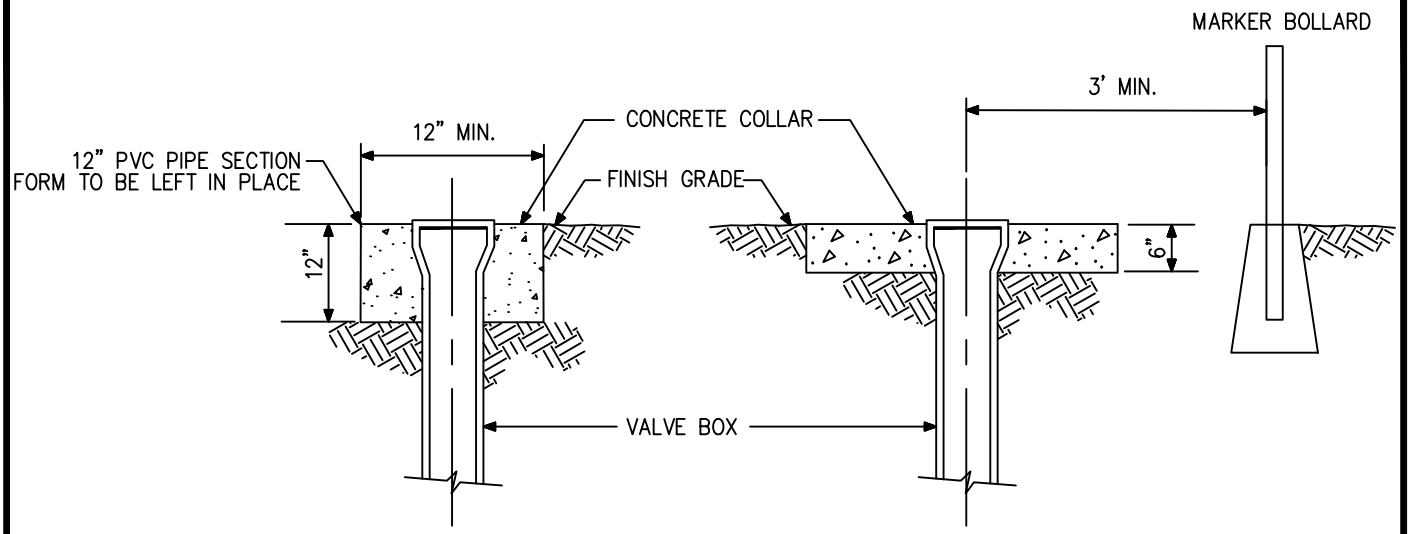
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

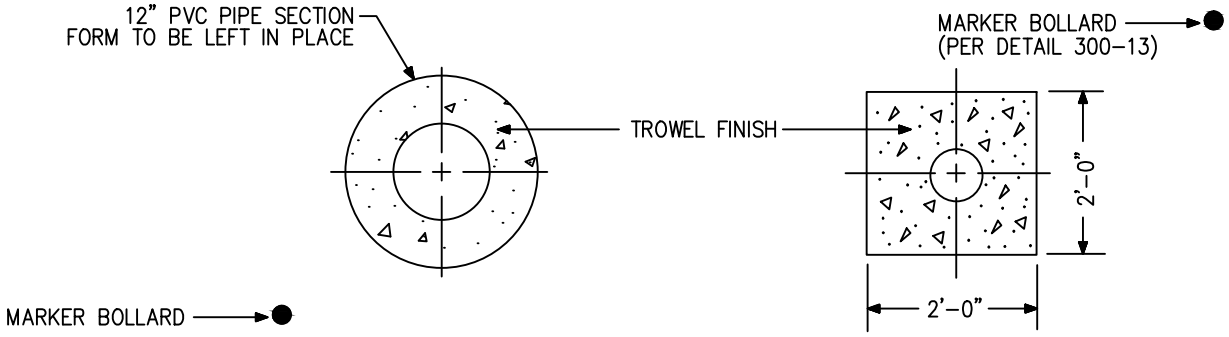
GATE VALVE AND VALVE BOX NOTES

ISSUED:
APRIL 2010
REVISED:

DRAWING NO.
200–6B



SECTION



PLAN

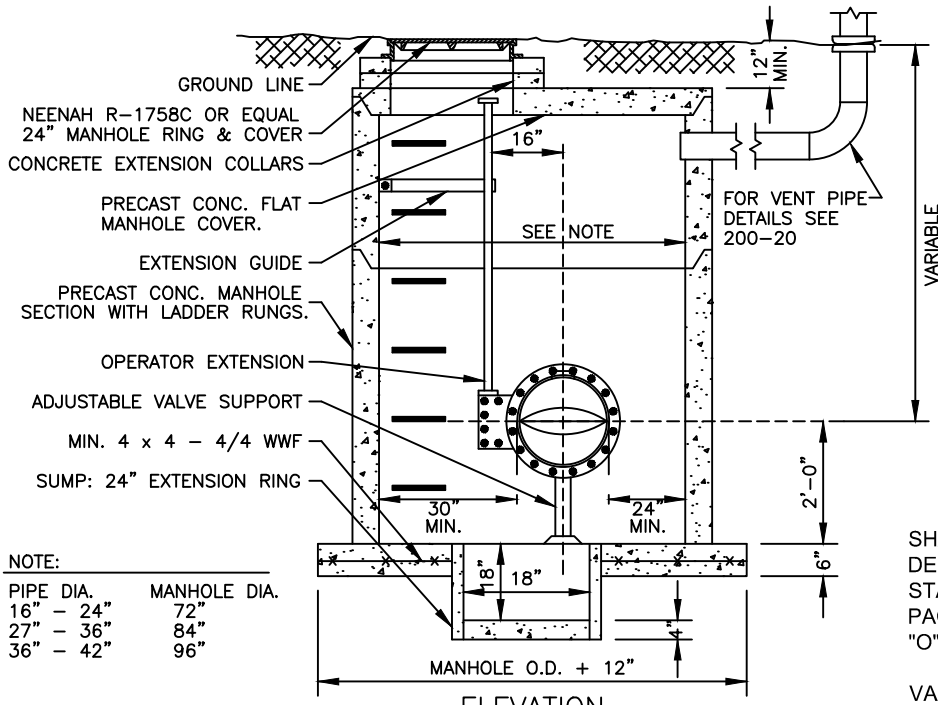
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

VALVE BOX COLLAR FOR GREENBELT AREA DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-7



NOTE:

PIPE DIA.	MANHOLE DIA.
16" - 24"	72"
27" - 36"	84"
36" - 42"	96"

ELEVATION

1.) VALVE OPERATOR SHALL BE ACCESSIBLE THRU MANHOLE OPENING.

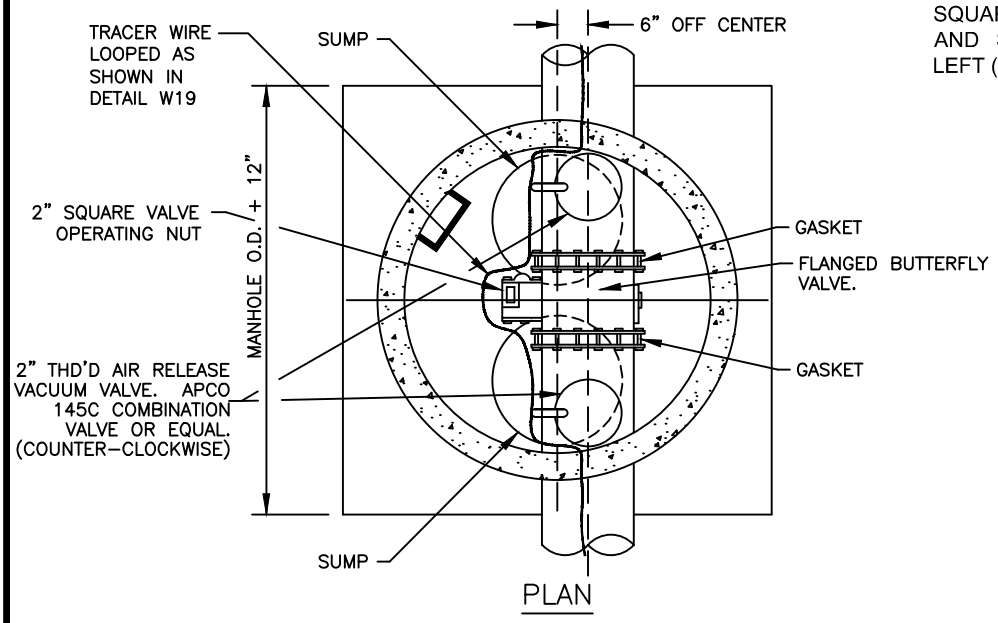
2.) PAD TO REST ON UNDISTURBED SOIL OR 18" OF 1-1/2" FRACTURED ROCK.

3.) SHAFTS SHALL BE A ONE-PIECE UNIT CONSTRUCTED OF STAINLESS STEEL AND SHALL EXTEND COMPLETELY THROUGH THE VALVE DISC BODY.

4.) BUTTERFLY VALVES SHALL BE FURNISHED WITH FLANGED END OR MECHANICAL JOINT CONNECTIONS.

SHAFT SEALS MAY BE DESIGNED FOR THE USE OF STANDARD SPLIT-V TYPE PACKING OR FOR STANDARD "O" RING SEALS.

VALVES SHALL BE FITTED WITH A TWO (2) INCH SQUARE OPERATING NUT AND SHALL OPEN TO THE LEFT (COUNTERCLOCKWISE).



PLAN

NOTE: BUTTERFLY VALVES SHALL BE CLASS 150-B AND CONFORM TO AWWA SPECIFICATION C-504

THE MANUFACTURER SHALL FURNISH A CERTIFIED STATEMENT THAT THE INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THE RESULTS THEREOF COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE STANDARD(S). A COPY OF THE CERTIFICATION SHALL BE SENT TO THE DEVELOPMENT ENGINEERING MANAGER UPON REQUEST.

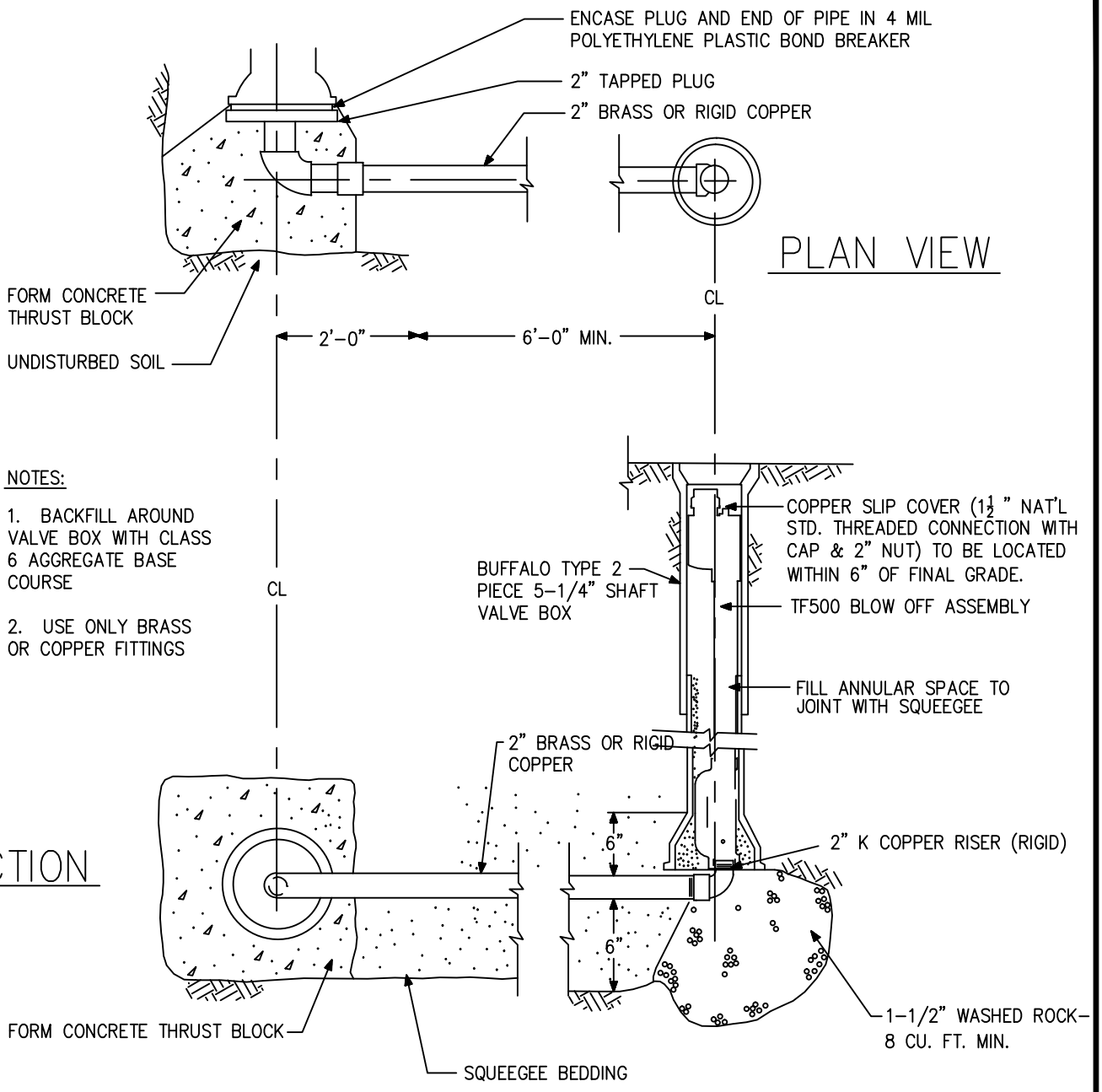
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

16" TO 42" VALVE AND VAULT DETAIL

ISSUED:
JANUARY 2005
REVISED:
APRIL 2010

DRAWING NO.
200-8



VALVES SHALL BE HANDLED IN SUCH A MANNER AS TO PREVENT ANY INJURY OR DAMAGE AND SHALL BE THOROUGHLY CLEANED BEFORE INSTALLATION. VALVES SHALL BE SET IN SUCH A MANNER THAT THE VALVE STEMS ARE PLUMB. VALVE BOXES SHALL BE INSTALLED PLUMB. FINAL ELEVATION OF THE VALVE BOXES SHALL BE LEFT TO THE DISCRETION OF THE DEVELOPMENT ENGINEERING MANAGER.

NOTE: FOR LINES 12" AND LARGER, A HYDRANT SHALL BE USED FOR THE BLOWOFF

N.T.S.

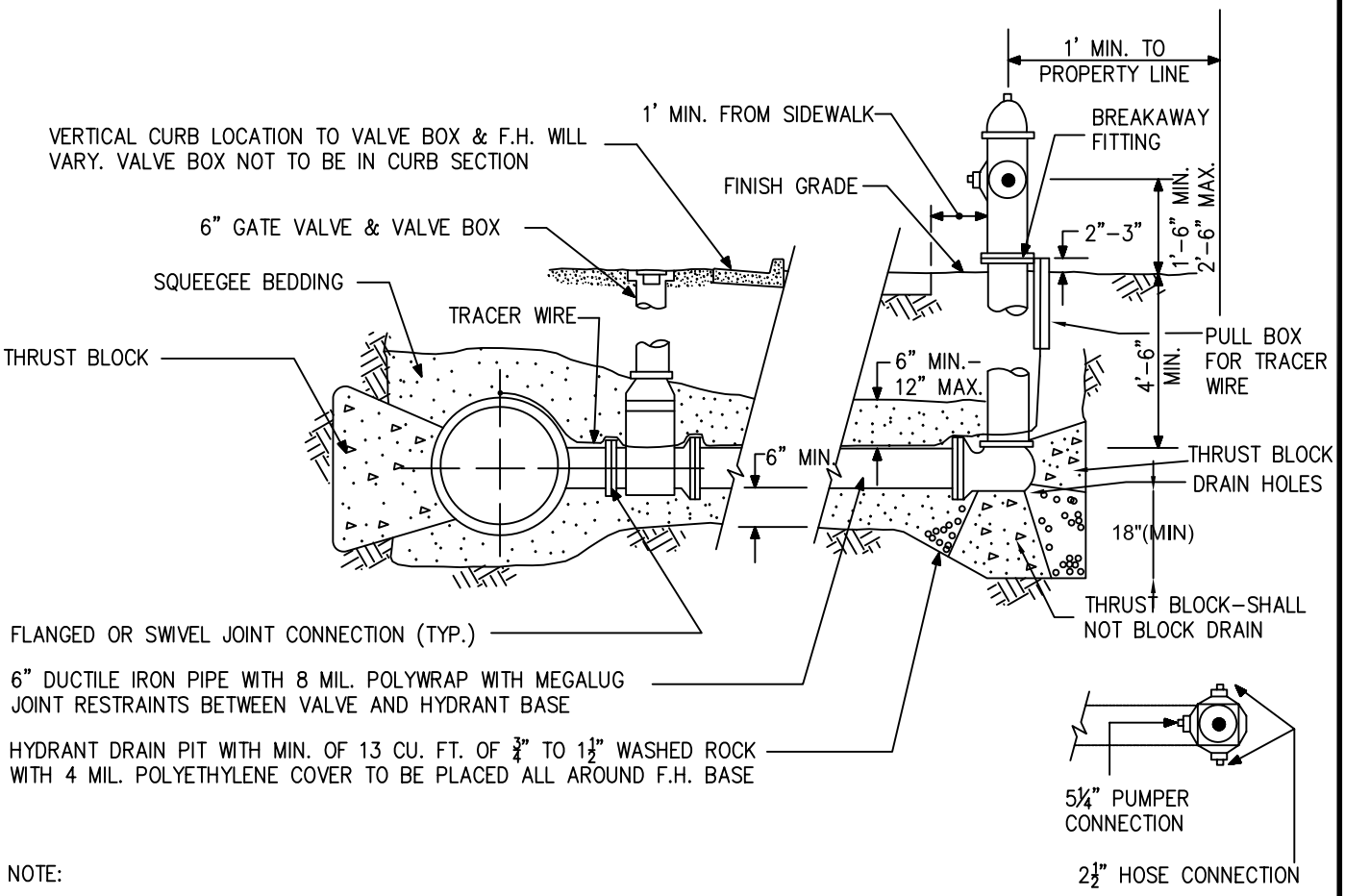
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

2" BLOWOFF DETAIL (FOR MAINS LESS THAN 12" DIA.)

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-9

FIRE HYDRANT ASSEMBLY



NOTE:

FIRE HYDRANTS SHALL BE LIMITED TO THE FOLLOWING MANUFACTURERS ONLY:
1) MUELLER COMPANY 5-1/4 SUPER CENTURION
2) WATEROUS COMPANY (1) MODEL WB-250-PACER

SHOE AND BARREL SHALL BE CONNECTED WITH HIGH STRENGTH STAINLESS BOLTS AND NUTS
HYDRANT SHALL HAVE A FIVE (5') FOOT CLEAR ZONE ON EACH SIDE OF HYDRANT (TEN (10') FOOT EASEMENT AROUND).
MINIMUM DISTANCE FROM DRIVEWAYS SHALL BE SIX (6) FEET.
HYDRANTS SHALL CONFORM TO AND BE TESTED IN ACCORDANCE WITH AWWA SPECIFICATION C-502.
HYDRANTS SHALL BE MADE OF CAST IRON WITH FULL BRONZE MOUNTINGS.
INLET SHALL FIT SIX (6) INCH PIPE WITH BARREL LENGTH SUFFICIENT FOR A FIVE (5) FOOT TRENCH.
ONLY TWO (2) HEIGHT EXTENSIONS MAY BE USED PER HYDRANT.
HYDRANT BASES SHOULD NOT BE ANY DEEPER THAN SIX (6) FEET FROM THE TOP OF FINISHED GRADE.
MAIN VALVE OPENING IN THE HYDRANT SHALL BE NO LESS THAN FIVE (5) INCHES IN DIAMETER.
THREADS ON NOZZLES SHALL BE NATIONAL STANDARD.
OPERATING NUT & NOZZLE COVERS SHALL BE NATIONAL STANDARD PENTAGON MEASURING ONE AND ONE-HALF (1½) INCHES FROM POINT TO OPPOSITE FLAT AND SHALL OPEN CLOCKWISE.
HYDRANTS SHALL BE PLUMBED VERTICALLY WITH PUMPER NOZZLE FACING STREET.
NO WATER SERVICE MAIN TAPS SHALL BE MADE TO A DISTRIBUTION MAIN WITHIN FIVE (5) FEET OF A FIRE HYDRANT BRANCH MAIN.
NO HORIZONTAL BENDS OR OFFSETS SHALL BE USED IN INSTALLING FIRE HYDRANT BRANCH MAINS.

EACH HYDRANT SHALL BE PAINTED WITH OSHA ENAMEL, SAFETY YELLOW, OR AN APPROVED EQUIVALENT.
FIRE HYDRANT ASSEMBLIES SHALL BE MEGALUGGED IN ACCORDANCE WITH SUBSECTION 204.1 (N)

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

FIRE HYDRANT ASSEMBLY DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-10

THRUST BLOCKS SHALL BE CONSTRUCTED AT BENDS AND FITTINGS WHICH RESULT IN UNBALANCED LINE THRUST. CARE SHALL BE TAKEN NOT TO BLOCK OUTLETS OR TO COVER BOLTS, NUTS, CLAMPS OR OTHER FITTINGS OR TO MAKE THEM INACCESSIBLE.

A BOND BREAKER SHALL BE PLACED BETWEEN THE FITTING AND THE THRUST BLOCK TO AID IN EASE OF FUTURE REMOVAL.

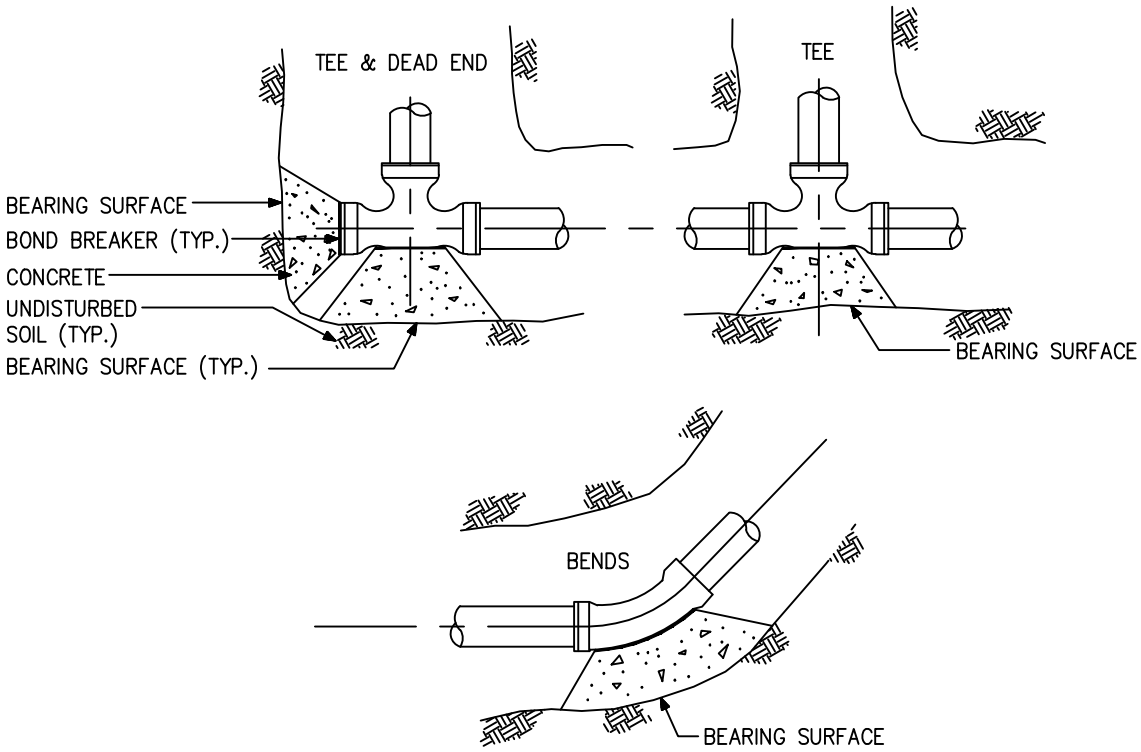
THE VERTICAL SIDES OF THE CONCRETE THRUST BLOCKS SHALL BE FORMED TO ALLOW FOR SYMMETRICAL THRUST.

WHEN IT IS IMPOSSIBLE THROUGH OVER EXCAVATION OR OTHER CAUSES TO POUR A THRUST BLOCK AGAINST UNDISTURBED EARTH, HARNESS RODS SHALL BE REQUIRED TO ANCHOR THE FITTINGS TO THE MAIN UPON APPROVAL OF THE DEVELOPMENT ENGINEERING MANAGER.

BACKFILL MAY BE PLACED OVER THE THRUST BLOCK ONCE THE SURFACE HAS SET SUFFICIENTLY TO RESIST THE WEIGHT OF THE BACKFILL.

NO DRY KICKERS SHALL BE ALLOWED.

NO HAND MIXED CONCRETE SHALL BE ALLOWED.



PLAN VIEW

NOTES:
1. THRUST BLOCKS MUST BE CAST IN PLACE CONCRETE.
2. NO TAMPING OR COMPACTING SHALL BE ALLOWED ABOVE THRUST BLOCK FOR A MINIMUM OF TWENTY–FOUR (24) HOURS AFTER PLACEMENT.
3. CONCRETE MUST SET A MINIMUM OF FORTY–EIGHT (48) HOURS PRIOR TO THE PERFORMANCE OF A HYDROSTATIC TEST.
4. BEARING SURFACE BASED ON BEARING STRENGTH OF 3000 P.S.F. AND MAIN PRESSURE OF 200 P.S.I.. FOR MAINS GREATER THAN 16" OR VERICAL THRUSTS, SHOW AREA REQUIREMENT ON STANDARD DETAILS.
5. BOND BREAKER TO BE MINIMUM OF 8 MIL. POLYETHYLENE PLASTIC.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

THRUST BLOCK DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200–11

THE PRESSURE REDUCING VAULT SHALL BE MANUFACTURED BY ENGINEERED FLUID, INC., DAKOTA PUMP INC. OR OTHER APPROVED BY DEVELOPMENT ENGINEERING MANAGER.

THE VAULT SHALL ALSO BE EQUIPPED WITH FOLLOWING:

A. SUMP PUMPS SHALL BE HYDRO-MATIC OSP50AB, OR AN APPROVED EQUIVALENT. A PIPE UNION SHALL BE INSTALLED IN THE DISCHARGE LINE BETWEEN THE PUMP AND THE CHECK VALVE. DISCHARGE LINE SHALL BE MADE OF IRON AND SHALL DIRECT FLOWS TO A LOCATION APPROVED BY CITY OF THORNTON INSPECTOR.

B. VENTILATION FANS SHALL BE AS MANUFACTURED BY ILG, OR AN APPROVED EQUIVALENT, MODEL PTD DIRECT-DRIVE TUBEAXIAL DUCT FAN SIZE PTD 123 (811 CFM @ 3/8" S.P.) WITH A ONE-SIXTH (1/6) HP, 120-VOLT CONSTANT SPEED, SINGLE PHASE, 60HZ ELECTRIC MOTOR. CONTROL SWITCH FOR THE FAN SHALL BE MOUNTED NEXT TO THE ENTRYWAY SO THAT IT CAN BE OPERATED WITHOUT COMPLETELY ENTERING THE VAULT. THE DISCHARGE OF THE VENT FAN SHALL BE TOTALLY ENCLOSED AND ATTACHED TO THE OPENING OF THE EXHAUST VENT PIPE.

C. DEHUMIDIFIERS SHALL BE DAYTON MODEL# 5EAJ7, OR AN APPROVED EQUIVALENT. PROVIDE CONDENSATE DRAIN PIPE FROM DRIP TRAY TO WITHIN SIX (6) INCHES OF THE FINISHED FLOOR.

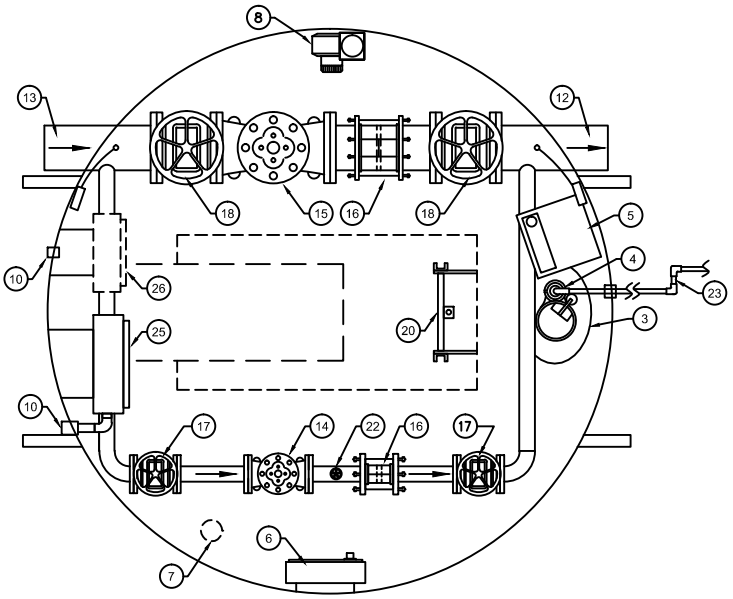
ALL CONTROL LINES AND FITTINGS SHALL BE STAINLESS STEEL AND INCLUDE ISOLATION TO ALL PRV CONTROL LINES

SEE SECTION 204.1(G) AND 204.1(J) OF THE CITY OF THORNTON STANDARDS AND SPECIFICATIONS.

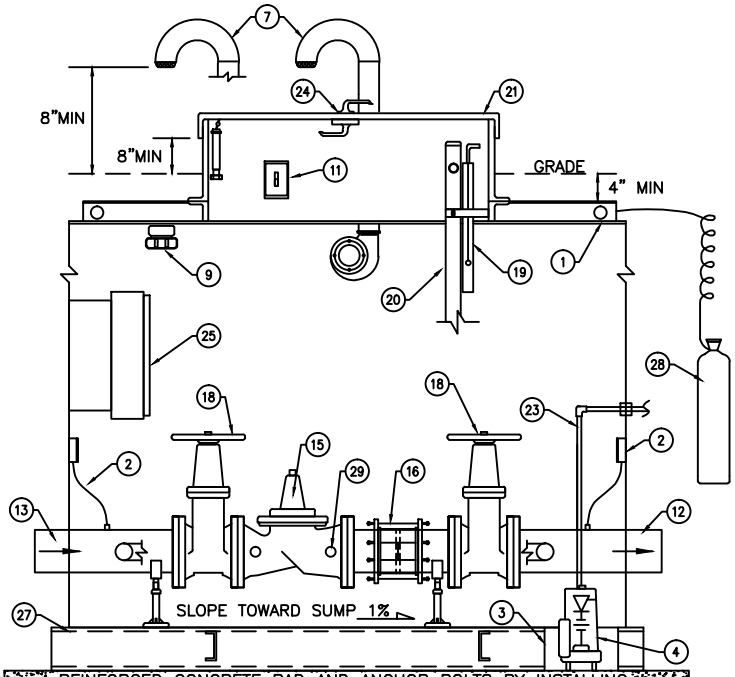
LOW FLOW BYPASS SIZES

PRV	MIN. BYPASS SIZE
8"	2-1/2"
12"	4"
16"	6" w/2" BYPASS

Legend	
1	Lifting Hooks (Add to any equipment in excess of 60 lbs)
2	Pressure Gauges (stainless steel w/ isolation vlv & purge line)
3	Sump Well (18" deep 12" wide)
4	Sump Pump with grate
5	Dehumidifier
6	Station Heater
7	Air Ducts
8	Ventilation Blower
9	Station Light
10	1.5" Conduit (provide a minimum of two conduits)
11	Light and Fan Switch (accessible from outside the vault)
12	Main Outlet
13	Main Inlet
14	Low Flow Bypass
15	Pressure Reducing Valve (With rising stem indicator)
16	Coupling
17	GATE Valves
18	BUTTERFLY valves
19	Safety Post
20	Entrance Ladder
21	Entrance Hatch (weather tight cover with overhang skirt)
22	3/4" Hose Bib
23	Sump discharge (IRON pipe with swivel joint for settlement)
24	Lock with AH1 keys or "BEST" locking assembly
25	Power Panel Enclosure
26	Telemetry Panel (as required by Dev. Eng. Manager)
27	Capsule reinforcement as directed by responsible party
28	Cathotic Protection as directed by responsible party
29	Control lines (stainless steel w/ stainless steel isolation valves)



PLAN VIEW



PROFILE VIEW

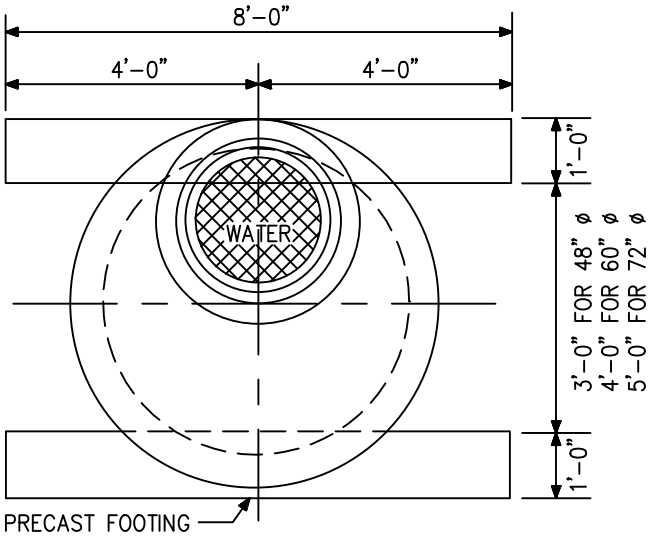
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

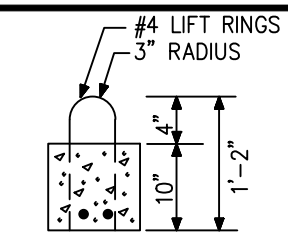
PRESSURE REDUCING VAULT DETAIL

ISSUED:
APRIL 2010
REVISED:

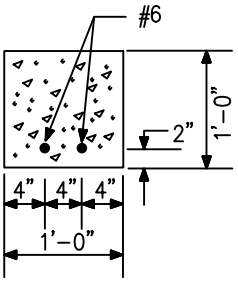
DRAWING NO.
200-12



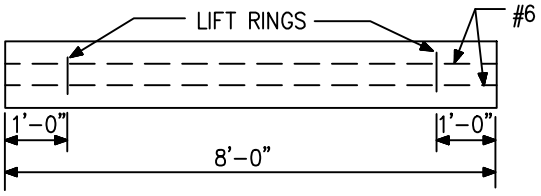
MH PLAN



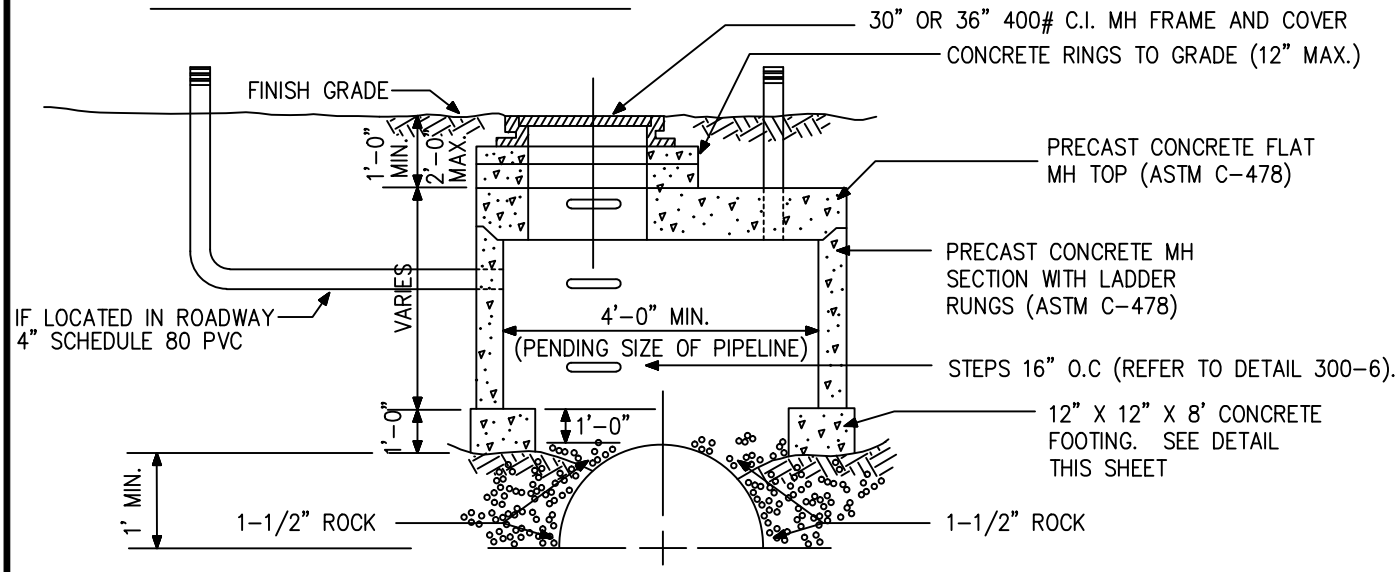
LIFT RING



SECTION
CONCRETE FOOTING



PLAN
CONCRETE FOOTING



ELEVATION

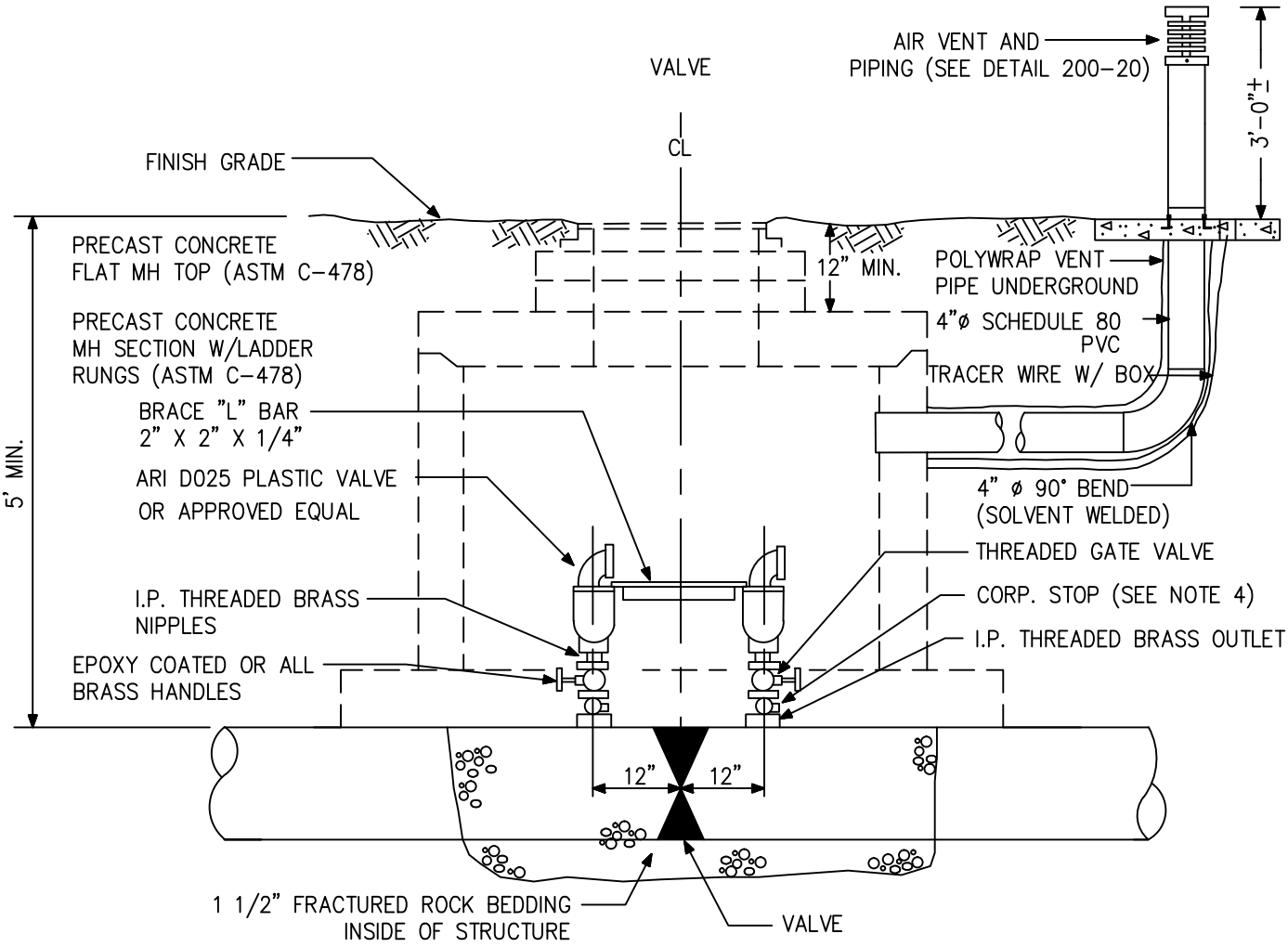
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CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

AIR RELIEF VALVE ASSEMBLY MANHOLE DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-13A



NOTES:

1. 1-1/2" FRACTURED ROCK SHALL BE PLACED IN BOTTOM OF MH TO CROWN OF PIPE ONLY.
2. PIPE AND FITTINGS SHALL BE BRASS.
3. PIPELINES 24" IN DIAMETER AND LARGER SHALL HAVE MH DIAMETERS OF 60" MINIMUM. MH DIAMETER SHALL BE DETERMINED BY ENGINEER.
4. WITH I.P. THREADED OUTLET, CORP. STOP SHALL BE I.P. THREADED BOTH ENDS (MUELLER H-10012 OR APPROVED EQUAL). FOR DIRECT TAP ON PIPE, CORP. STOP SHALL BE MUELLER (CC) THREADED ONE END, I.P. THREADED OTHER (H-10003 OR OTHER APPROVED BY THE DEVELOPMENT ENGINEERING MANAGER).

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

AIR RELIEF VALVE ASSEMBLY DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-13B

SERVICE PIPE TWO (2) INCHES OR LESS IN DIAMETER SHALL BE CONNECTED TO THE MAIN BY MEANS OF A BRONZE CORPORATION STOP OF THE SAME SIZE. NO UNDERGROUND JOINTS ARE PERMITTED IN THE COPPER SERVICE PIPE BETWEEN THE CORPORATION STOP AND THE CURB STOP AND/OR METER EXCEPT AT REDUCERS. OVERSIZING OF SERVICE LINES IS PERMITTED, AND SHOULD BE OUTSIDE OF THE PIT OR VAULT.

ALL JOINTS MUST BE OF A SWEAT COPPER DESIGN. SOLDER USED IN CONNECTION OF THE JOINTS SHALL BE OF A LEAD CONTENT OF 0.20 OR LESS.

CORPORATION STOPS SHALL BE AWWA TAPER THREAD TO COPPER CONNECTION OF PACK JOINT AND SHALL BE A FORD TYPE F600 OR AN APPROVED EQUAL. TAPS SHALL BE MADE BY THE RESPONSIBLE PARTY.

NO TAPS SHALL BE MADE UNTIL AFTER THE SERVICE PIPE IS SET IN PLACE AND THE COPPER SETTER (ON RESIDENTIALS) OR CURB STOP (ON COMMERCIALS) HAS BEEN INSTALLED.

UNDER NO CIRCUMSTANCES IS A WATER MAIN TO BE TAPPED DIRECTLY. ONLY SADDLES UTILIZING A CAST BRONZE CASTING WITH DOUBLE SILICONE BRONZE STRAPS SHALL BE PERMITTED.

WHEN TAPPING EXISTING ASBESTOS CEMENT PIPE, THE SIZE OF TAPS MUST BE ONE (1) PIPELINE SIZE SMALLER THAN THE SIZE OF THE PIPE BEING TAPPED.

TAPS SHALL NOT BE MADE ON A WATER MAIN UNTIL THE MAIN HAS PASSED THE CHLORINE AND HYDROSTATIC PRESSURE TESTS AND CLEARWATER TESTS.

CARE SHALL BE TAKEN TO PROPERLY INSTALL WATER SERVICE SO THAT ENOUGH SLACK IS IN THE SERVICE TO PROTECT AGAINST PULLOUT PROBLEMS.

WATER MAINS SHALL BE TAPPED AT A 45 DEGREE ANGLE FROM THE HORIZONTAL CENTER LINE OF THE WATER MAIN ON THE SAME SIDE OF THE PIPE AS THE WATER METER.

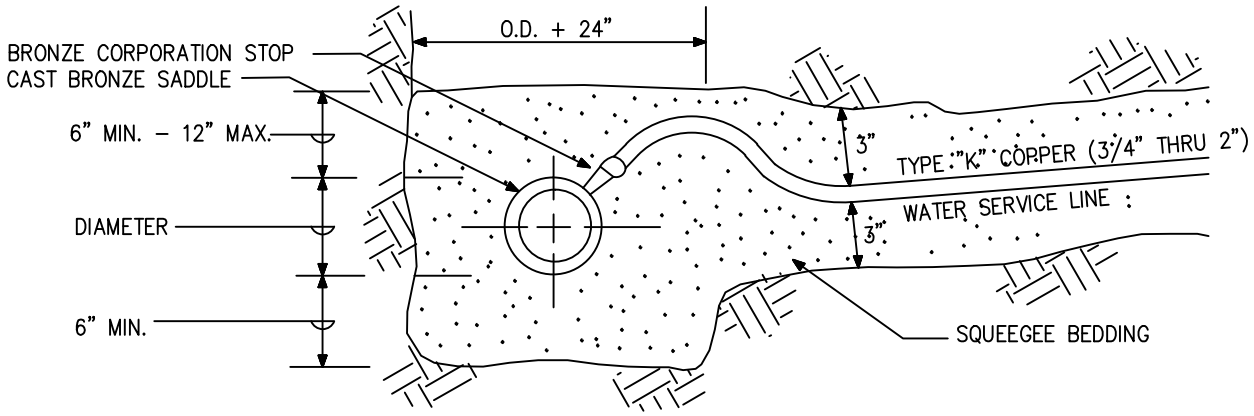
TAPPING MAINS MAY REQUIRE DIGGING OUT BEDDING MATERIAL AND CUTTING OR REMOVING PART OF THE CORROSION PROTECTIVE WRAPPING. AFTER THE TAPS ARE MADE, THE WRAP SHALL BE REPAIRED OR REPLACED BY THE INSTALLING RESPONSIBLE PARTY IN SUCH A MANNER AS TO PROTECT BOTH THE PIPE AND THE MAIN.

SERVICE TAPS SHALL HAVE A MINIMUM SEPARATION OF TWENTY FOUR (24) INCHES AND BE NO CLOSER THAN TWENTY-FOUR (24) INCHES TO A COUPLING OR PIPE JOINT OR FITTING. NO MORE THAN FOUR (4) SERVICE TAPS SHALL BE PERMITTED ON ANY ONE (1) JOINT OF PIPE.

ALL SERVICE PIPE MUST BE LAID AT LEAST FOUR AND ONE-HALF (4½) FEET BELOW THE ESTABLISHED GRADE OF THE STREET IN WHICH THEY WILL BE LAID AND ALL OTHER PLACES AT LEAST FOUR AND ONE-HALF (4½) FEET BELOW THE SURFACE OF THE GROUND.

IF AFTER A SERVICE PIPE HAS BEEN INSTALLED, THE GRADE OF THE SURFACE OF THE GROUND IS LOWERED, THE SERVICE PIPE MUST BE LOWERED TO PROVIDE AT LEAST FOUR AND ONE-HALF (4½) FEET OF COVER.

WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB. SANITARY SEWER SERVICE LOCATIONS SHALL BE MARKED WITH AN "X" ON THE CURB. MARKINGS SHALL BE NEATLY STAMPED, CHISELED, OR SAWCUT, NOT PAINTED.



NOTE: BEDDING MATERIAL SHALL BE SQUEEGEE NON-FRACTURED ROUNDED AND SHALL CONFORM TO THE FOLLOWING LIMITS WHEN TESTED BY MEANS OF LABORATORY SIEVES:

SIEVE SIZE	TOTAL % PASSING BY WEIGHT
3/8- INCH	100
NO. 200	0-5

N.T.S.

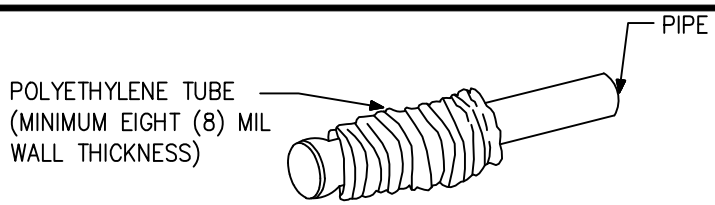
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

3/4" THRU 2" SERVICE CONNECTION DETAIL

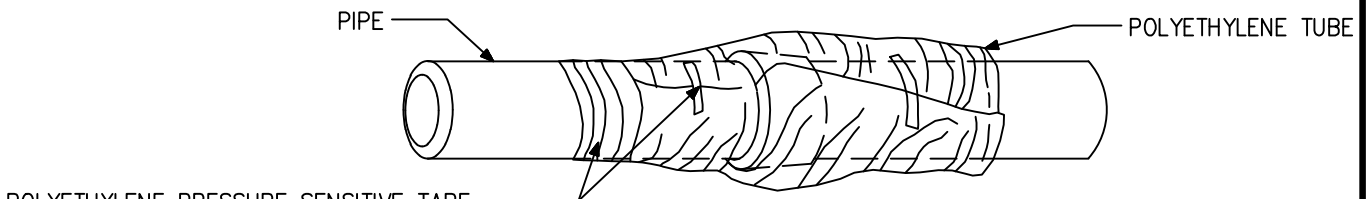
ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-14

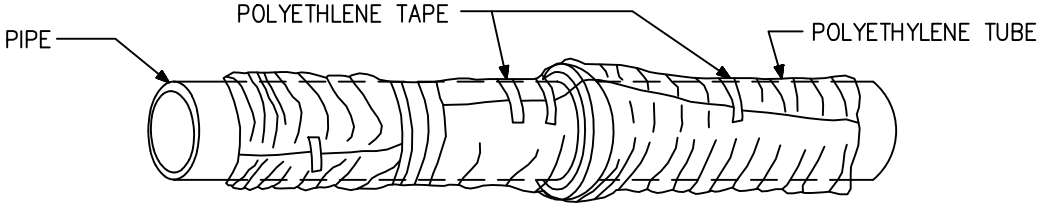
FOR D.I.P.:



STEP 1



STEP 2



STEP 3

NOTE: POLYETHYLENE ENCASEMENT MATERIAL SHALL BE MANUFACTURED IN ACCORDANCE WITH CURRENT ASTM STANDARD. THE RAW MATERIAL USED TO MANUFACTURE POLYETHYLENE FILM SHALL BE TYPE I, CLASS A, GRADE E-1 IN ACCORDANCE WITH CURRENT ASTM STANDARD.

STEP 1 – PLACE TUBE OF POLYETHYLENE MATERIAL ON PIPE PRIOR TO LOWERING IT INTO TRENCH.

STEP 2 – PULL THE TUBE OVER THE LENGTH OF THE PIPE. TAPE TUBE TO PIPE AT JOINT. FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH TAPE TO HOLD THE PLASTIC TUBE IN PLACE.

STEP 3 – OVERLAP FIRST TUBE WITH ADJACENT TUBE AND SECURE WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL COVERING THE PIPE SHALL BE LOOSE. EXCESS MATERIAL SHALL BE NEATLY DRAWN UP AROUND THE PIPE BARREL, FOLDED ON TOP OF PIPE AND TAPED IN PLACE.

FOR STEEL:

BITUMINOUS MATERIAL IS TO BE USED FOR CORROSION PROTECTION ON ALL STEEL PIPES.

SOIL RESISTIVITY TESTS:

SOIL RESISTIVITY TESTS AND/OR ANY OTHER SOIL TESTS ARE REQUIRED WITH THE UTILIZATION OF METAL PIPING OR AT THE SOLE DISCRETION OF THE DEVELOPMENT ENGINEERING MANAGER. OTHER MEANS OF CORROSION PROTECTION MUST BE SPECIFICALLY APPROVED BY THE DEVELOPMENT ENGINEERING MANAGER. THE RESPONSIBLE PARTY SHALL INCUR THE COSTS OF ALL SOIL TESTING AS REQUIRED.

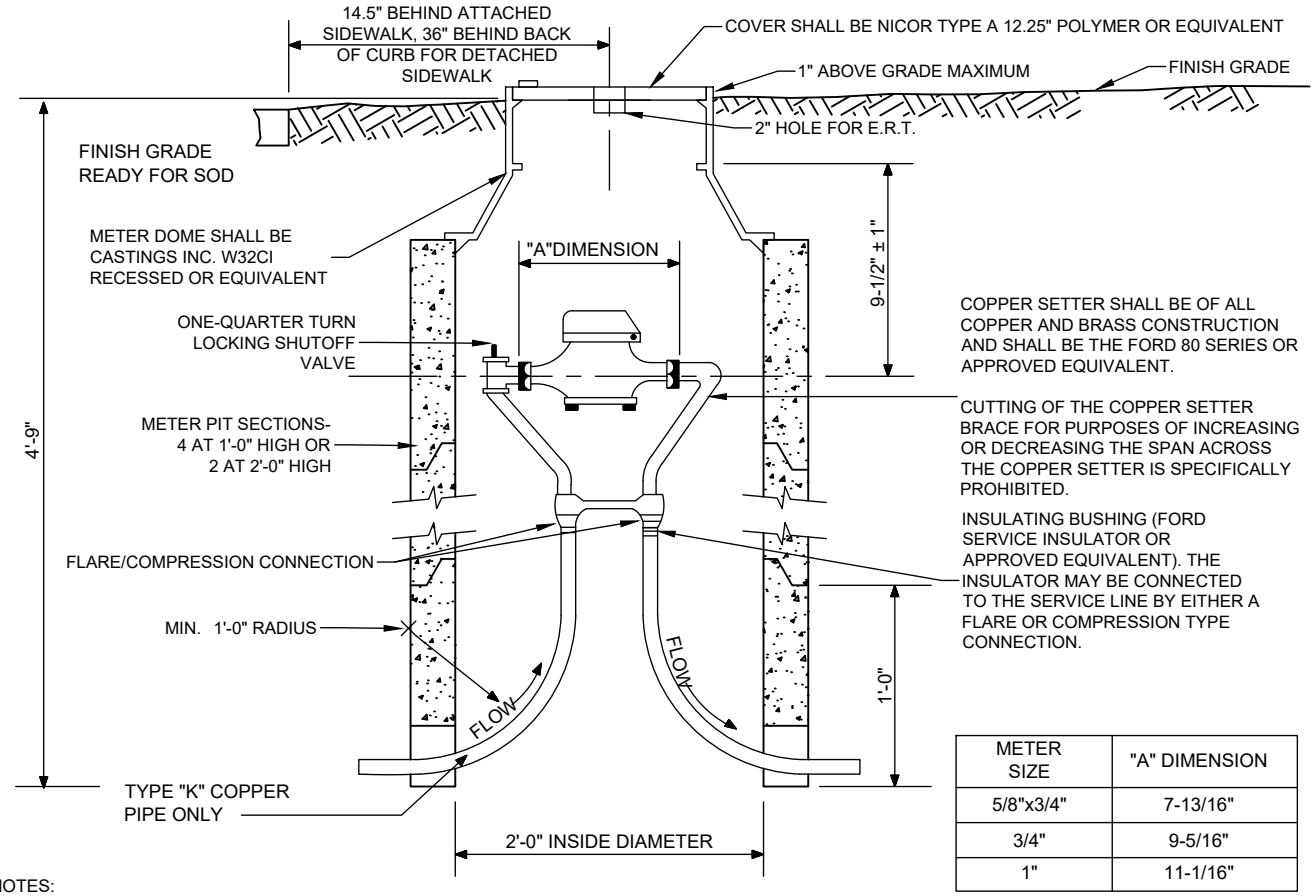
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

CORROSION PROTECTION DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-15



METER SIZE	"A" DIMENSION
5/8"x3/4"	7-13/16"
3/4"	9-5/16"
1"	11-1/16"

NOTES:

1. IF SERVICE LINE IS A DIFFERENT SIZE THAN THE METER, THEN THE REDUCTION SHALL OCCUR OUTSIDE THE METER PIT.
2. WATER METER PITS, COPPER SETTERS, DOMES AND COVERS SHALL BE INSTALLED BY THE RESPONSIBLE PARTY. THE WATER METER SHALL BE INSTALLED BY THE CITY. METER PITS MAY NOT BE INSTALLED IN ANY TYPE OF VEHICULAR OR PEDESTRIAN TRAFFIC ZONE WITHOUT THE APPROVAL OF THE DEVELOPMENT ENGINEERING MANAGER. IN THE EVENT A METER PIT IS INSTALLED WITHIN A VEHICULAR OR PEDESTRIAN TRAFFIC ZONE, A TRAFFIC RATED DOME SHALL BE INSTALLED BY THE RESPONSIBLE PARTY AT THE SOLE EXPENSE OF THE RESPONSIBLE PARTY.
3. IF INSTALLATION IN A RESIDENTIAL DRIVE IS PERMITTED, THE CONCRETE JOINT PATTERN SHALL CONSIST OF JOINTS ALLOWING THE LEAST AMOUNT OF DAMAGE TO THE SURROUNDING CONCRETE AS POSSIBLE. 4 X 4 TOOL JOINT IN CONCRETE AROUND THE METER PIT AND FREEZE JACKET.
4. METER PITS SHALL BE CONSTRUCTED OF CONCRETE OR PLASTIC. PLASTIC METER PITS SHALL BE MID-STATES PLASTIC, MODEL NO. MS202448B OF DFW PLASTICS, MODEL NO. 2048 B OR EQUAL AS APPROVED BY THE DEVELOPMENT ENGINEERING MANAGER. PLASTIC METER PITS SHALL MEET SAME DIMENSION REQUIREMENTS AS THE CONCRETE PITS. THE INTERIOR OF THE PLASTIC METER PITS SHALL ALSO BE WHITE.
5. METER PITS GRADE ADJUSTMENT SHALL BE MADE UTILIZING CONCRETE RINGS. THE TRENCH FLOOR UNDER THE CONCRETE RINGS SHALL BE COMPACTED EARTH. COPPER SERVICE PIPE ENTERING AND LEAVING THE PIT BENEATH THE BOTTOM CONCRETE RING SHALL BE OF SUFFICIENT LENGTH SO AS TO MEET THE DEPTH SPECIFICATIONS WHEN THE COPPER SETTER IS INSTALLED. THE PIT SHALL NOT BEAR ON THE SERVICE PIPE. UNDER NO CIRCUMSTANCES SHALL THE SERVICE PIPE ENTER AND EXIT ON THE SAME SIDE OF THE PIT.
6. WATER METER PIT INSTALLATIONS SHALL NOT BE GIVEN FINAL INSPECTION OR THE WATER METER INSTALLED UNTIL FINAL GRADING HAS BEEN COMPLETED. AFTER THE CITY HAS MADE THE FINAL INSPECTION, ANY NECESSARY GRADE ADJUSTMENTS TO THE PIT SHALL BE THE RESPONSIBILITY OF THE RESPONSIBLE PARTY.
7. THE USE OF CONCRETE RISER RINGS FOR THE PURPOSE OF DOME HEIGHT ADJUSTMENT IS PERMITTED PROVIDED SPECIFICATIONS ARE MET AFTER THE INSTALLATION IS COMPLETED (FOR PLASTIC METER PITS RISERS SHOULD BE PER MANUFACTURER'S RECOMMENDATION). THE USE OF BROKEN RINGS OR WOOD SHIMS UNDER THE DOME IS SPECIFICALLY PROHIBITED.
8. GALVANIZED PIPE AND FITTINGS ARE SPECIFICALLY PROHIBITED. COPPER LINES MUST BE FULLY VISIBLE AND FREE AND CLEAR OF ANY ADHESIVES, WRAPPINGS, OR COATINGS.
9. WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB. SANITARY SEWER SERVICE LOCATIONS SHALL BE MARKED WITH AN "X" ON THE CURB. MARKINGS SHALL BE NEATLY STAMPED , CHISELED OR SAWCUT, NOT PAINTED.

N.T.S.

THORNTON

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD METER PIT DETAIL
5/8" x 3/4", 3/4" x 1" METER ONLY

ISSUED: APRIL 1992

REVISED: AUGUST 2025

DRAWING NO. 200-16

SIZE	LAYING LENGTH
1–1/2"	13–1/2"
2" COMPOUND	15–1/2"
2" TURBINE	10–3/4"

WATER SERVICE SADDLES SHALL BE CAST BRONZE CASTING WITH DOUBLE SILICONE BRONZE STRAPS, SERIES 183–0 AS MANUFACTURED BY R. H. BAKER AND COMPANY; TYPE 323 BY SMITH–BLAIR INC., OR AN APPROVED EQUIVALENT.

CORPORATION STOPS SHALL BE AWWA TAPER THREAD TO COPPER CONNECTION OF PACK JOINT AND SHALL BE A FORD TYPE F600 OR AN APPROVED EQUAL. TAPS SHALL BE MADE BY THE RESPONSIBLE PARTY.

A CURB STOP OR VALVE CONFORMING TO THE FOLLOWING STANDARDS SHALL BE INSTALLED ON EVERY COMMERCIAL SERVICE LARGER THAN ONE (1) INCH BETWEEN THE WATER MAIN AND THE METER WHICH IS AT A POINT AT OR NEAR THE PROPERTY LINE.

CURB STOPS SHALL BE COMPRESSION TO COMPRESSION CONNECTIONS AND SHALL BE FORD BALL VALVES, B44–666M (ONE AND ONE–HALF (1–1/2) INCHES) OR B44–777M (TWO (2) INCHES) OR APPROVED EQUAL.

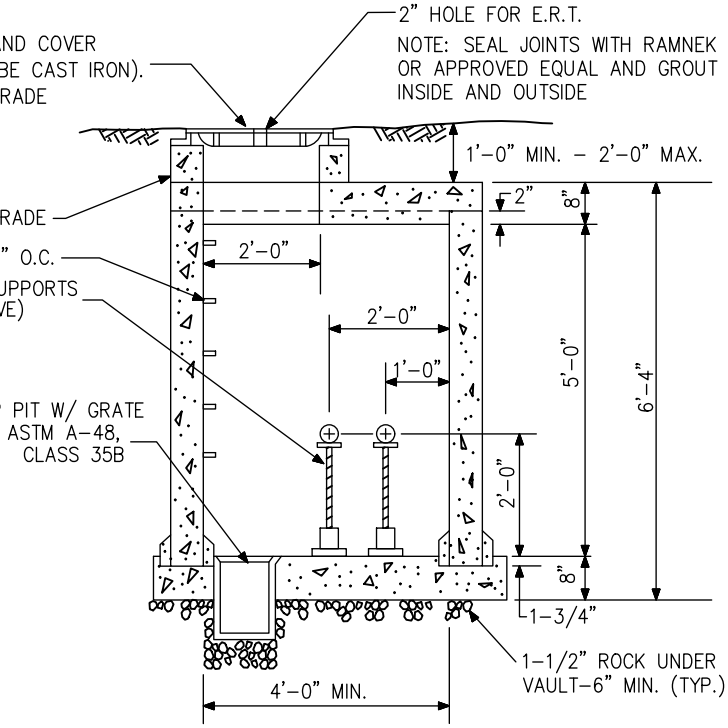
CURB STOP SERVICE BOXES SHALL BE A CAST IRON BOX, MINNEAPOLIS PATTERN, EXTENSION TYPE. THE CURB STOP BOX SHALL BE CENTERED OVER THE CURB STOP VALVE AND IN A VERTICAL POSITION. THE TOP LID OF THE CURB STOP BOX SHALL BE INSTALLED ONE (1) INCH ABOVE THE FINAL GRADE.

PIPE SHALL BE TYPE K CLASS, RIGID COPPER PIPE. THE METER VAULT PIPING SHALL BE OF THE SAME INSIDE DIAMETER AS THE METER ORIFICE. ANY SERVICE PIPE MATERIAL CHANGES SHOULD OCCUR OUTSIDE THE METER VAULT ON THE OUTLET SIDE.

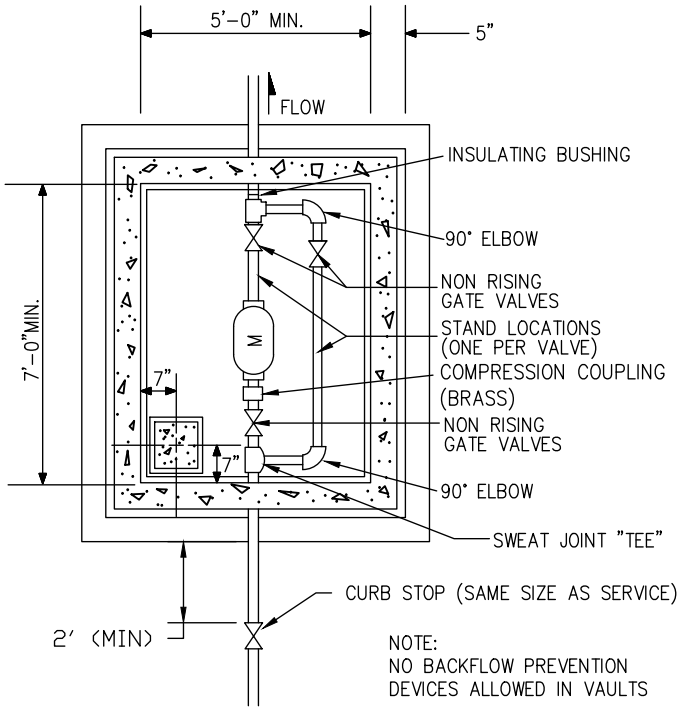
JOINTS SHALL BE OF A SWEAT COPPER DESIGN. SOLDER USED IN CONNECTION OF THE JOINTS SHALL BE OF A LEAD CONTENT OF 0.20 OR LESS.

GATE VALVES SHALL BE AWWA APPROVED GATE VALVES OF BRASS CONSTRUCTION. THE VALVES SHALL BE COUNTERCLOCKWISE OPEN. REFER TO SUBSECTION 204.1(D) OF THESE STANDARDS AND SPECIFICATIONS. VALVES LOCATED IN VAULTS SHALL HAVE HANDWHEELS IN LIEU OF A TWO (2) INCH SQUARE OPERATING NUT.

WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB, AND SEWER SERVICE SHALL BE MARKED WITH AN "X". MARKINGS SHALL BE NEATLY STAMPED, CHISELED, OR SAWCUT, AND SHALL NOT BE PAINTED.



VAULT PROFILE



VAULT PLAN

N.T.S.

THORNTON

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD 1-1/2" AND 2" METER SETTING DETAIL

ISSUED: APRIL 1992

REVISED: AUGUST 2025

DRAWING NO. 200-17A

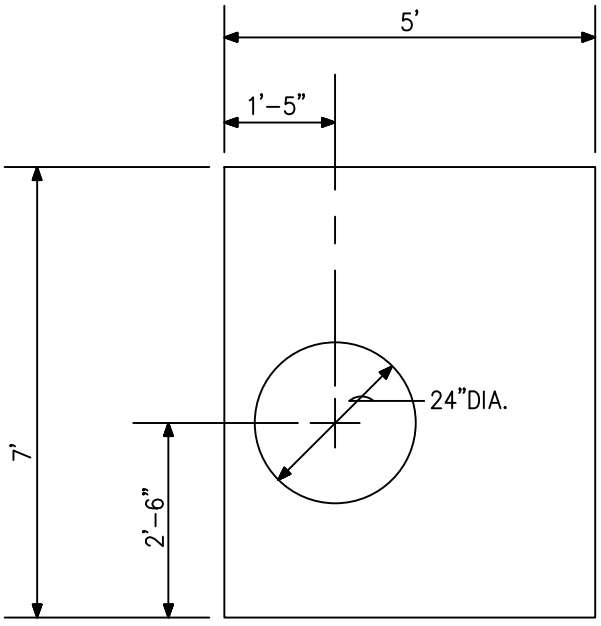
1. METER VAULT LIDS AND COVER SHALL BE CAST IRON.

2. PIPE SHALL BE TYPE K CLASS, RIGID COPPER PIPE. THE METER VAULT PIPING SHALL BE OF THE SAME INSIDE DIAMETER AS THE METER ORIFICE. ANY SERVICE PIPE MATERIAL CHANGES MUST OCCUR OUTSIDE THE METER VAULT ON THE OUTLET SIDE. JOINTS SHALL BE OF SWEAT COPPER DESIGN. SOLDER USED IN CONNECTION OF THE JOINTS SHALL BE OF A LEAD CONTENT OF 0.20 OR LESS. THE OUTLET SIDE OF THE COPPER SETTERS SHALL BE ISOLATED FROM TE SERVICE LINE WITH A FORD SERVICE INSULATOR OR APPROVED EQUIVALENT.

3. GATE VALVES SHALL BE AWWA APPROVED GATE VALVES OF BRASS CONSTRUCTION. THE VALVE STEMS SHALL BE OF NON-RISING DESIGN. VALVES SHALL BE COUNTERCLOCKWISE OPEN, AND SHALL HAVE HANDWHEELS IN LIEU OF A TWO (2) INCH SQUARE OPERATING NUT. VALVES SHALL BE INSTALLED BOTH UPSTREAM AND DOWNSTREAM OF THE WATER METER WITHIN THE VAULT.

4. BYPASS PIPING SHALL BE INSTALLED ON THESE SERVICES TO FACILITATE REMOVAL OF THE WATER METER WITHOUT DISCONTINUATION OF SERVICE. A GATE VALVE SHALL BE INSTALLED ON THE BYPASS LINE. THE CONNECTION TO THE METER SERVICE LINE SHALL BE MADE BY MEANS OF A SWEAT JOINT "TEE" INSIDE THE VAULT. CONNECTIONS SHALL BE UPSTREAM OF THE VALVE ON THE INLET SIDE OF THE WATER METER AND DOWNSTREAM ON THE OUTLET SIDE.

5. BRASS UNIONS OF A COMPRESSION TYPE SEALING DESIGN SHALL BE INSTALLED BETWEEN THE GATE VALVE AND THE WATER METER, EITHER UPSTREAM OR DOWNSTREAM OF THE METER TO FACILITATE REMOVAL OF THE WATER METER FROM THE SERVICE LINE.



ROOF SLAB

N.T.S.

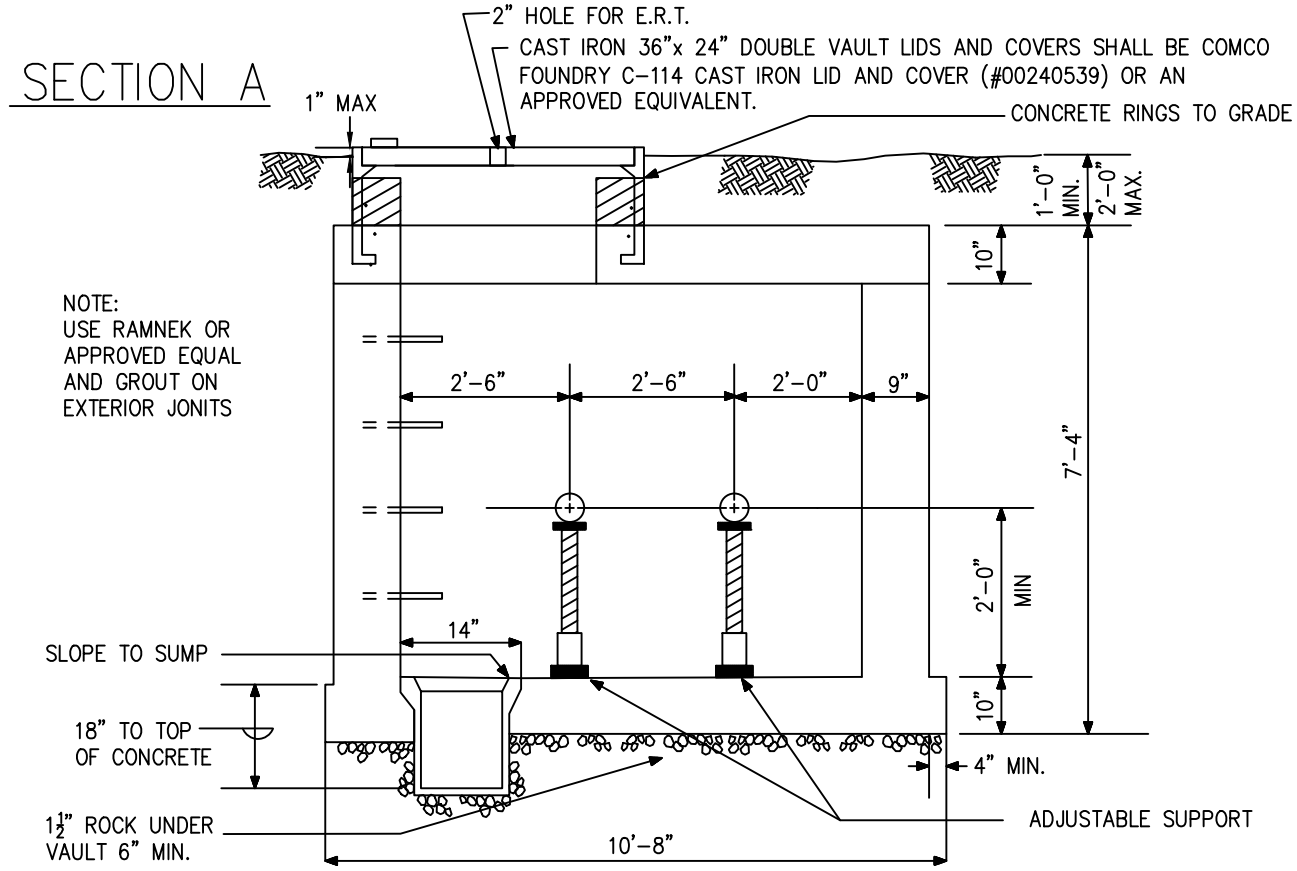
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD 1-1/2" & 2" METER SETTING ROOF SLAB DETAIL

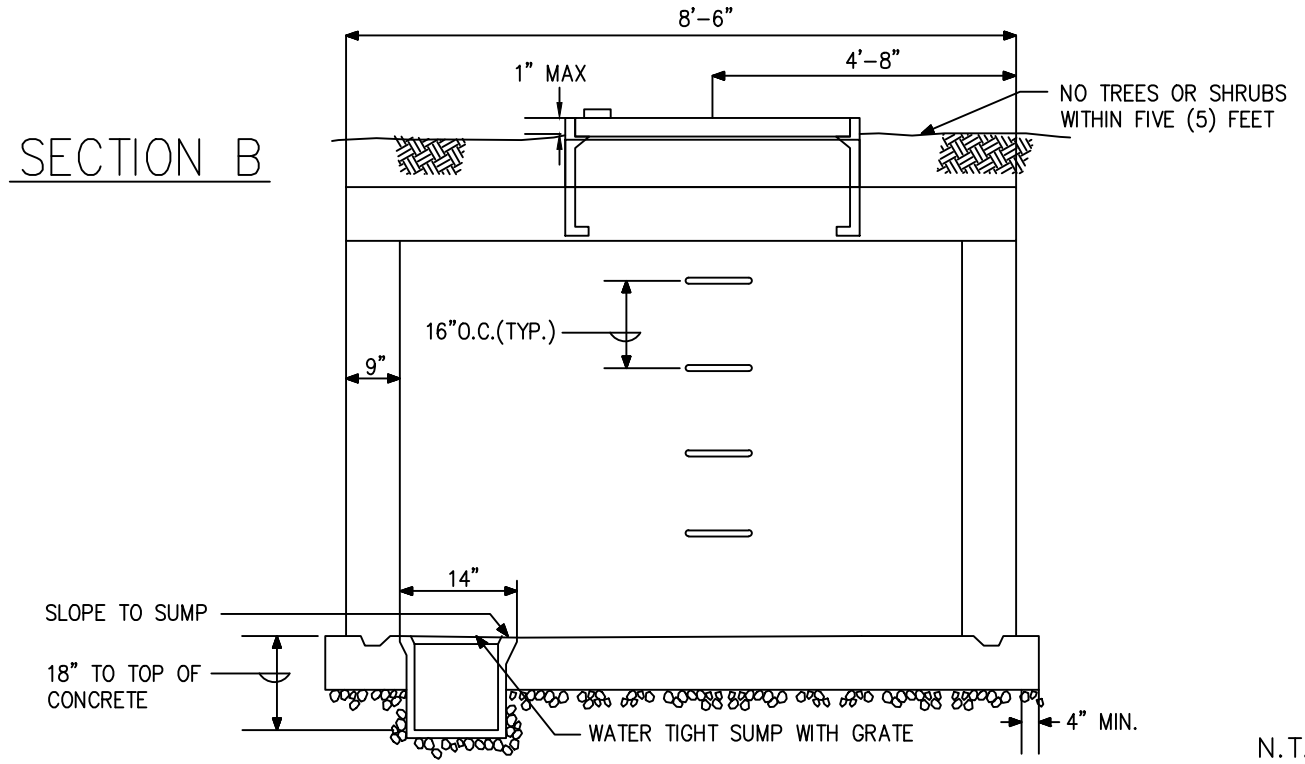
ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-17B

SECTION A



SECTION B



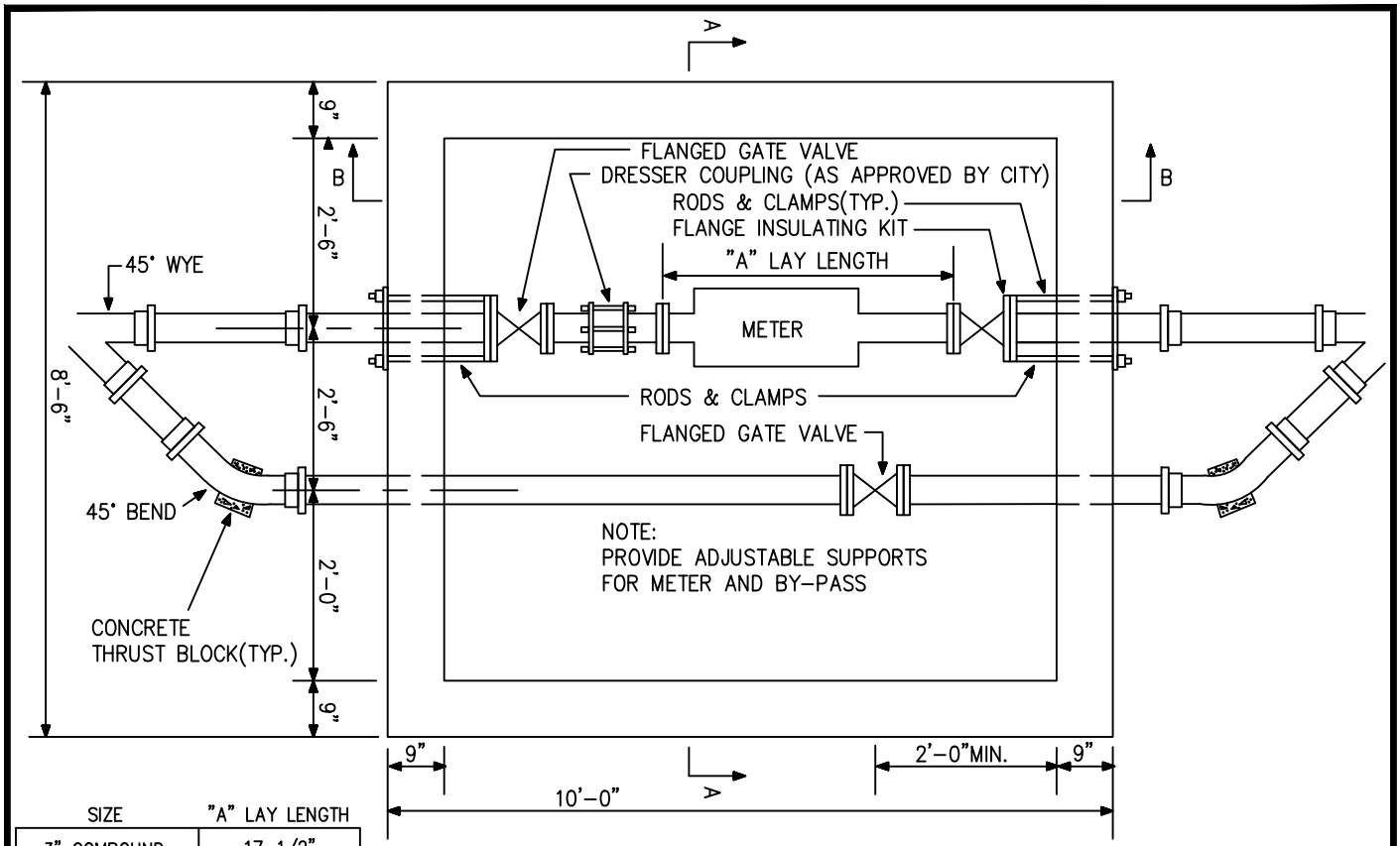
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD 3" AND 4" METER SETTING DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-18A



SIZE	"A" LAY LENGTH
3" COMPOUND	17-1/2"
3" TURBINE	12-1/4"
4" COMPOUND	20-1/4"
4" TURBINE	14-1/4"

1. WATER SERVICE SADDLES SHALL BE CAST BRONZE CASTING WITH DOUBLE SILICONE BRONZE STRAPS, SERIES 183-0 AS MANUFACTURED BY R. H. BAKER AND COMPANY; TYPE 323 BY SMITH-BLAIR INC., OR AN APPROVED EQUIVALENT.

2. CURB STOP GATE VALVES SHALL MEET AWWA SPECIFICATIONS AND BE CAPABLE OF WITHSTANDING 200 PSI WORKING PRESSURE. THEY SHALL BE OF BRONZE MOUNTED, ALL CAST IRON BODY CONSTRUCTION. THE VALVES AND OPERATING STEMS SHALL BE OF A NON-CORROSIVE CONSTRUCTION, COUNTERCLOCKWISE OPEN. GATE VALVES LARGER THAN THREE (3) INCHES IN SIZE SHALL BE WEDGE DISC TYPE. THE VALVE SHALL BE INSTALLED IN THE SERVICE PIPE A MAXIMUM OF TWO (2) FEET UPSTREAM OF THE METER VAULT WALL THROUGH WHICH THE INCOMING SERVICE PIPE ENTERS.

3. CURB STOP SERVICE BOXES SHALL BE A CAST IRON BOX, MINNEAPOLIS PATTERN, EXTENSION TYPE. THE CURB STOP BOX SHALL BE CENTERED OVER THE CURB STOP VALVE AND IN A VERTICAL POSITION. THE TOP LID OF THE CURB STOP BOX SHALL BE INSTALLED A MAXIMUM OF ONE (1) INCH ABOVE THE FINAL GRADE.

4. PIPING INSIDE THE VAULT FOR THREE (3) INCH AND FOUR (4) INCH METER SERVICES SHALL BE OF DUCTILE IRON, FLANGE JOINT DESIGN ONLY. THE METER VAULT PIPING SHALL BE OF THE SAME SIZE AS THE WATER METER ORIFICE, BOTH ENTERING AND LEAVING THE VAULT.

5. GATE VALVES INSTALLED SHALL MEET ALL AWWA SPECIFICATIONS AND BE CAPABLE OF WITHSTANDING 200 PSI WORKING PRESSURE. THE VALVES SHALL BE COUNTERCLOCKWISE OPEN AND OF A NON-RISING STEM TYPE CONSTRUCTION WITH HAND WHEELS IN LIEU OF SQUARE OPERATING NUTS. REFER TO SUBSECTION 204.1(D) OF THESE STANDARDS AND SPECIFICATIONS.

6. CONNECTION TO THE METER SERVICE FOR THE BYPASS MAY BE MADE BY MEANS OF A "WYE" CONNECTION OUTSIDE THE VAULT, IF NECESSARY, ALTHOUGH THE GATE VALVE MUST BE INSTALLED INSIDE THE METER VAULT.

7. INSTALLATION OF METER SHALL BE PERFORMED BY A LICENSED PLUMBER.

8. WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB, AND SEWER SERVICE SHALL BE MARKED WITH AN "X". MARKINGS SHALL BE NEATLY STAMPED, CHISELED, OR SAWCUT, AND SHALL NOT BE PAINTED.

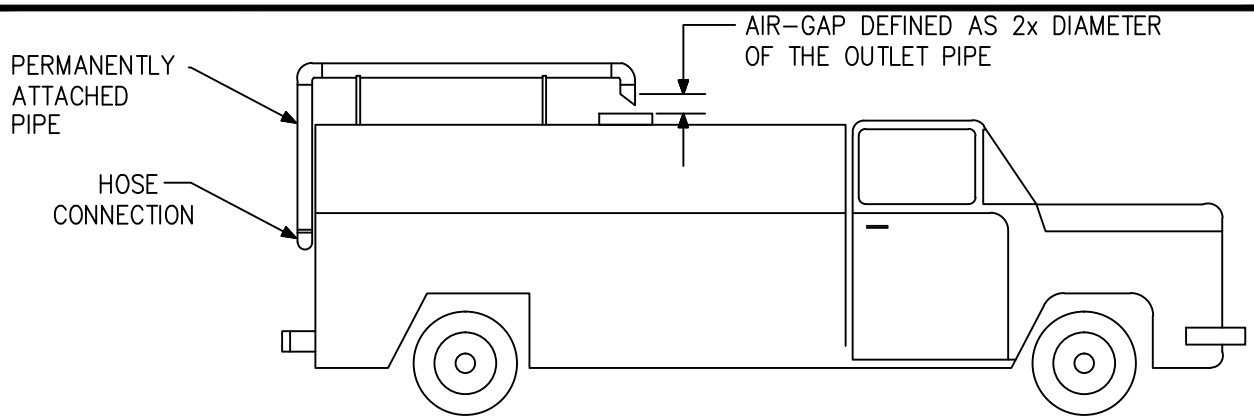
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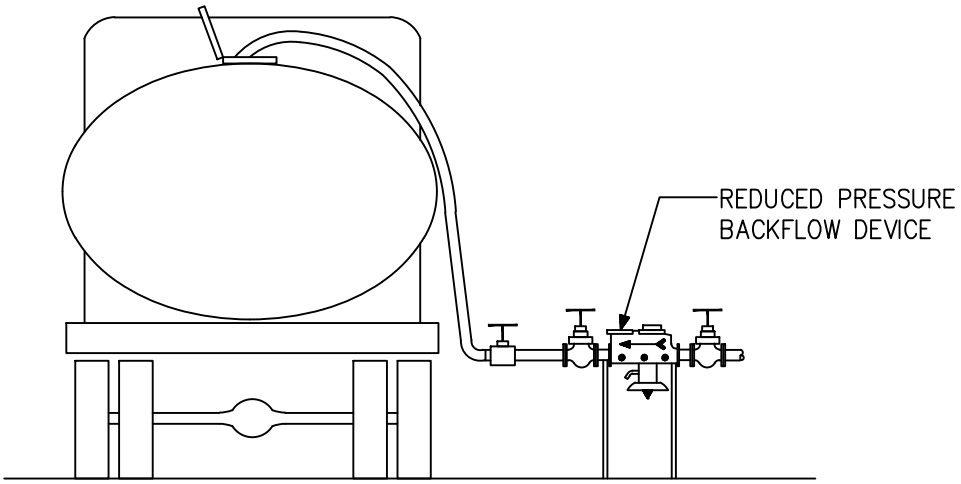
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

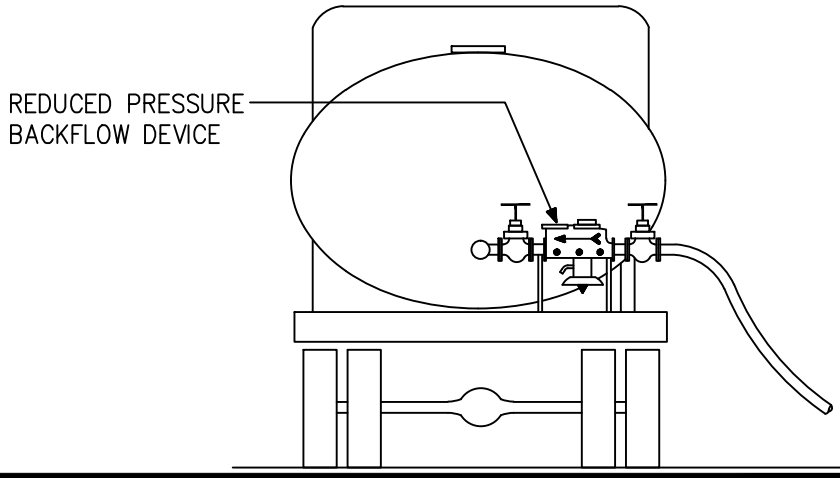
STANDARD 3" AND 4" METER SETTING DETAIL

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-18B







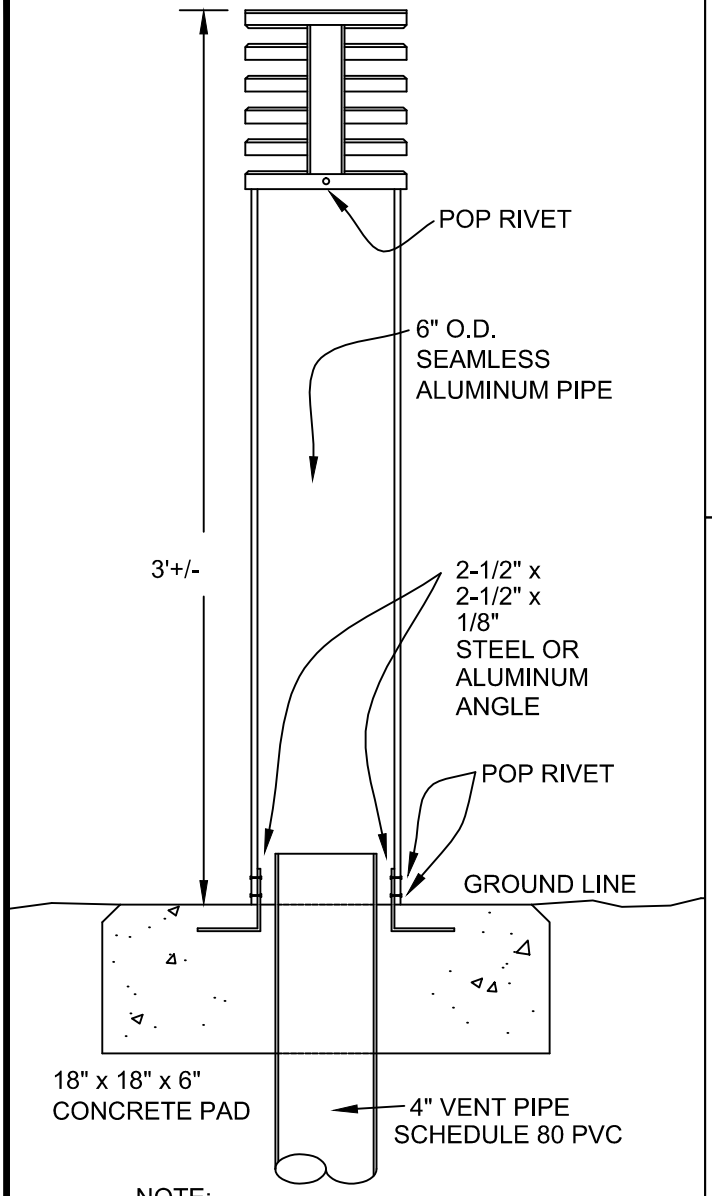
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

APPROVED METHODS OF FILLING PORTABLE SPRAY AND CLEANING EQUIPMENT

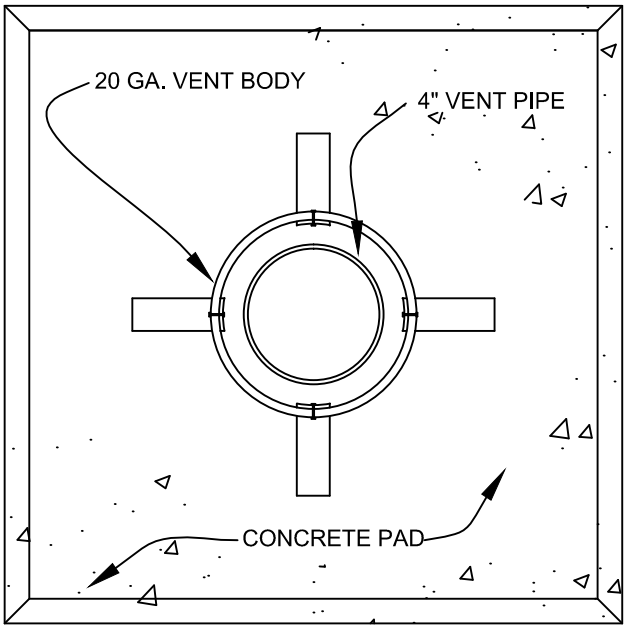
ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
200-19

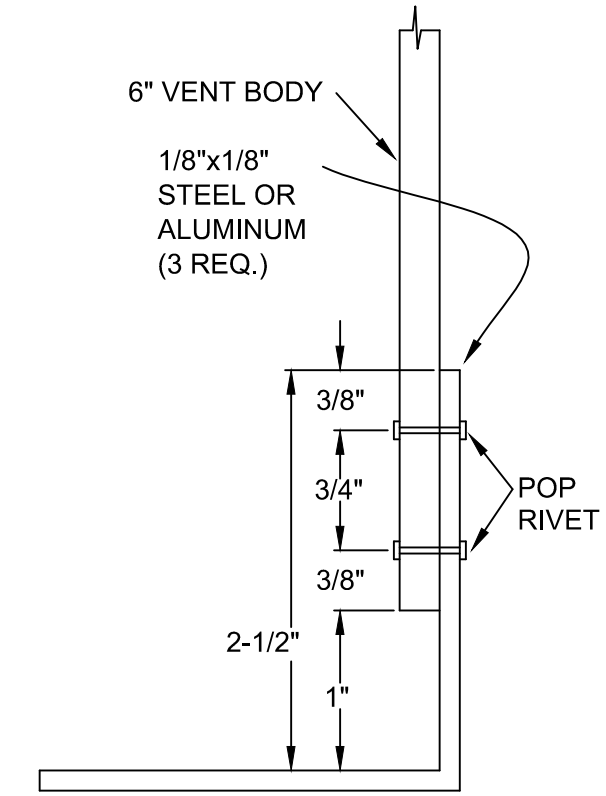


NOTE:
COLOR SHALL BE FLAT BLACK

ROUND VENT SCREEN



BASE DETAIL



STEEL OR ALUMINUM ANGLE DETAIL

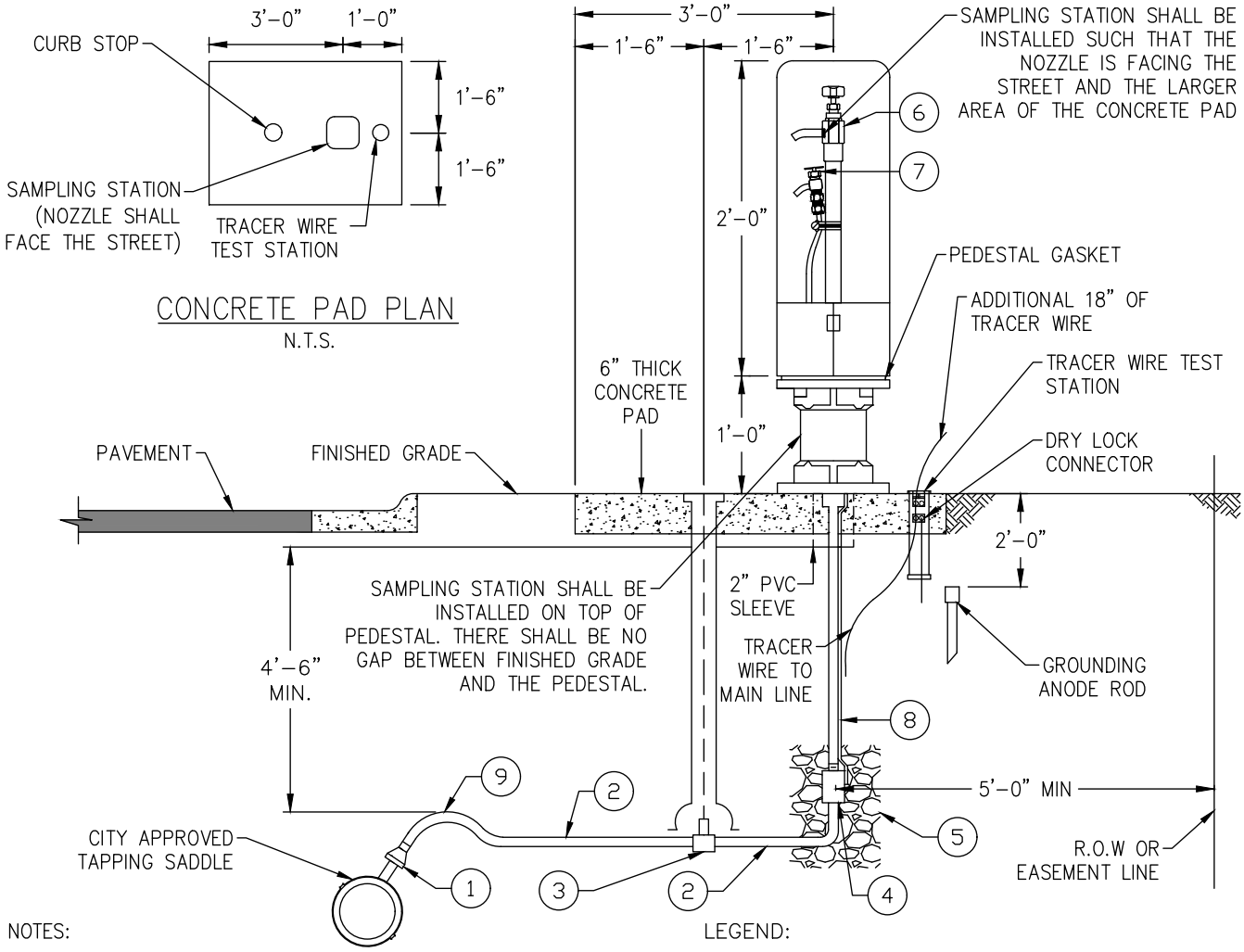
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

TYPICAL AIR VENT DETAIL

ISSUED:
JANUARY 2005
REVISED:
APRIL 2010

DRAWING NO.
200-20



NOTES:

1. SERVICE LINE MUST HAVE MIN. 4'-6" COVER.
2. THERE SHALL NOT BE ANY CONNECTIONS MADE WITHIN 5'-0" OF THE SAMPLE STATION.
3. NO DISSIMILAR METALS WILL BE ALLOWED.
4. TRACER WIRE SHALL BE INSTALLED ALONG THE SERVICE LINE.
5. SAMPLING STATIONS SHALL BE LOCATED IN RIGHT-OF-WAY (R.O.W.) OR IN A POCKET EASEMENT. LOCATIONS SHALL BE CLOSELY COORDINATED WITH THE CITY.
6. BOLLARDS SHALL BE INSTALLED AT LOCATIONS WITH NO CURB AND GUTTER, ADJACENT TO TRAVELED WAYS, AND OUTSIDE OF CLEAR ZONE FOR TRAFFIC.
7. IN THE ABSENCE OF A TREE LAWN, THE SAMPLING STATION SHALL BE INSTALLED 2' (MIN.) BEHIND THE SIDEWALK.
8. MAINTAIN 2' MINIMUM HORIZONTAL CLEARANCE FROM THE SAMPLING STATION TO THE ROADWAY TRAVEL LANES, SIDEWALK, OR TRAIL.
9. SAMPLING STATIONS ARE INTENDED FOR POTABLE (DRINKING) WATER AND SHALL ONLY BE CONNECTED TO A POTABLE WATER MAIN.
10. INSTALLATION SHALL CONSIDER POSITIVE DRAINAGE AWAY FROM SAMPLING STATION AND A REDUCED EROSION POTENTIAL DOWNHILL FROM NOZZLE.

LEGEND:

① CORPORATION STOP WITH 3/4" TYPE K COPPER
② 3/4" TYPE K COPPER SERVICE LINE
③ 3/4" TYPE K COPPER CURB STOP AND BOX
④ 3/4" ELBOW MIPT X Q-LINE BRASS FITTING
⑤ 1-1/2 CUBIC FEET GRAVEL
⑥ KUPFERLE ECLIPSE #24 SAMPLING STATION FOR COLD WEATHER OR CITY APPROVED EQUAL WITH LOCKING CAPABILITY
⑦ STAINLESS STEEL 1/4" PET COCK WITH STAINLESS STEEL TUBING
⑧ 1/2" STAINLESS STEEL WATERWAY
⑨ EXPANSION LOOP

N.T.S.

THORNTON

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

WATER SAMPLING STATION

ISSUED: April 2026

REVISED:

DRAWING NO. 200-21