

TOWN OF WEAVERVILLE

WATER DEPARTMENT

STANDARD DETAILS FOR CONSTRUCTION

Rev. 3.9.2017

12.14.2018



Town of Weaverville
Department of Public Works
15 Quarry Road
Weaverville, NC 28787

Phone: 828-645-0606

Fax: 828-645-4877

Tony Laughter,
Public Works Director

TOWN OF WEAVERVILLE

DEPARTMENT OF PUBLIC WORKS
WATER DEPARTMENT

STANDARD DETAILS FOR CONSTRUCTION

TABLE OF CONTENTS

SECTION "S"	WATER LINE SPECIFICATIONS
SECTION "W"	WATER LINE DETAILS
APPENDIX "A"	WEAVERVILLE WATER POLICIES AND PROCEDURES STANDARD REQUIREMENTS (Excerpts from Weaverville Town Code)

March 9, 2017

SECTION 06900, "TESTING" REVISED PER AWWA C600-10/5.2.1.4 DATED NOV. 1, 2010)

REVISED 12.14.2018

SECTION "S"

WATER LINE SPECIFICATIONS

02227	Waste Material Disposal
02822	Landscaping
02828	Restoration of Surfaces
03300	Unclassified Excavation
03400	Trench Excavation, Backfill and Compaction
06100	Water Pipe and Appurtenance Materials
06210	Water Pipe Installation
06900	Water Appurtenance Installation
	Water line testing and Disinfection
07296	Domestic Water Service Connections

DESCRIPTION

The work covered by this section consists of the disposal of waste and debris in accordance with the requirements of these specifications. Waste will be considered to be all excavated, grubbed or removed materials which are not utilized in the construction of the project.

GENERAL REQUIREMENTS

Waste shall be disposed of in areas that are outside of the project area and provided by the Contractor, unless otherwise required by the plans or special provisions or unless disposal within the project area is permitted by the Town.

The Contractor shall maintain the earth surfaces of all waste areas, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and siltation.

The following requirements shall also be applicable to all waste or disposal areas other than active public waste or disposal areas:

1. Rock waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical, and shall be covered with a minimum 6 inch thick layer of earth material either from the project waste or from borrow.
2. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practicable, but in no case will slopes steeper than 2:1 be permitted.
3. Construction debris, grubbed debris and all broken pavement and masonry shall be covered with a minimum 6 inch thick layer of earth waste material from the project or borrow. The completed waste area shall be shaped as required above for disposal of earth waste.
4. Seeding and mulching shall be performed over all earth or earth covered waste areas. The work of seeding and mulching shall be performed in accordance with Section 02822 "Landscaping" of these specifications.
5. Where the Town has granted permission to dispose of waste and

debris within the project, the Town will have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed project.

Disposal of waste or debris in active public waste or disposal areas will not be permitted without prior approval by the Town. Such disposal will not be permitted when, in the opinion of the Town, it will result in excessive siltation or pollution.

SCOPE

This section covers the furnishing of all labor, equipment and materials necessary for the landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses and legumes.

PROTECTION OF EXISTING TREES AND VEGETATION

Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

Provide protection for roots over 1-1/2" diameter cut during construction operations. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.

The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Town or those within the Clearing Limits designated to remain.

Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Town. Repair damaged trees promptly to prevent progressive deterioration caused by damage.

Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Town with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

GRADING

Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.

Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction material. It shall also include thorough loosening of the soil to a depth of 6-inches by plowing, disking, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section by section basis immediately upon completion of earthwork or pipeline installation.

Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Town may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Town.

MATERIALS

A. Fertilizer:

The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.

Fertilizer shall be 10-10-10 grade. Upon written approval of the Town a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.

During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. Lime:

The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.

During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original conditions before being used.

Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. Seed:

The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Town before being sown, and no seed will be accepted with a date of test more than 9 months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Town, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents or other causes.

Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

D. Mulch:

Straw Mulch shall be threshed straw of oats, rye or wheat free from

matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.

E. Tackifier:

Emulsified asphalt or organic tackifier such as Reclamare R2400 shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Rates of application will vary with conditions. Asphalt shall not be used in freezing weather.

SEEDBED PREPARATION

The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Town to provide for more effective seeding and for ease of subsequent mowing operations.

The soil shall then be scarified or otherwise loosened to a depth of not less than 6 inches except as otherwise provided below or otherwise directed by the Town. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Town.

On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Town.

On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Town, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

On cut slopes that are either 2:1 or steeper, the Town may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in condition acceptable to the Town, additional seedbed preparation may be reduced or eliminated.

The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Town determines that it is in an otherwise

unfavorable working condition.

APPLICATION

Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated in Table I.

Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Town before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Town, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Town determines that weather and soil conditions are unfavorable for such operations.

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specified rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed. Seed shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Town. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Town.

Immediately after seed has been properly covered, the seedbed shall be compacted in the manner and degree approved by the Town.

When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Town may direct or permit that modifications be made in the above requirements which pertain to

incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

Such modifications may include but not be limited to the following:

1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1; (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.
2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

MULCHING

All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Town.

It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.

Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3 inches in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil. Mulch shall be applied within 24 hours after the completion of seeding unless otherwise permitted by the Town. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operation.

Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Town. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application.

The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

MAINTENANCE

The Contractor shall keep all seeded areas in good condition, reseeding if and when necessary, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.

Grassed areas will be accepted when a 95 percent cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.

Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Town. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Town at no cost to the Owner.

TABLE I - APPLICATION RATES

A. Lime and Fertilizer

In the absence of a soil test, the following rates of application of limestone and fertilizer shall be:

1. 4,000 pounds limestone per acre
2. 1000 pounds 10-10-10 (N-P₂O₅-K₂O) fertilizer per acre and the remaining quantity applied when vegetation is three inches in height or 45 days after seeding, whichever comes first.

B. Mulch

Mulch shall be applied at the following rates per acre:

1. 3,000-4,000 pounds straw mulch, or
2. 1,500-2,000 pounds wood cellulose fiber.
3. 35-40 cubic yards of shredded or hammermilled hardwood bark
4. 1,200-1,400 pounds of fiberglass roving

C. Seed

The kinds of seed and the rates of application shall be as contained in this table. All rates are in pounds per acre. See Notes 1 and 2.

1. Fall and Winter (Normally August 1 to June 1)

80 pounds of Ky-31 tall fescue and 15 pounds of rye grain

2. Summer (Normally May 1 to September 1)

100 pounds of Ky-31 tall fescue

NOTE:

1. On cut and fill slopes having 2:1 or steeper slopes, add 40 pounds of sericea lespedeza per acre to the planned seeding (hulled in spring and summer unhulled in fall and winter) plus 15 pounds of sudangrass in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.
2. These seeding rates are prescribed for all sites with less than 50 percent

ground cover and for sites with more than 50 percent ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50 to 80 percent ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

SCOPE

This section covers the furnishing of all labor, equipment and materials necessary for the proper restoration of existing surfaces disturbed or damaged as a result of construction operations which are not specifically scheduled or specified for topsoil and seeding, paving, landscaping or other surfacing.

GENERAL

In general, the types of replacement included in this section are seeding along pipelines, concrete sidewalks, driveways, roadways, ditches, lawns and landscaped areas, curb and gutter.

Any damage to existing structures shall be repaired using materials and workmanship equal to those of original construction.

SEEDING ALONG PIPELINES

All ground surfaces along pipelines, which are not classified as lawns, landscaped areas, or pavement areas, but would be classified as open fields, shall be raked smooth and seeded in accordance with the sections entitled Landscaping. Large rocks, clumps of earth and excessive spoil material shall be removed from the area prior to seeding.

Shoulders of all roads shall be restored as specific for lawns and landscaped areas.

Wooded areas, not classified as lawns shall be restored to as near their original condition as possible.

CONCRETE SIDEWALKS

Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed of Class B concrete on a thoroughly compacted subgrade, shall have a vertical thickness of not less than 4 inches or the thickness of the replaced walk where greater than 4 inches.

Walks shall be float finished, edged with an edging tool, and grooved at intermediate intervals not in excess of the width of the walk, uniform throughout the length of the walk in any one direction.

DRIVEWAYS

Unpaved driveways shall be surfaced with not less than three inches of Crusher-run gravel, topped with three inches of stone, gravel, or other materials equal to that found in the original driveway. Driveways shall be left in a condition better than their original condition.

Concrete drives shall be replaced with Class B concrete and shall have equal thickness and reinforcing steel to that of the original drive. Prior to placing the concrete a six-inch aggregate base course shall be placed in the drive area.

Bituminous or Asphaltic concrete drives shall be restored with a six-inch aggregate base course and a two-inch surface course, as defined in the section entitled Bituminous Pavement Repairs.

ROADWAY REPLACEMENT

Bituminous or Asphaltic pavements shall include all areas paved with blacktop; built-up pavements or oil and stone, tar and stone and similar pavements constructed with a bituminous or asphalt and stone materials.

Immediately upon completion of refilling of the trench or excavation in a specified area, the Contractor shall repair all damage to the existing pavement. In the excavated area, the repair shall consist of an eight-inch aggregate base course, 4-inch HB Binder Course and a two-inch surface course as defined in the section entitled Bituminous Pavement Repairs. If, in the opinion of the Town, the area adjacent to the excavation has not been damaged to the extent that the base course need to be replaced, restoration may consist of a surface course of sufficient thickness to meet the existing pavement.

Portland cement concrete roadways shall be replaced with Class B Concrete and shall have equal thickness and reinforcing steel as the original roadway. An aggregate of six-inches shall be placed prior to the placing of concrete. Differential settlement of restored pavements shall be corrected immediately.

DITCHES

Ditches shall be regraded to the original grade and line. The surface of all ditches shall be returned to the same condition as found before commencing work.

LAWNS AND LANDSCAPED AREAS

Lawns and landscaped areas shall be regraded and replaced as follows:

- A. Grading shall be to the grade existing before construction of the work under this Contract.
- B. Lawn replacement shall be in accordance with the section entitled Landscaping. Topsoiled areas shall be replaced with topsoil of equal quality and quantity.
- C. Landscaped areas shall be replaced with shrubs, hedges, ornamental trees, flowers, or other items to original condition.

CURB AND GUTTER

Curb and gutter removed with, or damaged as a result of construction operations, injured or disturbed by the Contractor, his agents, or employees, shall be replaced with new construction to a condition similar and equal to that existing before damage was incurred. Class B Concrete shall be used in curb and gutter replacement.

DAMAGE TO STRUCTURES

Any damage to existing structures shall be repaired of materials and workmanship equal to those of original construction. Extensively damaged structures, where the structural stability has been affected or which cannot be repaired in a suitable fashion shall be replaced entirely. Replacement shall not commence until approval of the plan of replacement has been given by the Town. Replacement costs shall be responsibility of the Contractor.

SCOPE

The work covered by this section consists of the excavation, placement, and compaction or satisfactory disposal of all unclassified materials encountered within the limits of the work.

GENERAL

All materials excavated under this section, regardless of its nature or composition, shall be classified as Unclassified Excavation.

UNCLASSIFIED EXCAVATION

All suitable material removed in the excavation shall be used as far as practical in the formation of embankments, subgrades, and shoulders and at such other places as may be indicated on the plans or directed by the Town. No excavation shall be wasted except as may be permitted by the Town.

The Town will designate materials that are unsuitable and their disposal location.

Where suitable materials containing excessive moisture encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Town such measures are necessary to provide proper construction.

Widening of cuts or flattening of cut slopes will not be required in rock or material which required ripping. When rock is unexpectedly encountered, any widening or flattening already begun shall be transitioned to leave the cut with a pleasing and safe appearance.

Excavation in the earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earth fill, except that, if the earth is to become the subgrade for riprap, rock fill, sand or gravel bedding, or drain fill, the voids may be filled with material conforming to the specifications for the riprap, rock fill, bedding or drainfill.

Slide and overbreaks which occur prior to final acceptance of the project due to natural causes shall be removed and disposed of by the Contractor as directed by the Town.

Where slides or overbreaks occur due to negligence or carelessness on the

part of the Contractor, the Contractor shall remove and dispose of the material at no cost to the Owner.

Where it is necessary for existing utilities to remain in their original location, the Contractor shall conduct his earthwork operations in a manner which will not disturb these facilities.

SCOPE

- A. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.
- B. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, waterpipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other unclassified excavation as may be deemed necessary by the Town.

GENERAL

- A. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Town. All work covered by this section shall be coordinated with the the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Town.
- B. All excavation shall be by open cut unless otherwise authorized by the Town. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least six inches below established bottom grade and backfilled to grade with sand thoroughly compacted in place. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than six (6) inches between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of two (2) feet above the top of the pipe shall be 30 inches or 10 inches clearance from the outside of the pipe, whichever is greater.

- C. **Sheeting and Bracing Trenches:** If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing to prevent movement by slides or settling of the sides of the trench, in such manner as the Town may direct to prevent injury to, or displacement of, the pipe or appurtenances or diminish the working space required at the sides of the pipe. For the purpose of preventing injury to persons or property or adjacent structures, trench safety and any shoring that may be needed is the responsibility of the Owner, Contractor, and Owner's Engineer.

No sheeting or bracing shall extend closer than two (2) feet off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom. If the Town is of the opinion, that at any point, sufficient or proper supports have not been provided, the Town may order additional supports put in at the Contractor's expense, but compliance with such orders shall not release the Contractor from responsibility for the sufficiency of such supports.

EXCAVATED MATERIALS

- A. Excavated materials to be used for backfill will be approved by the Town, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.
- B. Materials which are excess to the needs of the project will be disposed of according to Section 02227 "Waste Material Disposal" of these specifications.

BACKFILL AND COMPACTION

- A. Backfill trenches immediately after approval of the pipeline construction.
- B. Pipes: Use select backfill carefully placed in uniform layers not

exceeding six (6) inches in thickness to a depth of two (2) feet over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill two (2) feet over top of pipe to top of trench, shall be backfilled with a select material containing no rocks larger than six (6) inches in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over four (4) inches in diameter will be allowed.

Moisten backfill above two (2) feet over the top of the pipe and place in 8-inch layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

- C. Roadways and Road Crossings: Use select backfill placed in uniform layers not exceeding six (6) inches in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95 percent compaction (100% for the top two (2) feet of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway, per Section 02828.4 "Roadway Replacement" of these specifications.
- D. Cleanup: Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

SECTION 06100 WATER PIPE AND APPURTENANCE MATERIALS

SCOPE

These specifications shall apply to the materials to be furnished and installed to complete the water line installations in accordance with the plans. All pipe and appurtenances shall be of the class and type as indicated on the plans and designated herein.

GENERAL

All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.

As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

In general, ductile iron pipe shall be used for all waterlines larger than 2" diameter unless alternate materials are specifically approved by the Town.

PIPE

A. Ductile Iron Pipe

Ductile Iron Pipe shall be manufactured in accordance with AWWA C151. All Ductile Iron Pipe shall be 350 psi Class unless otherwise specified and shall be lined with a cement mortar lining not less than 1/16" thick conforming to AWWA C104. Pipe wall thickness for all Ductile Iron Pipe shall conform to "Thickness Design for Ductile Iron Pipe," AWWA C150. The Standard laying condition shall be type 2. The exterior of all Ductile Iron Pipe shall have a protective coating of a coal tar or asphaltic material a minimum of 5 mils thickness conforming to AWWA C110 and C115.

1. Flanged Joints (required for all valuts, pits, pump stations, and any exposed location): Flanged pipe shall have flanges

with long hubs, shop fitted on the threaded end of the pipe.

Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushed before installation of pipe.

Ductile Iron Flanged joint pipe shall have a thickness of Class 53 minimum and shall conform to AWWA C110 and AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field. All pipe shall have 125 lb. Flanges conforming to AWWA C110 unless otherwise specified.

In general, flanged joints shall be made up with through bolts of the required size. Stud or tap bolts shall be used only where shown or required. Steel or tap bolts shall be cadmium plated, with good and sound, well fitting threads, so that the nuts may be turned freely by hand. Cadmium plating shall be by an approved process with a plate thickness of 0.0003 to 0.0005 inches.

Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment and piping is furnished by the installer or not.

2. Mechanical Joints (required at all fittings, high pressure installations, and at any location required by the Town or noted on plans):

All mechanical joint pipe shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi Class as determined by AWWA C150 unless otherwise noted.

All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

3. Slip Joints (permitted for normal water line installation unless

otherwise noted on plans):

Slip or "push-on" joints shall be manufactured in accordance with AWWA C151. Pipe thickness shall be 350 psi Class as determined by AWWA C150.

Bells of "slip" joint pipe shall be contoured to receive a bulb shaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of 4%. Field Lok 350 Gaskets may be approved and or specified for certain applications.

B. Polyvinyl Chloride Pipe (AWWA C-900)

Where specifically permitted by the Town, Polyvinyl Chloride (PVC) Pipe larger than 2" diameter shall meet the requirements of AWWA C-900 and shall meet all requirements of DR 18 and DR 14 whichever is applicable. All PVC pipe shall be tested to four times the rated working pressure of the pipe and be approved by the National Sanitation Foundation. The pipe shall be furnished in standard laying lengths of 20 feet +/- 1".

All PVC pipe joints shall be of an integral bell and spigot of the same material as the pipe with a solid cross-section rubber "O" ring.

C. Polyvinyl Chloride Pipe (Other than AWWA C-900)

Where specifically permitted by the Town, Polyvinyl Chloride (PVC) pipe equal to or smaller than 2" diameter shall meet the requirements of ASTM specifications D-2241, latest edition, and be approved by the National Sanitation Foundation for potable water use. It shall be extruded from virgin, PVC II20 compounds conforming to ASTM Specification D1784. The standard dimension ratio (SDR) shall be 13.5 unless otherwise specified.

All PVC pipe joints shall be of an integral bell and spigot which "push-on" joints which are manufactured in accordance with AWWA C151. The bell end of the pipe shall have an integral rubber gasket.

Where PVC pipe is furnished in IPS sizes, IPS transition gaskets

shall be furnished with each fitting for compatibility.

D. Steel Casing Pipe

Steel casing shall conform to ASTM A-53, Grade B or ASTM A-139 Grade B standard specifications. Casing pipe shall have a wall thickness as follows, unless otherwise noted in the bid documents:

12" thru 24" casing - 0.250 inches wall thickness

30" casing - 0.312 inches wall thickness

36" casing - 0.375 inches wall thickness

E. Galvanized Steel Pipe

Galvanized steel pipe may be used only where specifically permitted for temporary work or to tie into existing galvanized systems. Where specifically permitted by the Town, Galvanized Steel Pipe shall conform to ASTM Specification A 120. Joints and fittings shall be galvanized, malleable iron, screwed, Class B meeting Federal Specification WW-P-521, ASTM Specification A 197 and ANSI Specification B2.1.

Fittings

A. Ductile Iron Fittings

All ductile iron pipe fittings shall be mechanical joint in accordance with AWWA C153 (ductile iron, compact type) for 3" - 24" and AWWA c110 (ductile iron, full body type) for pipe larger than 24". Where flanged pipe is used ductile iron fittings shall be flanged in accordance with AWWA C153 or AWWA C110 where applicable for exposed piping. All flanges shall be Class 125 unless other noted.

All fittings shall be lined with cement mortar not less than 1/16-inch thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.

All mechanical joints shall be manufactured in accordance with AWWA C111.

Gate Valves

All gate valves shall be designed for a working pressure of 200 psi unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Valves to be installed underground shall be non-rising stem type while valves installed above ground or in buildings and structures shall have rising stems.

A. Gate Valves Smaller than 2-inches and 2" Valves installed in Structures

Gates valves smaller than 2-inches shall be No-Lead, all brass, single disc, double seat tapered wedge type built to manufacturer's standards with material and construction conforming to AWWA C-500.

Each valve shall have a tee handle or hand wheel, whichever is applicable, for valve operation.

Unless otherwise specifically approved, 1 inch - 2 inch valves installed in buildings or vaults shall be No-Lead, Full Port Ball Valves providing positive shut off and be lockable.

B. Gate Valves 3-inches to 12-inches, and for 2-inch valves installed in the ground

Gate valves 2-inches and larger shall be of cast iron or ductile iron body, bronze mounted resilient seated type meeting the requirements set forth in AWWA Specification C-509. All valves shall be from one manufacturer and parts interchangeable. All gate valves installed underground shall have mechanical joint ends unless otherwise specified. All gate valves installed inside vaults, pits, pump stations and other structures shall be flanged.

All internal surfaces of the valve body and bonnet shall be coated with fusion bonded epoxy to a minimum thickness of 8-mils. Said coating shall be non-toxic --impart no taste to water and shall conform to AWWA C-550 of latest revision.

The outside of the valve is to be coated with the same fusion bonded epoxy conforming to AWWA C-550 such that all exposed external surfaces, including and connection bolt holes, body to bonnet bolts holes, etc. shall be coated, 8-mils thick minimum.

Resilient seat valves are to be iron body with non-rising stems. The sealing mechanism shall consist of a solid iron gate totally encapsulated with rubber. It shall be designated so that compression-set of the rubber shall not inhibit the ability of the valve to seal when unbalanced pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at 200 PI working pressure when installed with the line flow in either direction.

All gate valves larger than 12-inches shall be for a horizontal installation and shall be equipped with bronze trunnions, non-corrodible tracks, bronze scrapers and any additional accessories necessary for proper operation in a horizontal position.

Gate valves for horizontal installation shall be equipped with bevel gears and gate valves for vertical installation shall be equipped with spur gears as specified. The minimum gear ration shall be 2:1 for valves 14 to 24 inches; 3:1 for valves 30 to 36 inches; and 4:1 for valves 42 to 48 inches.

Where installed in the ground, the valve gears shall be enclosed in a waterproof grease case of the extended type attached to the bonnet of the valve in such a manner as to permit repacking of the stuffing box of the valve without disassembly of the grease case. The valve stem and stuffing box or seals shall be protected by a suitable frame or shield to prevent contact of these parts with soil.

Valves to be installed underground shall be non-rising stem type with 2-inch square operating nut. Gate valves located inside structures shall be supplied with hand wheels and have rising stems (OS & Y type).

Gate valves shall have a by-pass and by-pass valve only if specified or shown on the plans or on the bid proposal. For horizontal installation, the by-pass valve shall be at right angles to the main valve stem in the positions shown on the plan. For vertical installation, the by-pass valve shall have its stem parallel to the main valve stem in position shown on the plans. The by-pass valve shall also conform to the most

recent AWWA Specification C-509.

All valves shall be Mueller A-2360 unless otherwise specifically permitted by the Town.

C. Gate Valves Larger than 12-inches

Gate valves larger than 12-inches shall be of the iron body, bronze mounted type meeting the requirements set forth in AWWA Specification C-500. Valves shall have double discs, rolled bronze stems, cast iron followers, and steel bonnet bolts and nuts. Where possible, all valves shall be from one manufacturer and parts interchangeable. All gate valves installed underground shall have mechanical joint ends unless otherwise specified. All gate valves installed inside structures shall be flanged.

All gate valves larger than 12-inches shall be for a horizontal installation and shall be equipped with bronze trunnions, non-corrodible tracks, bronze scrapers and any additional accessories necessary for proper operation in a horizontal position.

Gate valves for horizontal installation shall be equipped with bevel gears and gate valves for vertical installation shall be equipped with spur gears as specified. The minimum gear ration shall be 2:1 for valves 14 to 24 inches; 3:1 for valves 30 to 36 inches; and 4:1 for valves 42 to 48 inches.

Where installed in the ground, the valve gears shall be enclosed in a waterproof grease case of the extended type attached to the bonnet of the valve in such a manner as to permit repacking of the stuffing box of the valve without disassembly of the grease case. The valve stem and stuffing box or seals shall be protected by a suitable frame or shield to prevent contact of these parts with soil.

Valves to be installed underground shall be non-rising stem type with 2-inch square operating nut. Gate valves located inside structures shall be supplied with hand wheels and have rising stems.

Gate valves shall have a by-pass and by-pass valve only if specified or shown on the plans or on the bid proposal. For horizontal installation, the by-pass valve shall be at right angles to the main valve stem in the positions shown on the plan. For vertical installation, the by-pass valve shall have

its stem parallel to the main valve stem in position shown on the plans. The by-pass valve shall also conform to the most recent AWWA Specification C-500.

VALVE BOXES

All valve boxes shall be cast iron and shall conform to ASTM Specification A48. Valve boxes shall be of the adjustable screw type with a base to fit the valve yoke with a removable cover with the word "water" cast thereon.

FIRE HYDRANTS

All fire hydrants shall meet or exceed the requirements of AWWA C-502, be listed by Underwriters Laboratories, Inc. and have Factory Mutual Research approval. All hydrants shall be rated 200 PSI working pressure minimum and be tested to 400 PSI minimum. The rated working pressure shall be cast on the hydrant barrel. Hydrants shall be of the compression type, constructed such that the main valve closes with water pressure to assure no loss of water in the event of damage to the upper portion of the hydrant. The diameter of the main valve seat shall be five and one-quarter inches (5 -1/4") unless hydraulic data shows that the required fire flow can be achieved with a smaller valve size. The hydrant shall open counter clockwise against the pressure and close clockwise with the pressure.

The bonnet assembly shall have a lubrication reservoir which is sealed from the waterway and all external contaminants by the use of "O" ring seals. A port to add lubricant to the reservoir, without removal of the bonnet, is required.

Fire hydrant shall be manufactured with 1 1/2-inch Pentagon operating nut and thrust nut made of low zinc bronze complying with ASTM B-61, B-62 or B-96, with thrust bearings located both above and below the thrust collar and with operating nut protected by a cast iron weather shield. In lieu of the bronze operating nut, an integral ductile iron operating nut and weather shield will be acceptable.

Hydrants shall be a 3-way type with two (2) outlet nozzles, two and one-half inches (2 1/2") NST and (1) steamer nozzle four and one-half inches (4 1/2") NST. All nozzles shall be made of low zinc brass complying with ASTM B-61, B-62 or B-96. All nozzles shall be mechanically locked into the barrel and have "O" ring pressure seals. Caps shall be provided with chains and chain hooks.

The hydrant shall have a traffic "breakaway" coupling which is designed to fracture when the hydrant is impacted by a vehicle. The breakaway coupling shall be made of cast iron or steel and shall allow for 360

degrees rotation of the upper barrel to position the nozzle without removing the breakaway coupling or shutting down. All pins, clips, and or retainer rings associated with the "breakaway" coupling shall be stainless steel.

The main valve seat shall have bronze to bronze seating arrangement of low zinc bronze complying with ASTM B-61, B-62 or B-96. A bronze seat ring shall be threaded into bronze sub-seat located in the hydrant elbow. All "O" rings sealing the main valve seat ring shall bear against a non-corrodible low zinc bronze surface.

The main valve assembly shall include double drain valves to operate automatically each time operated without the aid of springs, pins or toggles. The valve upper plate and valve lower plate shall be made of ductile iron or low zinc bronze complying with ASTM B-61, B-62 or B-96. The entire valve and stem assembly must be capable of removal and re-assembly by the use of a small lightweight wrench without disassembly of the upper barrel.

The shoe casting, lower barrel casting, and flanges below ground shall be manufactured in accordance with ASTM A-126, Class B, Grey Iron or Ductile Iron. All ferrous metal surfaces in the hydrant shoe are to be fully coated with a minimum four (4) mills epoxy not to exclude the lower valve plate assembly.

The hydrant shall be of the correct bury depth for the location. Hydrant risers and NOT permitted in order to establish the correct bury depth in new installations. The hydrant will have a six inch (6") inlet connection of the (mechanical joint) type, unless otherwise noted. Painting and coating of the hydrant shall be as prescribed in AWWA C-502, latest revision. The color above the ground line flange shall be YELLOW.

All fire hydrants shall be Mueller Centurion 200 hydrants unless otherwise specifically permitted by the Town.

AIR RELIEF VALVE

The air relief valve shall be rated for a working pressure of 150 psi and hydrostatic test pressure of 300 psi and shall automatically function to release to atmosphere small amounts of air that accumulate in the pipeline. Once the air has been exhausted, the valve shall seat tightly to prevent water leakage. All air valves shall be GA Industries Figure 910 with 1" NPT Inlet unless otherwise specifically permitted by the Town.

MANHOLE SECTIONS AND APPURTENANCES

Precast concrete manhole bases, risers and cones shall conform to ASTM C478, latest revision, for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.

Minimum compressive strength of concrete shall be 4000 psi and the maximum permissible absorption shall be 6.5 percent. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole sections shall fit together readily and shall have a self-contained "O" ring rubber gasket conforming to ASTM C443.

The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his inspector. The manhole sections shall be perpendicular to their longitudinal axis, within the limits listed in ASTM C478.

Castings for manhole frames and covers shall be tough, even grained soft grey iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM A48, latest revision, Class 30.

Brick for manholes and other structures shall conform to applicable requirements of ASTM Specification C62, latest revision, Grade SW.

TAPPING SLEEVE AND VALVE (CAST IRON)

Tapping sleeves shall consist of two piece split steel sleeves, jointed by bolts manufactured of high strength cast iron and incorporating a longitudinal compound rubber gasket. The sleeves shall include split end gasket and two piece mechanical joint glands suitable for the class of pipe around which sleeves are to be placed. Glands will be joined by steel bolts and fastened to the bell openings of the sleeves to form totally enclosed rubber water tight seals around the periphery of the pipe and along the longitudinal joints.

The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to gate valves elsewhere specified with inlet and outlet ends adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

Resilient seated tapping valves 16-inches diameter and smaller shall be furnished with the tapping flange having a raised face or lip designated to engage the corresponding recess in the tapping sleeve flange in accordance with MSS SP60 and be drilled and faced in accordance with 125 pound standard. The branch outlet of the tapping valve shall be furnished with mechanical joint ends compatible with standard Mueller tapping equipment. Tapping valves are to be furnished complete with all jointing accessories fully assembled both flanged and M.J. ends.

Tapping sleeves shall be Mueller H-615 and Tapping Valves Shall be Mueller T-2360 Resilient Wedge, Unless otherwise specifically permitted by the Town.

HYDRAULIC CHECK VALVE

The hydraulic check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel trim and a non-corrosive stem.

It shall absolutely prevent the return of water, back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must be shockless (cushioned check) in operation. The seat ring must be renewable and shall be securely held in place.

All material and workmanship shall be first class throughout.

The valve shall be a GA Industries, Inc., Fig. No. 2730-D or approved equal.

ALTITUDE CONTROL VALVE

Altitude valves shall be installed at all reservoirs or elevated tanks to prevent the reservoirs or tank from overflowing unless an alternate control method is specifically approved. Float operate valves or switches will not be approved.

The altitude control valve shall be single acting, closing to prevent the overflow when high water level is reached and opening for refiling when the reservoir or tank level lowers by the specific amount specified by the Town for the specific application. The altitude valve shall be hydraulically

operated, pilot actuated piston/diaphragm type globe or angle valve specifically designed for ground level control of water in an elevated storage tank and reservoirs. The valve operates on a differential in pressure between the height of the water in the reservoir and an adjustable spring loaded pilot control. The valve is to be non-throttling and will remain in the full open position until the shut-off point is reached.

The valve shall be constructed with a cast iron body (ASTM A-126) with stainless steel or bronze trim. The main valve shall be packed with leather or other suitable material to insure tight closure and prevent metal to metal contact and seating. The main valve shall include a position indicator rod to show the position of the main valve. The main valve shall be equipped with test cocks for testing purposes. It shall be designed for an internal working pressure of at least 175 psi. The main valve shall be furnished with 125 lb. connecting flanges unless otherwise specified.

A pilot valve shall control the operation of the main valve. The pilot valve shall have a range for adjustment as specified by the Town for the specific project and shall be easily accessible and so arranged to allow for its servicing or removal from the main valve while the main valve is in service under pressure. Ball valves shall be installed in the control piping to completely isolate the pilot valve as may be required for servicing and repair. The ball valves, or a combination of ball valve and manually operable solenoid pilot valves shall allow manual opening and closing of the main valve.

Unless otherwise specifically approved, the altitude valve will be furnished with a 3 Way solenoid pilot valve, in addition to pilot valve for level control, to allow the main valve to be closed fully when the solenoid pilot valve is energized. Unless otherwise specified the solenoid pilot valve shall be furnished for 120 volt, 60 cycle a.c. operation.

An external strainer with blow-off shall be provided in the control circuit to protect all of the pilot valves. Unless otherwise specifically approved, the control circuit shall provide a means for controlling the closing speed of the main valve.

The main valve position indicator rod shall be fitted with two (2) limit switches (dual limit switches) of the single pole, double throw type to indicate the fully open and fully closed position of the main valve.

The altitude control valve(s) shall be of the size indicated on the contract drawings and shall be Ross Valve Mfg. Co. Model 30AWR.

REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTER

Backflow preventers detector check shall be required on all water lines serving commercial or industrial facilities unless otherwise specifically approved by the Town. Unless otherwise approved, all backflow preventers shall be of the reduced pressure zone type double check, double gate valve assemblies. Assemblies 2" and smaller in size shall be equipped with ball type shut-off valves. Assemblies larger than 2" shall be equipped with resilient wedge, OS & Y type valves with flanged ends. The valves (ball or OS&Y) shall be furnished by the manufacturer as part of the assembly. Groove connections are not permitted. All reduced pressure zone backflow preventers shall be equipped from the manufacturer with test cocks to allow for testing of the entire assembly while in place. All reduced pressure zone backflow preventers assemblies must be fully factory assembled and tested prior to installation.

Reduced pressure detector assemblies shall meet all specifications of and shall be approved by the USC Foundation for Cross Connection Control and Hydraulic Research and the American Society of Sanitary Engineers. Unless otherwise specifically approved, all reduced pressure zone backflow preventers shall be Watts Series 909 or Febco Type 825Y.

REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTER FOR FIRELINE INSTALLATIONS

A reduced pressure principal detector check shall be required on all fire lines. All detector check valves and meter assemblies shall be reduced pressure type double check, double gate valve assemblies consisting of a mainline reduced pressure configured backflow assembly in parallel with a by-pass meter assembly. The by-pass meter assembly shall consist primarily of a bronze positive displacement water meter, registering in U. S. Gallons, in series with a bronze reduced pressure backflow preventer and shall be equipped with shutoff valves and test-cocks. The mainline gate valves are considered integral to the assembly and shall be resilient wedge, OS & Y type, with flanged ends, UL/FM listed for fire line service and shall be equipped with test-cocks. Grooved connections are not permitted. Assemblies must be factory assembled and tested to assure proper backflow protection and mainline/by-pass balance and cross-over performance.

Reduced pressure detector assemblies shall meet all specifications of and shall be approved by the USC Foundation for Cross Connection Control and Hydraulic Research and the American Society of Sanitary Engineers. Unless otherwise specifically approved, all reduced pressure principal detector check assemblies shall be Watts Series 909RPDA or Febco Type 826YD.

**REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTERS
LOCATED IN UNDERGROUND VAULTS**

Underground vaults for reduced pressure detector assemblies shall include a drain, piped to daylight with a free discharge. The drain shall be sized two times the diameter of the largest reduced pressure detector installed in the vault, four (4) inch minimum - twelve (12) inch maximum. The open end of the drain shall be fitted with a flap valve with a non-ferric seat and be so designed to allow free discharge of the drain piping.

With specific approval, the drain pipe may discharge into a storm drainage system at a structure which provides access such as a catch basin or manhole. The invert of the vault drain pipe must be higher than the top of the highest pipe entering or leaving the drainage structure and shall be equipped with a flap valve with a non-ferric seat.

If due to the topography of the site, the underground vault cannot be located at any point on the site which will allow for a daylight drain or drain into a storm drainage structure as indicated above, the reduced pressure detector and gate valve assembly shall be installed in an above ground, heated, weatherproof structure with a "to daylight" drain. A method shall be provided to assure uninterrupted heat during cold weather to prevent freezing of the assembly.

DESCRIPTION

The work covered by this section consists of all excavation, bedding, laying pipe, jointing and coupling pipe joints, and backfilling necessary to install the various types of pipe and appurtenances required to complete the project.

Where waterlines are to be located within street right-of-ways the centerline and/or edge of proposed pavement shall be accurately staked prior to installation of the water lines. Unless otherwise specifically approved, water lines are to be located under the paved portion of the roads within the development approximately 4 feet from E. P.

Where waterlines are not located within street right-of-ways, the intended location of the proposed waterline shall be accurately staked on the ground and approved by the Town prior to beginning any pipe laying process.

HANDLING AND STORING MATERIALS

The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the pipe on sills above storm drainage level and deliver for laying after the trench is excavated. When any joint or section of pipe is damaged during transporting, unloading, handling or storing, the undamaged portions of the joint or section may be used where partial lengths are needed, or if damaged sufficiently, the Engineer, Distribution Superintendent, or Public Works Director will reject the joint or section as being unfit for installation.

If any defective pipe is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

PREPARATION OF PIPE FOUNDATION

The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed.

The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer. When an Inspector is present on the site and is so requested by the Contractor, he shall check the position of

grades and lines but the Contractor shall be responsible for the finished work conforming to exact and proper line and grade.

Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.

In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.

Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than six (6) inches. A suitably tamped and shaped foundation of approved material shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with either an approved material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.

The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on the timber or concrete cradle foundations. Such foundations whether of single plank, plank cradle supported by piles, or poured concrete cradle,

shall be placed by the Contractor and compensation will be allowed the Contractor for the work.

LAYING PIPE

All piping is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications. Installation manuals from various material suppliers will be furnished the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

No pipe shall be laid except in the presence of the Engineer or his Inspector, or with special permission from the Engineer.

Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flowline.

Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

Water lines and sanitary sewer force mains shall have thrust blocks constructed at all tees, "Y's", bends, and valves as shown on the plans.

All pipe joints shall be constructed in strict accordance with the pipe manufacturer specifications and materials and any deviation must have prior approval of the Engineer.

MAXIMUM DEFLECTION

The maximum deflection per joint of push-on-type joint pipe shall be as shown in the following table unless a greater deflection is specifically approved by the manufacturer.

MAXIMUM JOINT DEFLECTION		FULL-LENGTH PIPE		PUSH-ON-JOINT TYPE	
NOMINAL PIPE SIZE	DEFLECTION ANGLE	MAXIMUM OFFSET		APPROX. RADIUS OF CURVE	
		JOINT LENGTH = L		JOINT LENGTH = L	
<i>inches</i>	<i>degrees</i>	L = 18 ft	L = 20 ft	L = 18 ft	L = 20 ft
3 - 12	5	19 in.	21 in.	205 ft.	230 ft.
14 -24	3	11 in.	12 in.	205 ft.	340 ft.

For design purposes, maximum deflection shall be limited to 80 percent of the maximum shown in the table above.

No deflection shall be allowed in galvanized steel pipe joints or concrete pressure pipe joints.

SEPARATION FROM STORM AND SANITARY SEWER

All water lines shall have a minimum of 10 foot horizontal separation from sanitary sewer lines or 18-inch vertical separation with the water line over sewer. In the event these separations cannot be met, both water line and sanitary sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

All water lines shall have a minimum 12" clearance from storm drainage lines for 90 degree (approx.) crossings and a minimum of 24" clearance where a water line parallels storm drainage pipes, catch basins or manholes.

BACKFILLING

All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95 percent of the Standard Proctor Test (100% for the top two (2) feet of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free

from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.

The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

COMPENSATION

All work covered by this section will be considered incidental to other payment items to which it relates and no separate payment will be made therefor.

SCOPE

This section covers the installation of all necessary fittings, valves and appurtenances for the water distribution system as shown on the plans and specified herein. Pipe installation is covered in the applicable other sections of these specifications.

HANDLING AND STORING MATERIALS

The Contractor shall unload material so as to avoid deformation or other injury thereto. Material shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the fittings, valves and appurtenances on sills above storm drainage level and deliver for laying after the trench is excavated. All valves shall be drained and so stored as to protect them from freezing. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner at his own expense.

THRUST BLOCKS

All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed. Thrust blocks shall be made of concrete having a compressive strength of 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

Concrete for thrust blocks shall consist of a mix of Portland Cement, Fine

Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM Specification C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.

MECHANICAL JOINT ASSEMBLY

Prior to assembly of mechanical joint pipe or fittings the socket and plain end of the pipe shall be thoroughly cleaned. After placing the gland on the plain end of the pipe, lubrication and additional cleaning should be provided by brushing both the gasket and plain end with soapy water or an approved pipe lubricant meeting the requirements of ANSI/AWWA C111/A21.11, just prior to slipping the gasket on the plane end of the pipe.

The pipe is now ready to be inserted into the socket and the gasket firmly and evenly pressed into the gasket recess, taking care to keep the joint straight during assembly. After assuring that the gasket is correctly in place and the joint is straight, the gland will be moved into position and the bolts inserted and nuts **hand-tightened**. **MAKE ANY REQUIRED DEFLECTION ONLY AFTER THE JOINT IS ASSEMBLED AND BEFORE THE BOLTS ARE FURTHER TIGHTENED.**

Tighten the bolts to the normal range of bolt torque while, at all times, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This can be accomplished by partially tightening the bottom bolts first, then the top bolts, next side bolts and then any remaining bolts. Repeat this process until all bolts are within the appropriate range of torque as shown in the following table. Final tightening shall be made using a torque wrench set to the proper torque. The assembly of mechanical joints without the use of a torque wrench will not be accepted.

MECHANICAL-JOINT BOLT TORQUE FOR MJ PIPE AND FITTINGS				
NOMINAL PIPE SIZE	BOLT SIZE		RANGE OF TORQUE	
	<i>inches</i>	<i>mm</i>	<i>ft.lb</i>	<i>N.m</i>
3	5/8	16	45 - 65	61 - 81
4 - 24	3/4	19	75 - 90	102 - 122
30 - 36	1	25	100 - 120	136 - 163

Upper torque ranges shall be used where higher working pressures are to be expected.

GATE VALVE INSTALLATION

Before setting each valve, the Contractor shall make sure the interior is clean and test opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the plans, and at the exact locations shown. Trench backfill shall be tamped thoroughly for a distance of three feet on each side of valves boxes.

All in-line gate valves, including those located in-line with a tee for a branch line, shall be installed with deadman restraint in accordance with Standard Detail - W4. All gate valves installed at crosses shall be considered in-line valves and shall be installed with a deadman in accordance with Standard Detail - W4 in each direction. Gate valves installed at the side outlet of a tee shall be rodded or otherwise restrained to the tee and thrust blocked in accordance with Standard Detail - W6.

GATE VALVE BOX INSTALLATION

A valve box shall be installed over each underground valve. All boxes shall be set plumb with their top flush with finished grade and shall be installed in accordance with Standard Detail - W9. Valve boxes for valves 2 inch and smaller shall be supported independently of the water line in accordance with Standard Detail - W10.

FIRE HYDRANT INSTALLATION

Fire hydrants shall be located as shown. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18-inches and not more than 24-inches above the finished grade. Hydrants shall be thoroughly blocked with concrete or shall be rodded to the 6-inch branch tee. Unless otherwise specified, the backfill around hydrants shall be thoroughly compacted to the final grade immediately after installation in order to put the hydrant into service as soon as practicable. Not less than seven cubic feet of clean crushed stone shall be placed around the base of the hydrant to insure drainage of the hydrant barrel. A cap block shall be set under the fire hydrant foot for a solid bottom.

AIR RELIEF VALVE INSTALLATION

Each air relief valve shall be installed at the exact location shown in a precast concrete manhole as shown in detail on the plans. Manhole sections shall be set plumb and on a firm foundation. Each joint between sections and all wall openings shall be sealed inside and out with a 2:1 sand-cement mortar and made watertight. When so directed, the Contractor shall install a flat slab top,

precast with a standard frame and cover. Flat slab tops shall be traffic bearing.

The depth of the water line may have to be deeper than is normally called for to allow for the installation of the manhole. Depth shall be adjusted so that the top of the air valve is at least 18-inches below the top of the manhole. Air valves located in manholes shall be installed in accordance with Standard Detail - W12.

Where specifically approved, air valves may be installed in a water meter box as shown on Standard Detail - W13 in lieu of a manhole installation.

BLOWOFF CONNECTIONS

Six inch Blow-off valves shall be installed on the water main at the exact locations shown on the contract drawings. A standard blow-off installation shall consist of ductile or cast iron tee, 6" gate valve, and pipe to drainage area; gate valve shall be rodded to tee and thrust blocked in the same manner as a tee for a lateral line or fire hydrant. The pipe to the drainage area shall be so installed to drain to daylight in a non-submerged location. The open end of the pipe shall be fitted with a flap valve with a non-ferric seat.

TESTING

After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure-leakage test.

The Contractor shall notify the Engineer and the Town when the work is ready for testing with all testing done in the presence of the Engineer and the Town. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor at his own expense.

Water for testing, flushing and disinfection (sterilization) will be provided at the designated "point of connection" only through an approved backflow prevention device and under the direct supervision of the Town. No permanent tie-in connection with the Town's existing system will be permitted until the new water lines have been flushed, pressure tested and disinfected in accordance with the requirements contained herein.

All gauges used for testing shall be of the appropriate range such that the test pressure will be indicated between 50% and 75% of the gauge scale. All gauges shall have an accuracy of 1% full scale. Any gauge which is subjected to pressure exceeding its rating or to excessive vibration or pulsations so as to make its accuracy questionable shall be immediately

replaced.

Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 200 pounds per square inch (at the highest point of the line section under test) for a period of two hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.

Air removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air release valves are not located at all high points, taps with corporation stops shall be installed at these points to expel the air as the line is filled with water. After the air has been expelled, the corporation stops shall be closed. At the conclusion of the pressure test, the corporation stops shall be plugged and their location noted on the record drawings.

Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

Leakage (testing allowance) is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage is less than ten gallons per inch of pipe diameter per mile of pipe per 24 hours * (7 fluid oz. per inch of pipe diameter per 1000 lineal feet per hour).

When testing against closed metal-seated valves, where the line section of the opposite side of the valve is not pressurized, an additional testing allowance of 0.0078 gallons (1 fluid oz.) per inch of nominal valve size per hour shall be allowed for each such valve.

When hydrants are located in the test section, the tests shall be made against the hydrant main valve with the auxiliary valve fully open.

Tests of pipe in or under buildings and structures and any piping to be insulated shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for any such piping.

* (REVISED PER AWWA C600-10/5.2.1.4 DATED NOV. 1, 2010) 12.14.2018

DISINFECTION (STERILIZATION)

After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be flushed, cleaned and disinfected in the presence of and directed by the Operator in Responsible Charge of the Town water distribution system of his Representative.

Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.

Prior to disinfection (chlorination), all new water lines shall be filled to eliminate all air pockets and then flushed at a minimum velocity of 2.5 ft/sec (approx. 400 gpm for 8" water line) to remove all contaminants. All water for flushing and disinfection will be provided at the designated "point of connection" only through an approved backflow prevention device and under the direct supervision of the Town. The required backflow prevention device at the "point of connection" shall be of sufficient size to allow adequate flow for flushing.

Each section of the completed water line shall be disinfected as specified below as prescribed by AWWA Standard C651 "continuous feed method. The section to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 50 parts per million and shall be introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 10 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.

Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall be responsible for taking the necessary precautions, such as dechlorinating, to ensure that the flushing does not harm the environment and complies with all appropriate regulatory requirements.

During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Engineer will take samples of water in properly sterilized containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least two full days. The section of waterline will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant. The contractor shall be responsible for the cost of all bacteriological

testing. Bacteriological tests shall be performed by a State Approved laboratory.

Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory bacteriological samples have been obtained.

MEASUREMENT-PAYMENT

Measurement of pipe line shall be the actual number of lineal feet of pipe installed, complete in place and accepted. No deductions in length will be made for fittings, valves, etc.

Unless otherwise provided for in other sections of these specifications, payment shall be made on the following basis:

Pipe lines shall be paid for at the unit contract price for every pipe size shown on the plans.

Fittings will be paid for at the contract unit price per pound.

Fire hydrants, valves, etc. will be paid for at the unit contract price each.

SCOPE

The work covered under this section shall consist of furnishing all materials, labor, equipment and services for the complete installation of a domestic water service connection from the water main line to the property to be served.

CONNECTION TO MAIN

The standard service connection shall connect to the main at a brass corporation stop tapped to the main line. Taps shall be made at a position of 40° – 50° from vertical. Taps of service connection will NOT be permitted on the top or bottom of the pipe.

SERVICE LINE

The water service line shall be constructed of Type "K" flexible copper tubing placed at a depth providing a minimum cover of 3 feet.

METER BOX AND APPURTENANCES

The box shall be of round style and made of Polyvinyl Chloride Plastic with a minimum wall thickness of .375 inches. The box shall be sized to accept a 5/8" water meter and shall have a minimum inside diameter of 18 inches with a 30 inch depth. The box shall have a non-locking cast iron cover of the 'rim and lid' type. The center "lid" shall be removable for meter reading purposes without necessitating the removal of the entire rim assembly.

The meter yoke shall consist of a 72 Series *Coppersetter* as manufactured by Ford Meter Box Company, Inc. The meter inlet side of the setter shall be furnished with a ball type inlet valve with provisions for locking. The meter outlet side of the setter shall be furnished with a dual-check valve assembly. The internal parts of the check valve shall be removable without disconnecting the check valve the outlet piping. The connections to the copper water service line shall be Pack Joint or compression type.

The meter setter shall have a bottom pipe brace extending out from under the meter box to support the meter setter.

The meter and meter box shall be installed in accordance with Standard Detail - W15. Where water pressure at the water main would normally be less than 50 psi, meters for residential use shall be installed with a 1-inch service as

shown of Standard Detail - W15a.

METERS

Meters shall be provided and installed by the Town at the time the water service is activated.

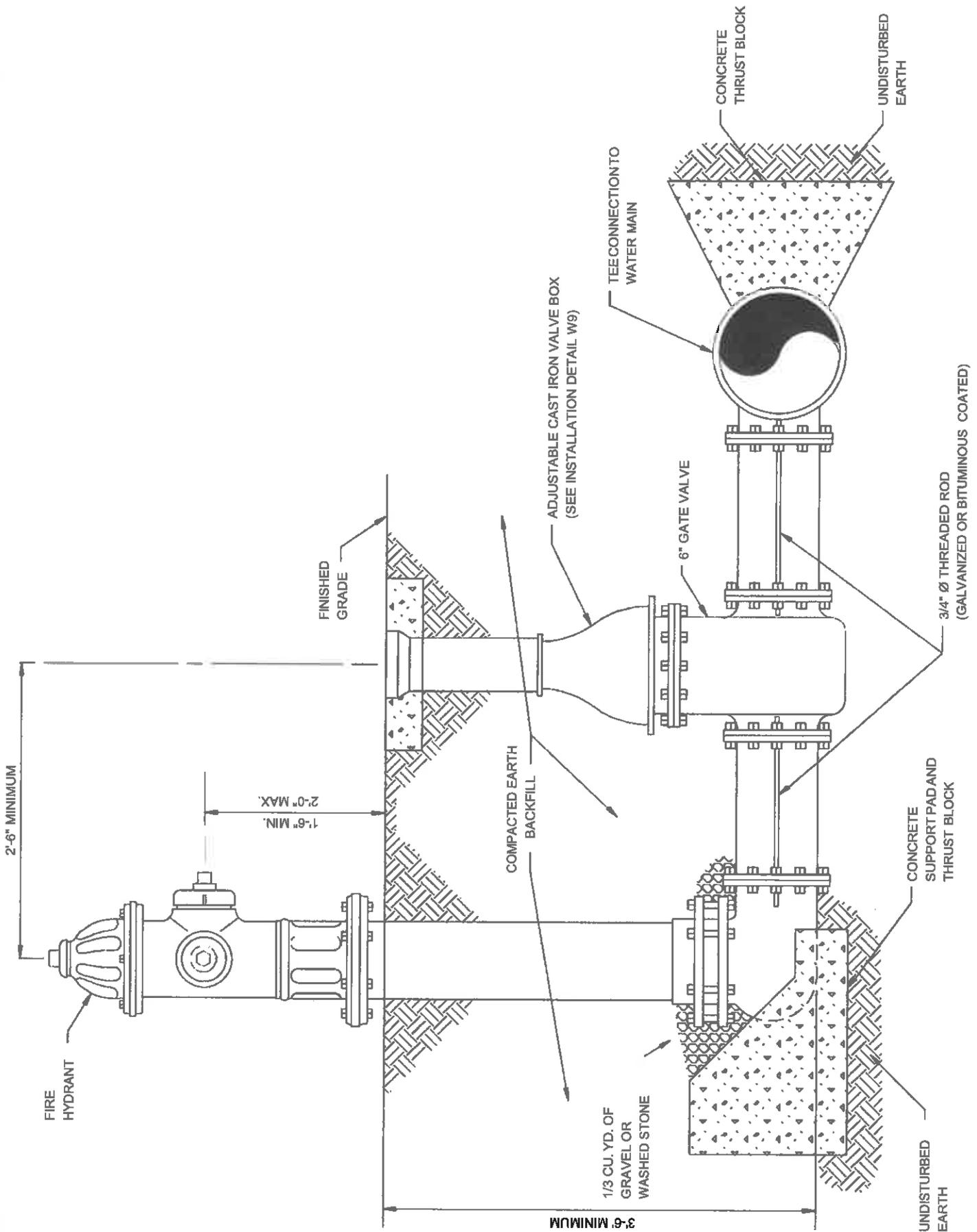
MEASUREMENT AND PAYMENT

Payment for furnishing and installation of all service connection as described in this section and as shown on the plans, shall be covered under the contract unit price bid for each Water Service Connection.

SECTION "W"

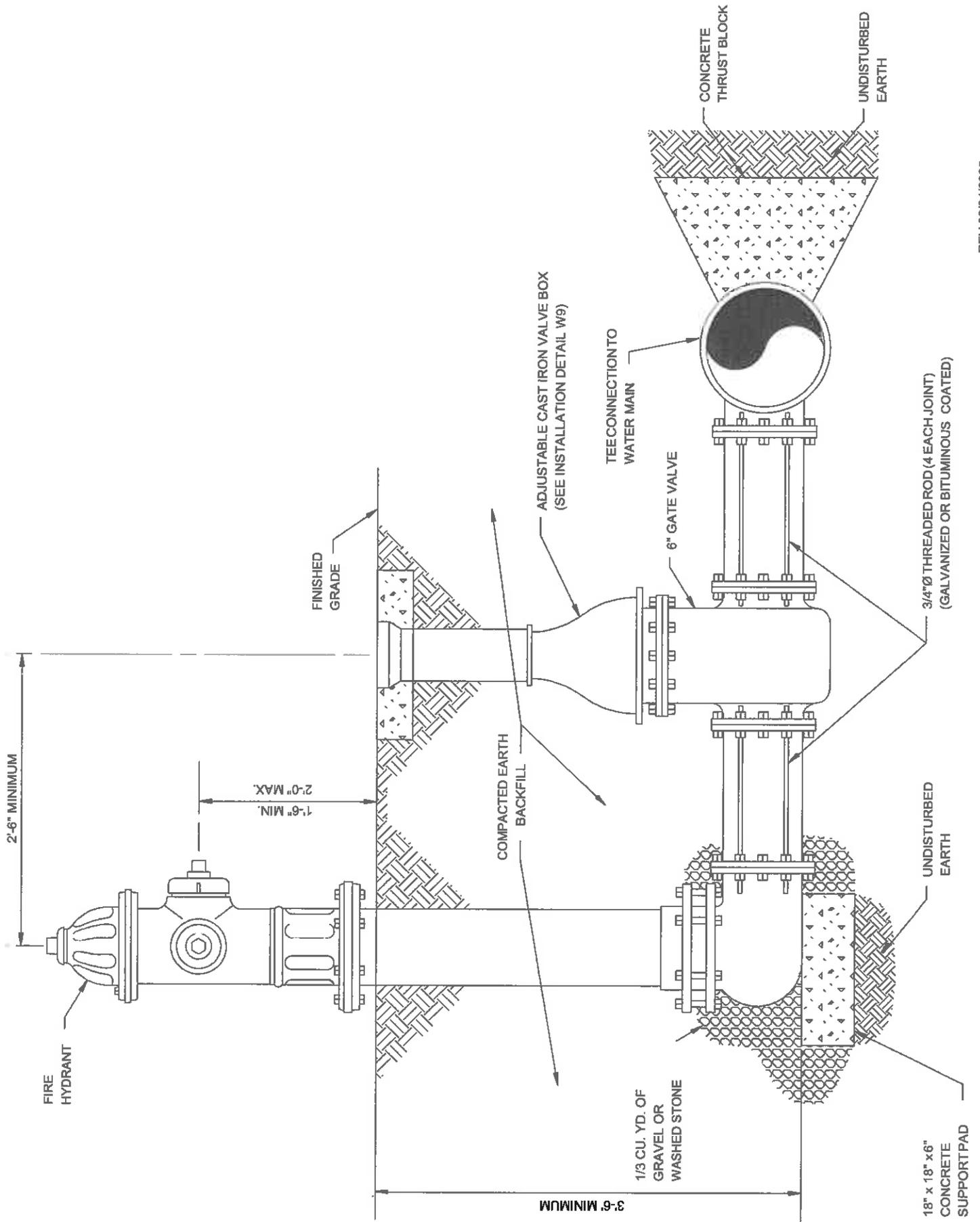
WATER LINE DETAILS

W1	Thrust Block Type Fire Hydrant Installation
W2	Rod Type Fire Hydrant Installation
W3	Tapping Sleeve and Valve Installation
W4	Typical Deadman Detail
W5	Thrust Blocks for Bends and Reducers
W6	Thrust Blocks for Plugs and Tees
W7	Thrust Block Dimensions
W8	Typical Trench Detail
W9	Vertical Gate Valve Installation
W10	2" Gate Valve Installation
W11	Pressure Reducing Valve Installation
W12	Air Release Valve Installation in Manhole
W13	Air Release Valve Installation in Meter Box
W14	2" Blow-Off Detail for PVC Water Line
W15	3/4" and 1" Water Meter Box Detail
W15a	3/4" Water Meter Box Detail (1" Service)
W16	Culvert Crossing Detail
W17	Creek Crossing and Creek Bank Stabilization
W18	Creek Crossing and Creek Bank Stabilization
W19	Cross Section Concrete Encasement
W20	Encasement Detail
W21	Backflow Preventor
W22	Backflow Preventor and Vault for Fire Sprinkler Systems with Domestic Water Meter
W22a	Backflow Preventor and Vault for Fire Sprinkler Systems without Domestic Water Meter
W23	Backflow Preventor and Vault - Section A - A
W24	2" and larger Meter, By-Pass and Vault with Backflow Protection
W25	2" and larger Meter, By-Pass and Vault with Backflow Protection Located Elsewhere
W26	2" and larger Meter, By-Pass and Vault - Section



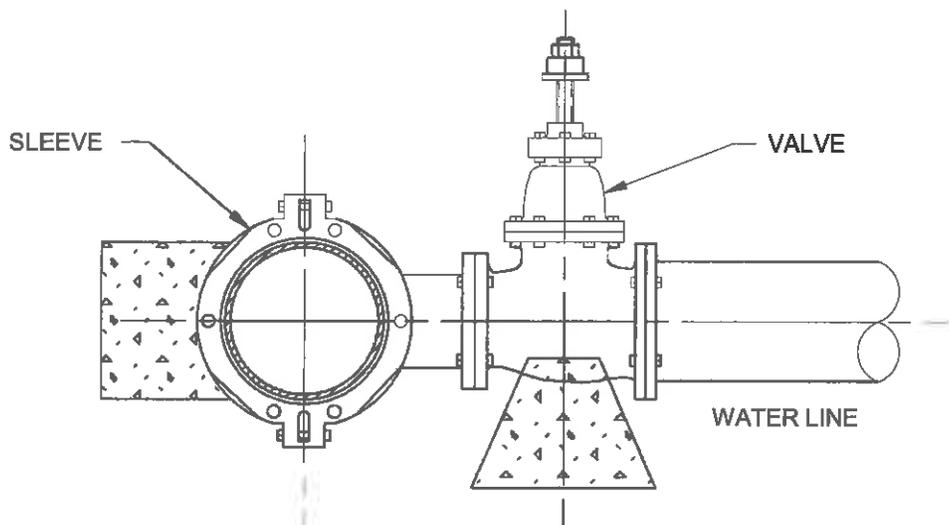
REV 02/04/2005

THRUST BLOCK TYPE FIRE HYDRANT INSTALLATION



REV 02/04/2005

ROD TYPE FIRE HYDRANT INSTALLATION

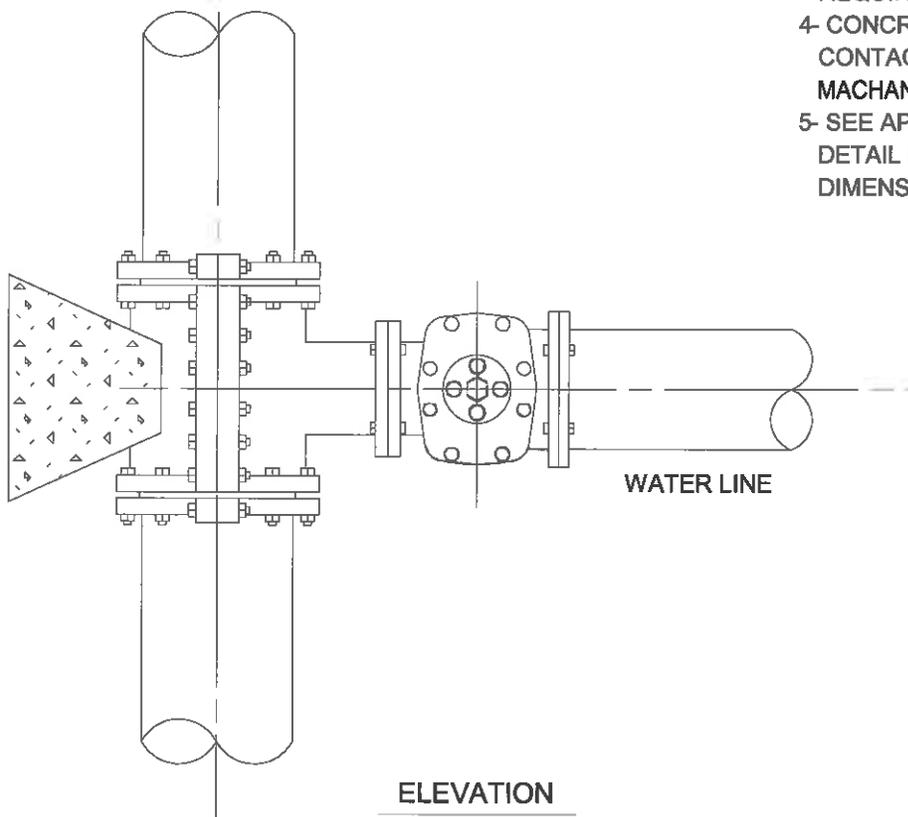


WATER LINE
MAIN

PLAN

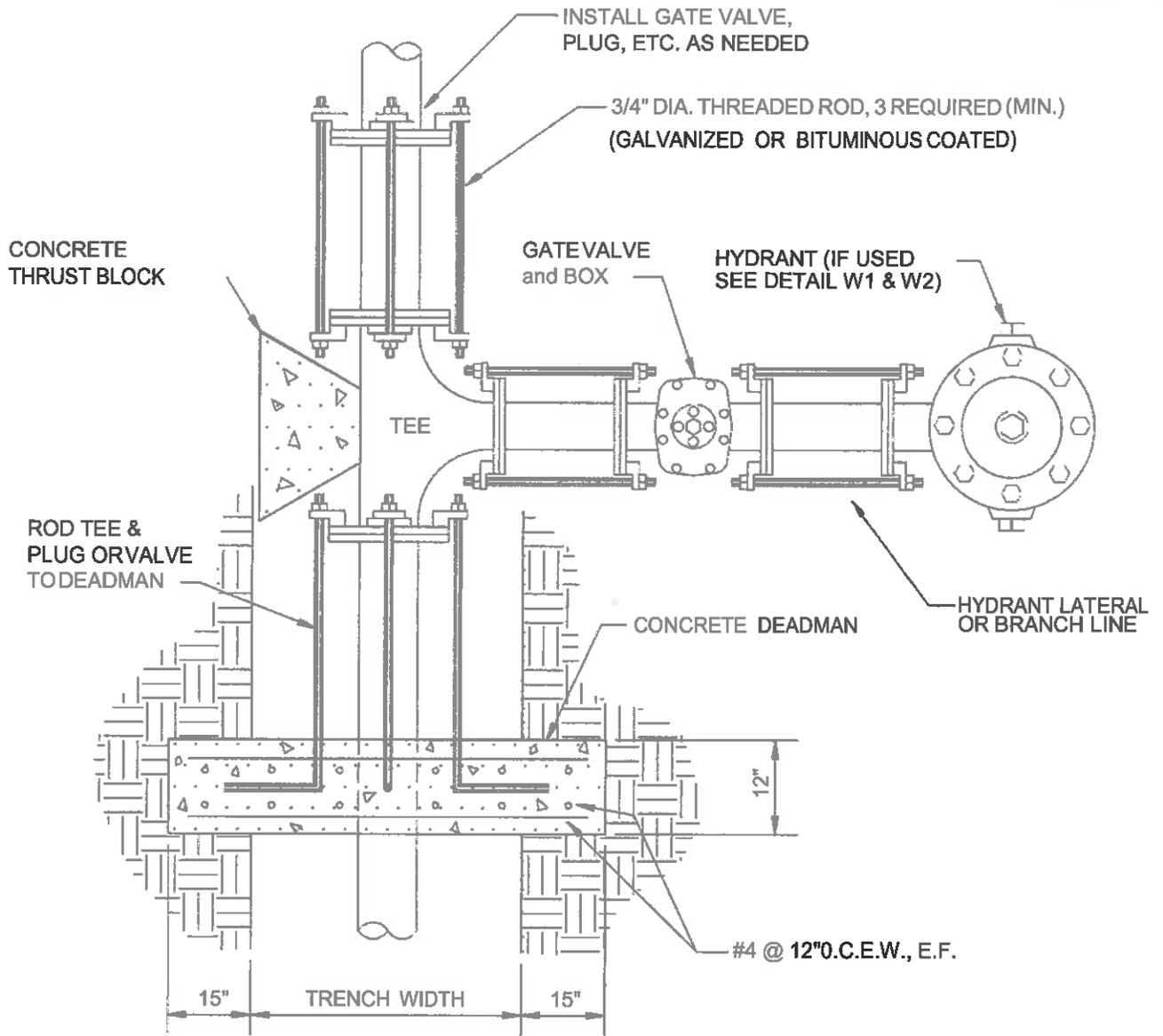
NOTES

- 1- TAPPING SLEEVE SHALL BE MUELLER NO. H-615 OR APPROVED EQUAL.
- 2- TAPPING VALVE SHALL BE MUELLER NO. T-2360 OR APPROVED EQUAL.
- 3- SOLID CONCRETE OR BRICK BLOCKING SHALL BE USED AS FOOTING FOR DUCTILE IRON PIPE. PVC PIPE SHALL REQUIRE A 3000 PSI FOOTING.
- 4- CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
- 5- SEE APPROPRIATE STANDARD DETAIL FOR THRUST BLOCK DIMENSIONS AND VALVE BOXES.

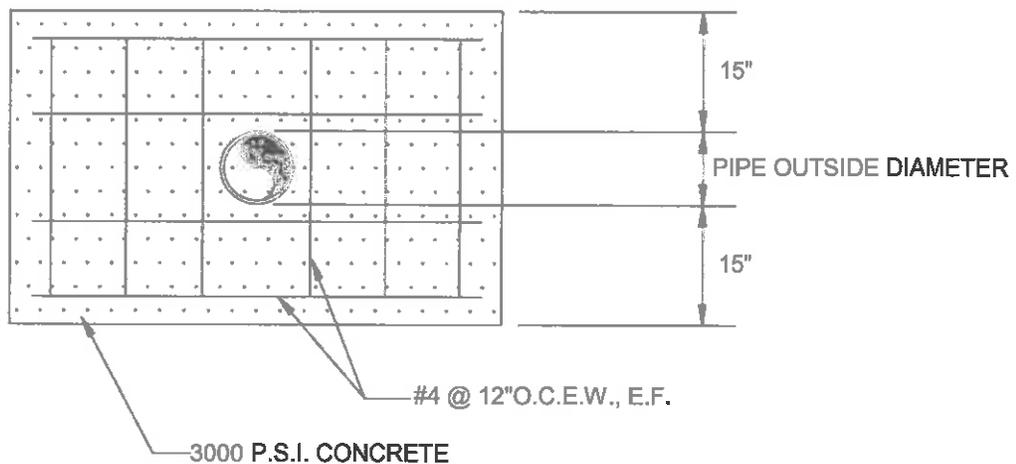


ELEVATION

TAPPING SLEEVE AND VALVE INSTALLATION



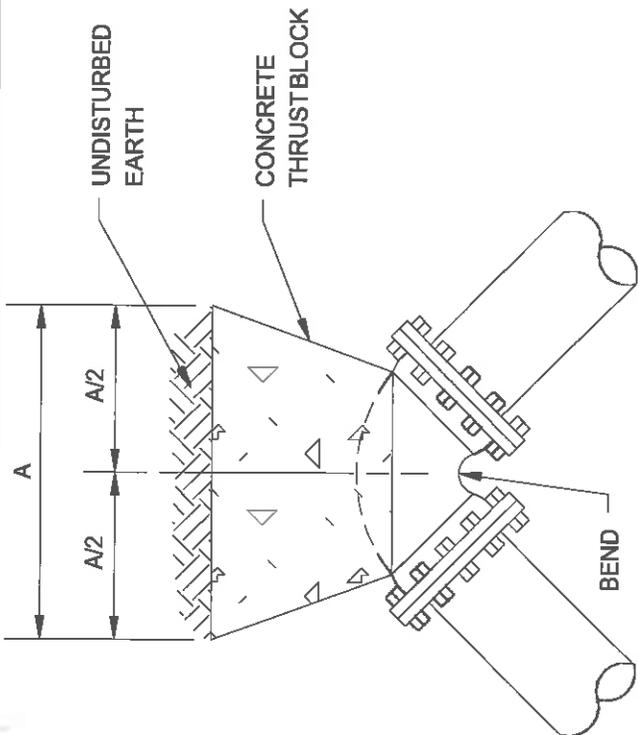
PLAN



ELEVATION

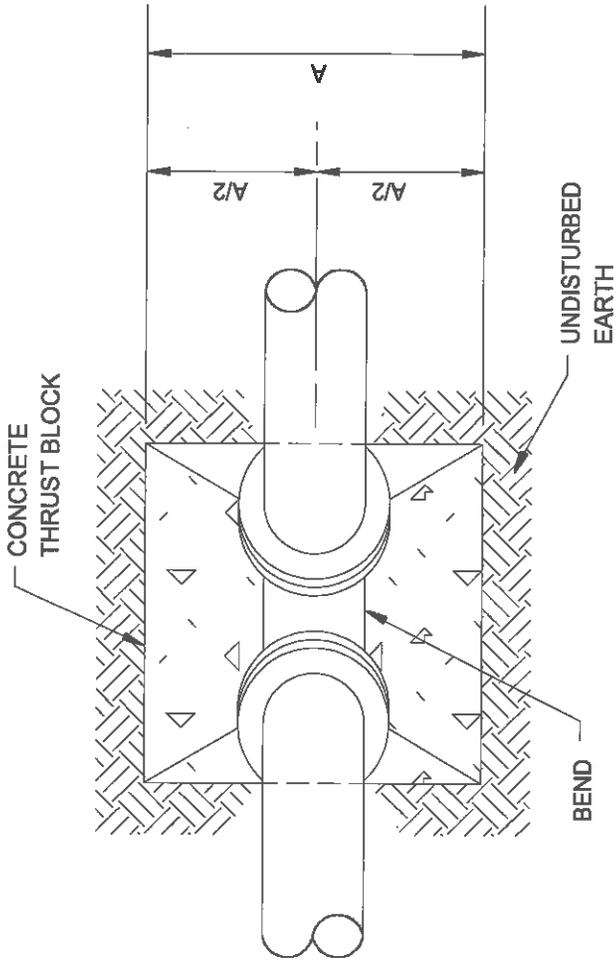
NOTE: ABOVE 150 PSI ALL FITTINGS SHALL HAVE MEGA-LUG RETAINER GLANDS UNLESS OTHERWISE SPECIFIED

TYPICAL DEADMAN DETAIL

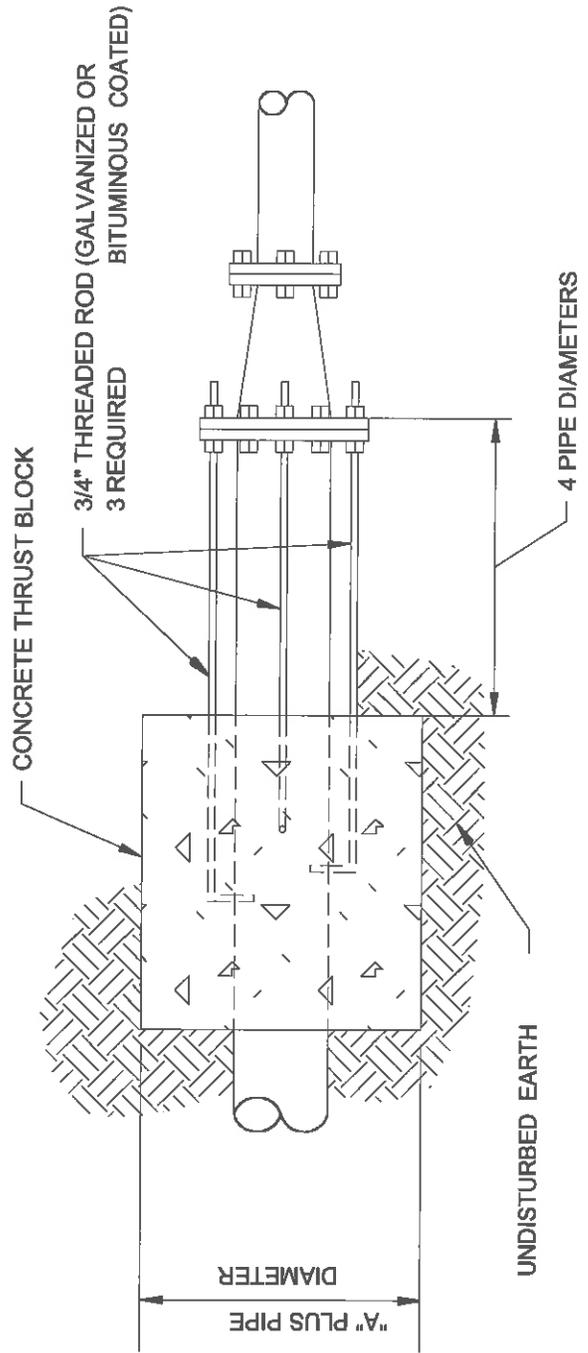


ALL FITTINGS SHALL HAVE
MEGA-LUG RETAINERS

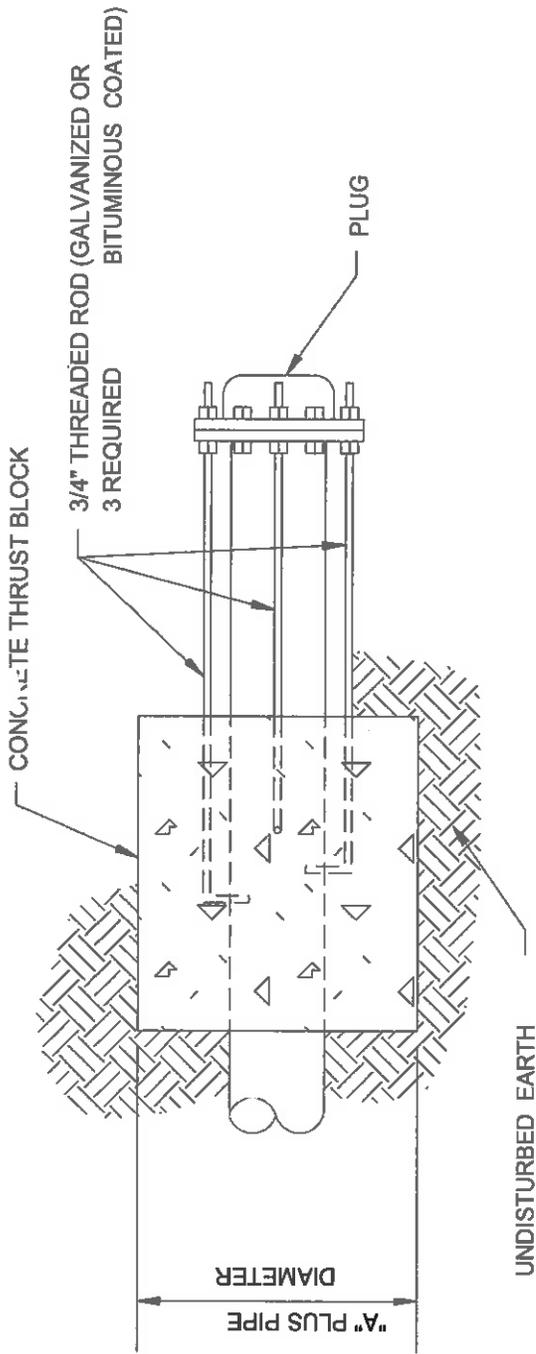
THRUST BLOCK FOR BENDS



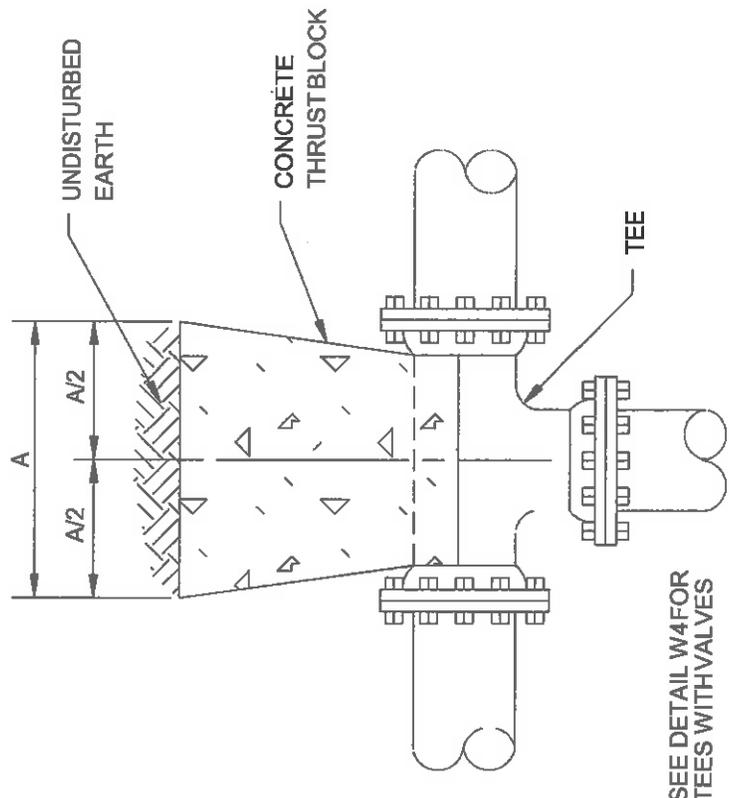
THRUST BLOCKS FOR BENDS AND REDUCERS



THRUST BLOCK FOR REDUCERS

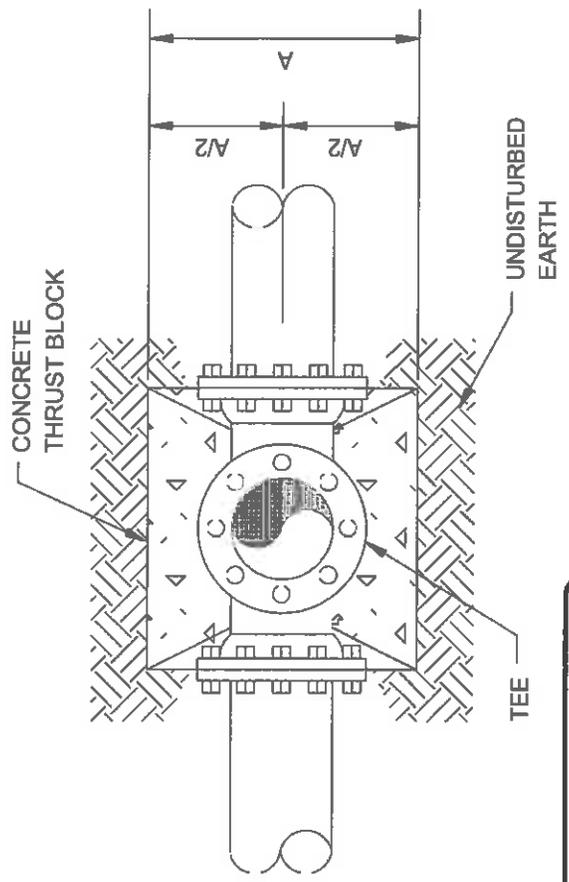


THRUST BLOCK FOR PLUGS



SEE DETAIL W4 FOR
TEES WITH VALVES

THRUST BLOCK FOR TEES



THRUST BLOCKS FOR PLUGS AND TEES

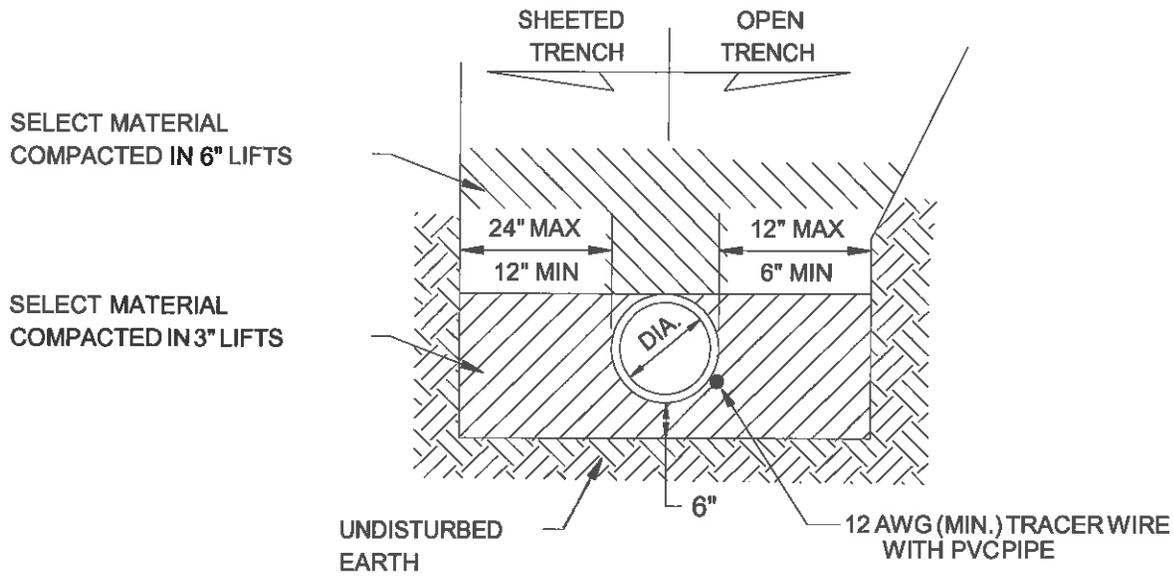
THRUST BLOCK DIMENSION "A"

TYPE

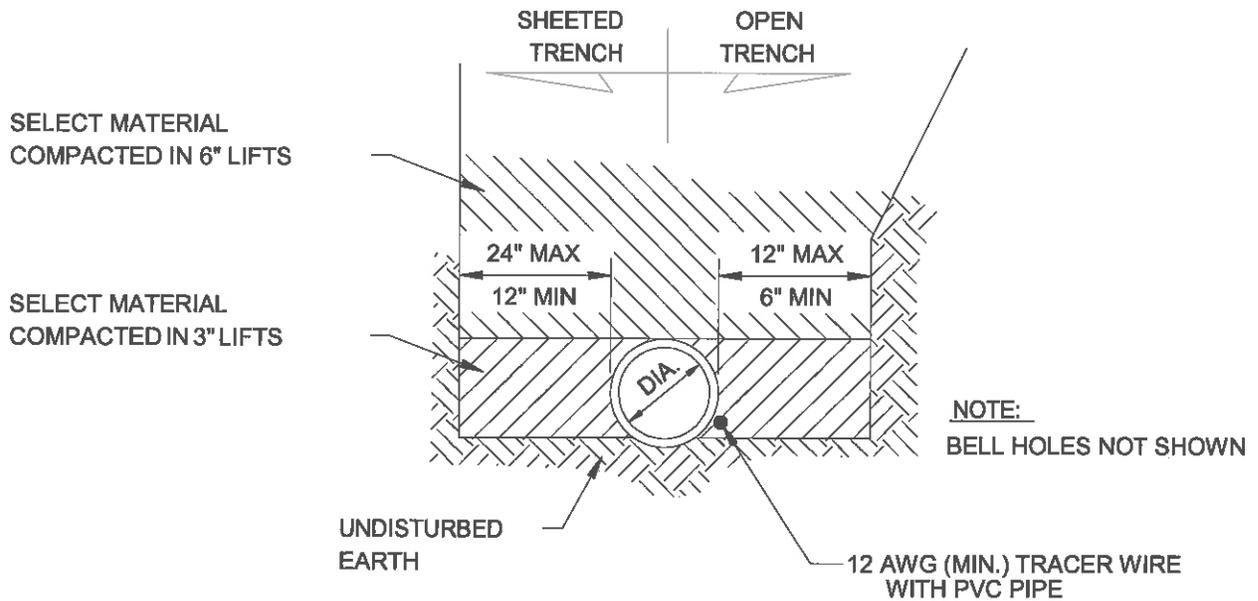
SIZE	11-1/4° BEND	22-1/2° BEND	45° BEND	90° BEND	TEE	PLUG
2-6	12	12	12	16	16	14
8	12	12	16	22	22	18
10	12	14	20	28	28	22
12	12	18	24	32	32	28
14	14	20	28	38	38	32
16	16	22	32	42	42	36
18	18	26	36	48	48	40
20	20	28	40	52	52	44
24	24	34	46	64	64	54
30	30	42	58	78	78	66
36	36	50	70	94	94	80
42	40	58	80	108	108	92
48	46	66	90	124	124	104

NOTE:

CARE SHALL BE TAKEN WHEN PLACING THRUST BLOCKS TO KEEP THE FITTING JOINTS FREE OF CONCRETE. A LAYER OF POLYETHYLENE PLASTIC SHALL BE PLACED BETWEEN THE FITTING AND THE CONCRETE.

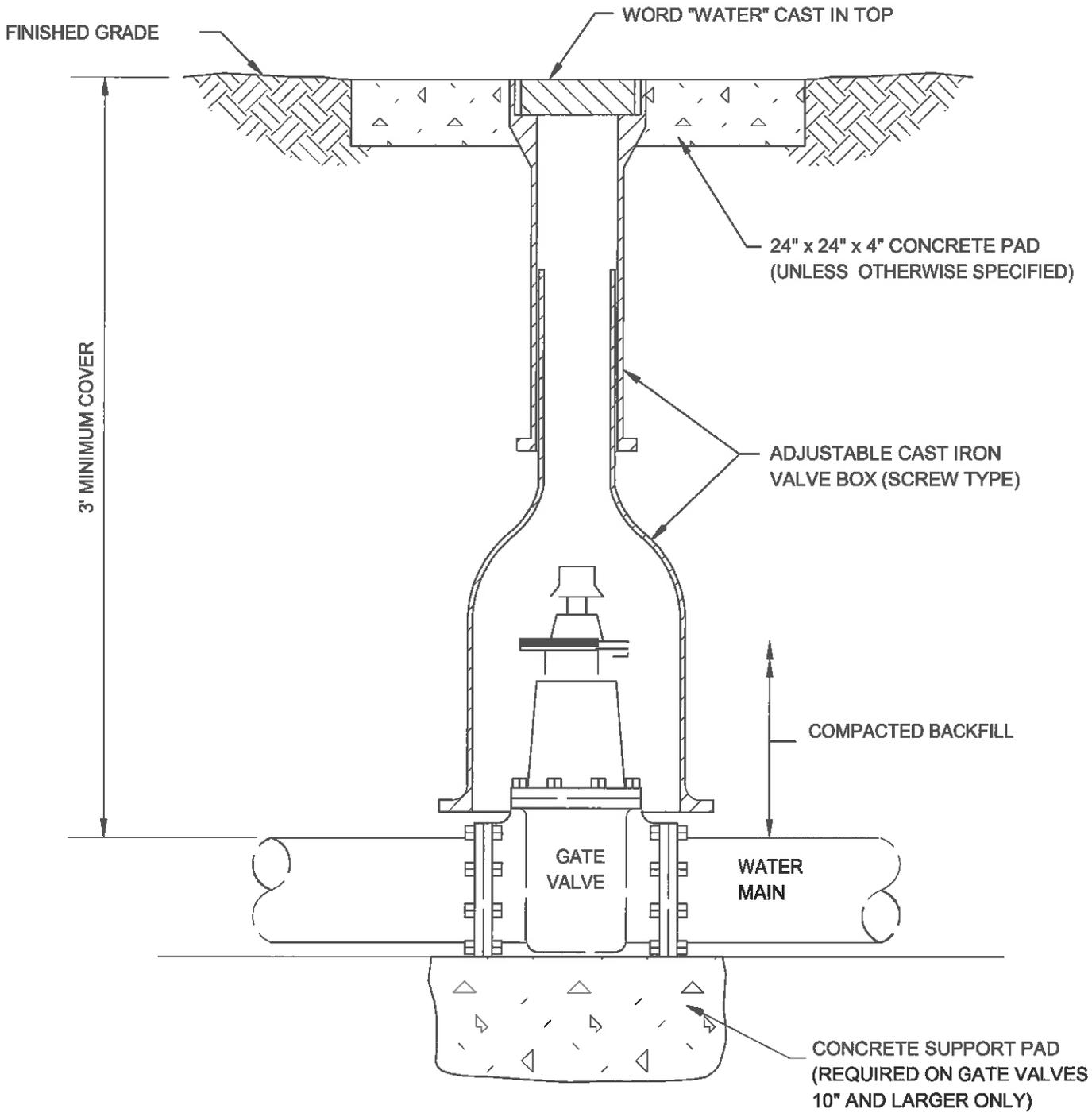


OVERCUT EXCAVATION

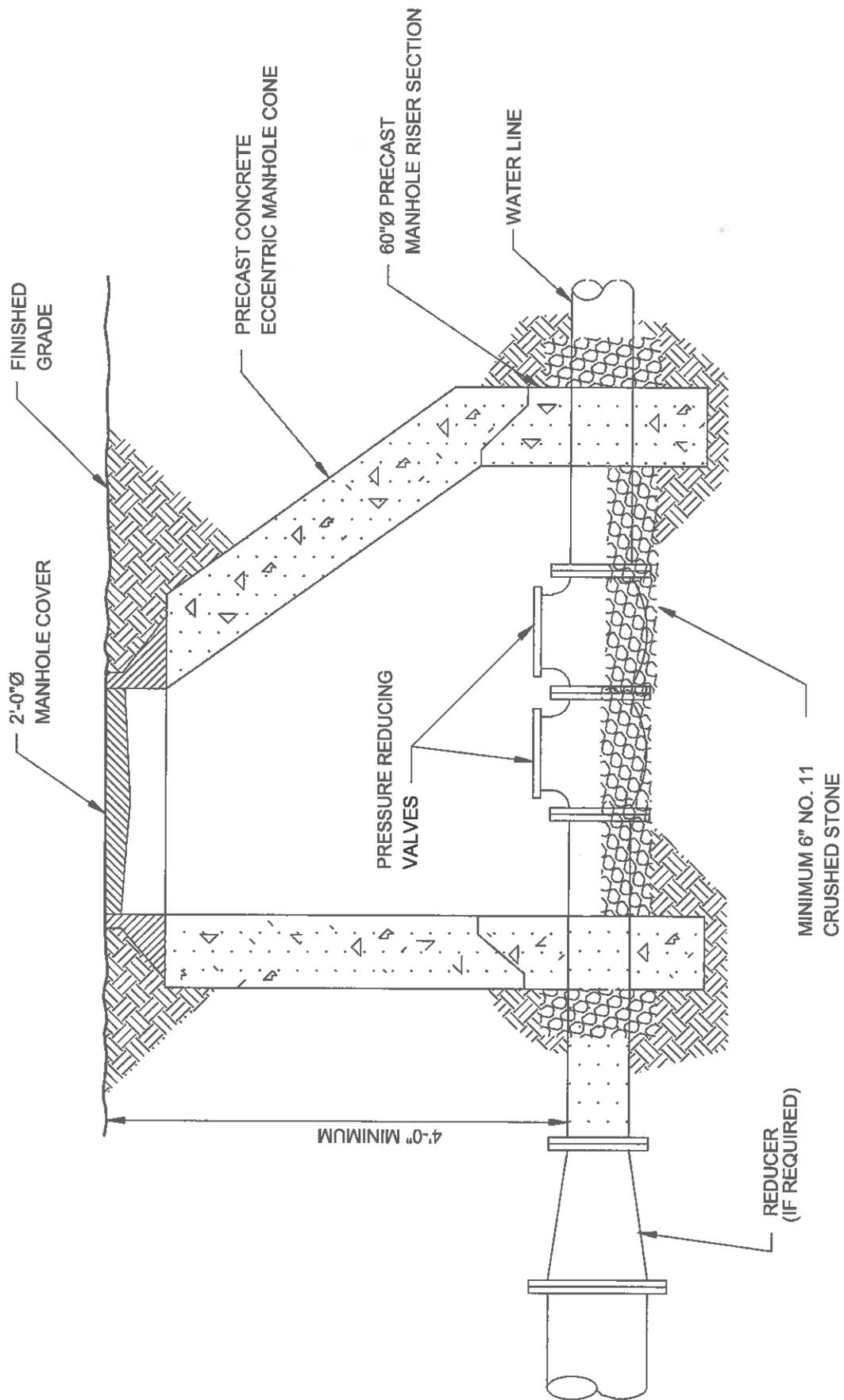


STANDARD EXCAVATION

TYPICAL TRENCHING DETAILS

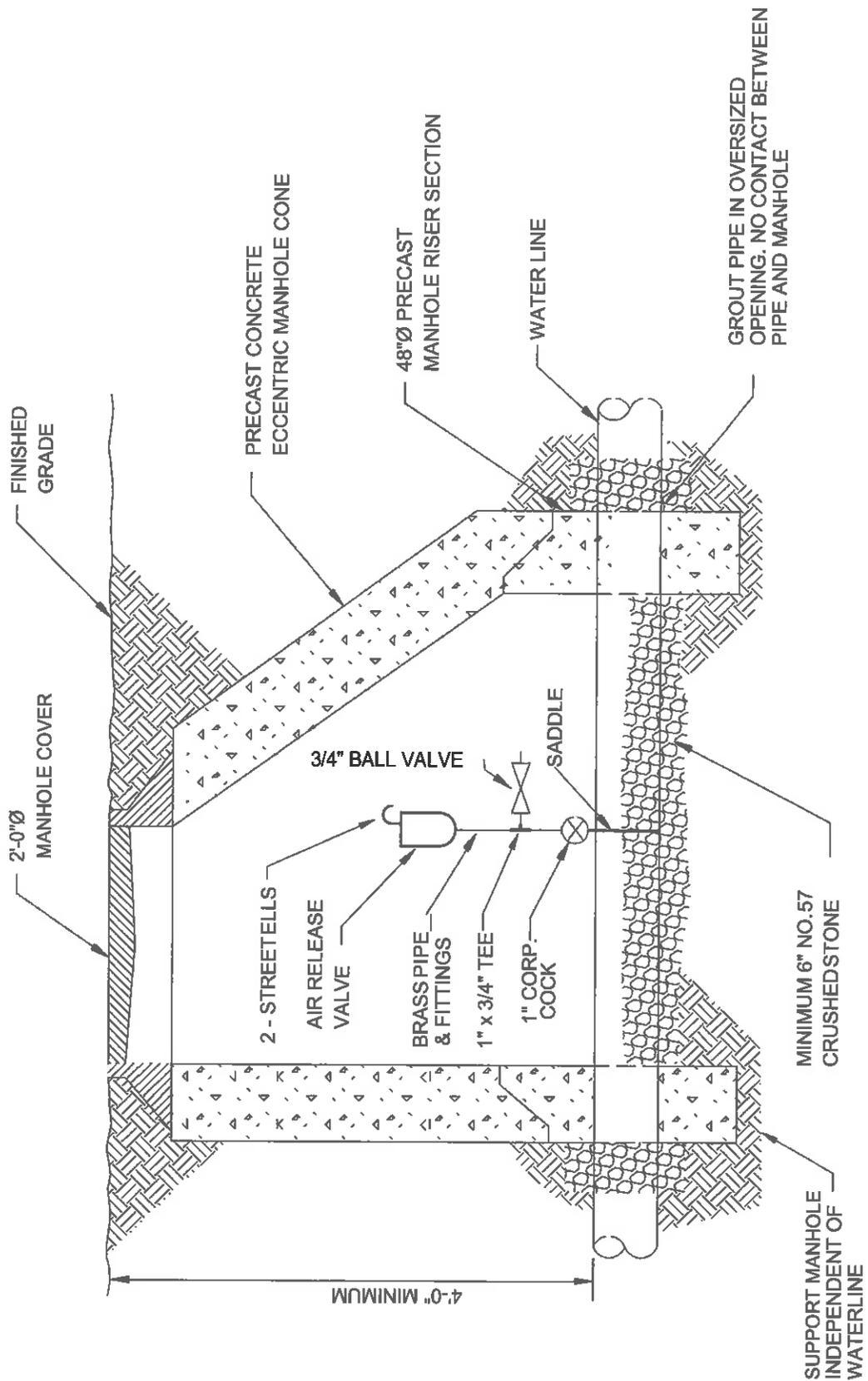


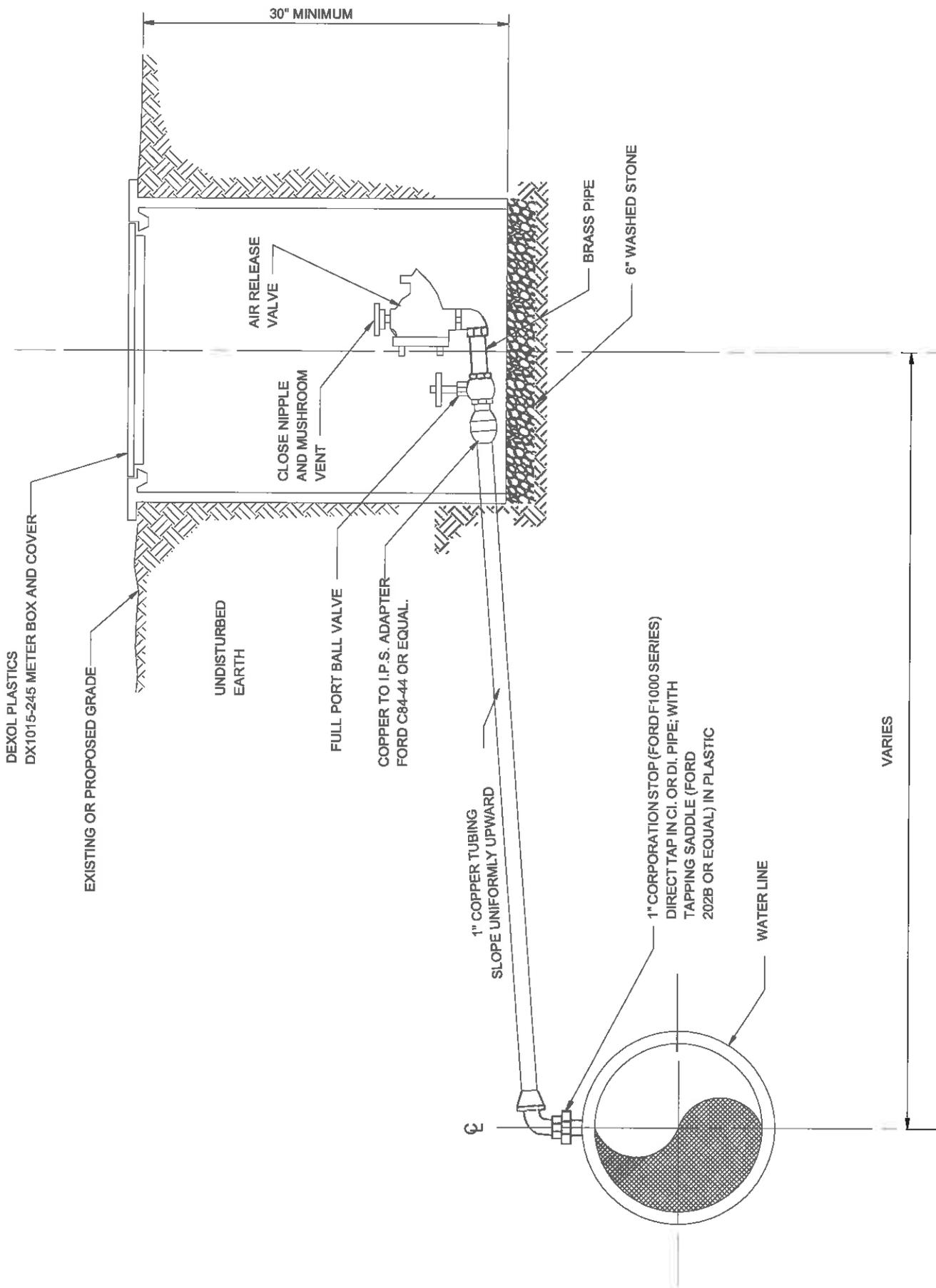
VERTICAL GATE VALVE INSTALLATION



PRESSURE REDUCING VALVE INSTALLATION

AIR RELEASE VALVE INSTALLATION-IN MANHOLE

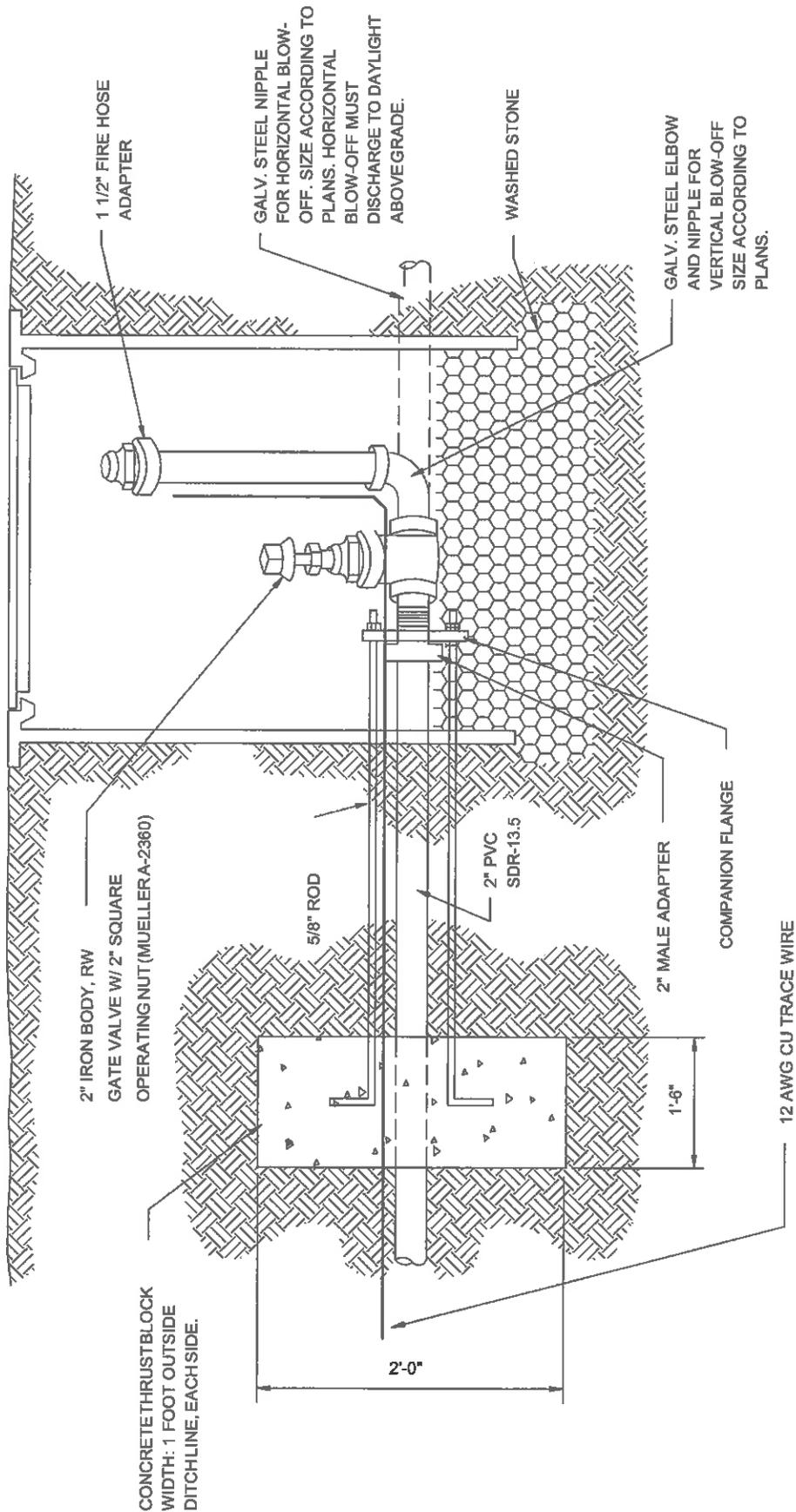




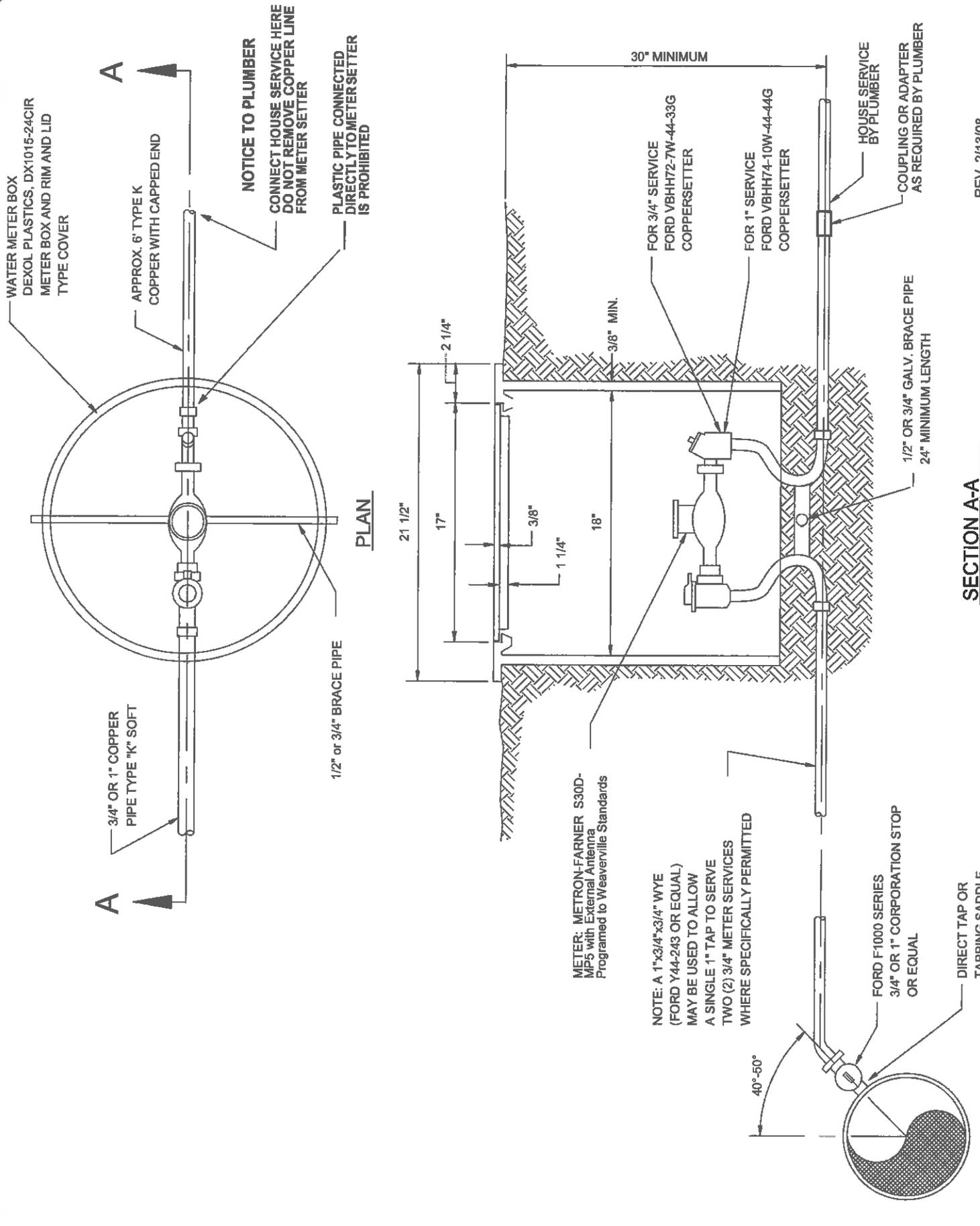
AIR RELEASE VALVE INSTALLATION-IN METER BOX

NOTES:

1. GLUED JOINTS WILL NOT BE PERMITTED.
2. VERTICAL BLOW-OFF ARRANGEMENT TO BE USED ONLY WHEN HORIZONTAL BLOW-OFF IS NOT POSSIBLE.



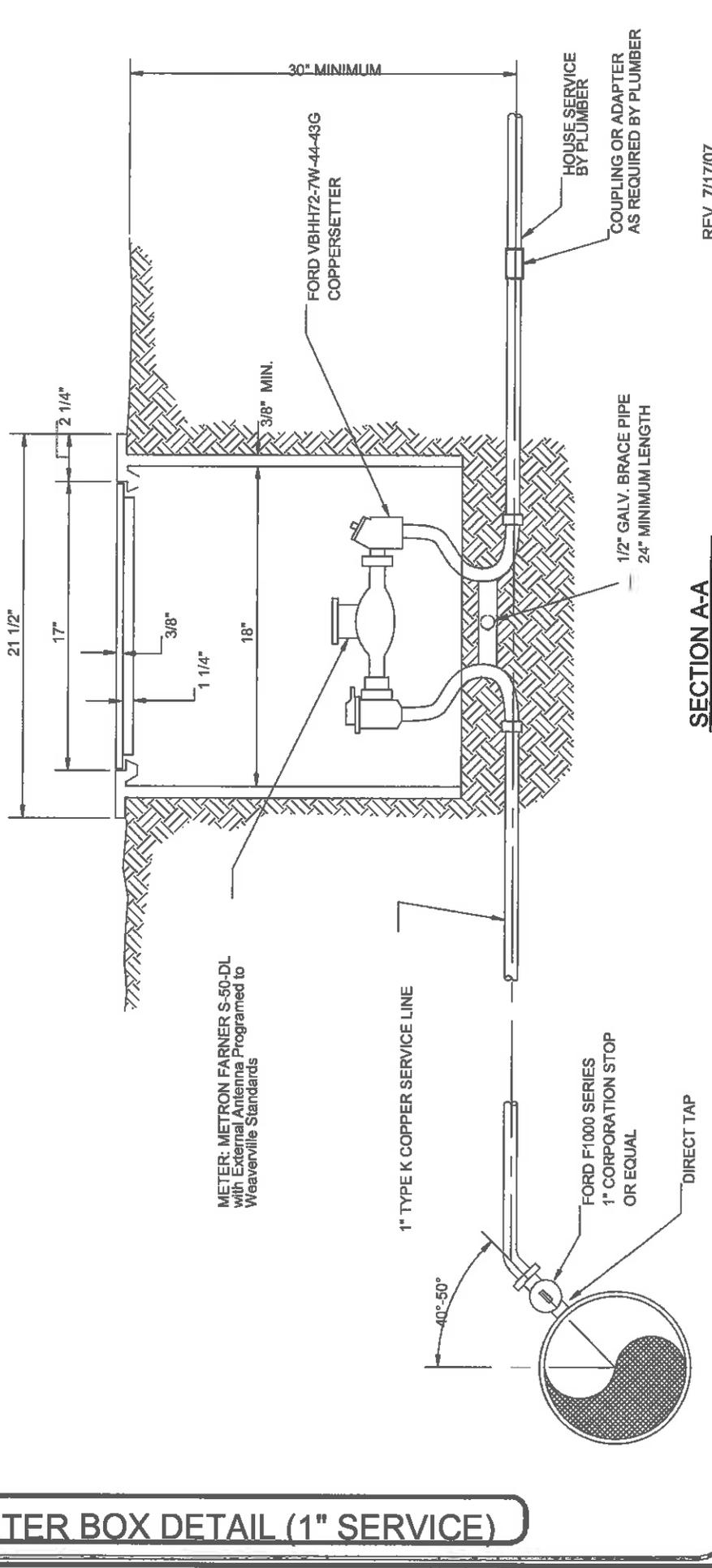
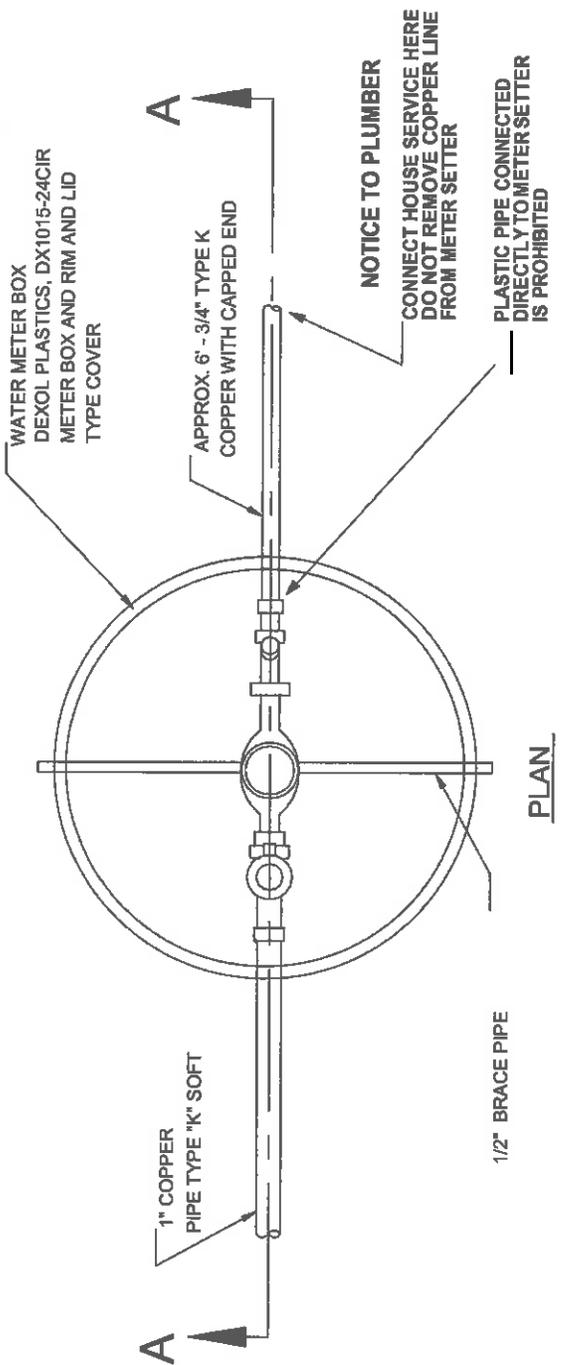
**2" BLOW-OFF DETAIL
PVC WATER LINE**



REV. 2/13/08

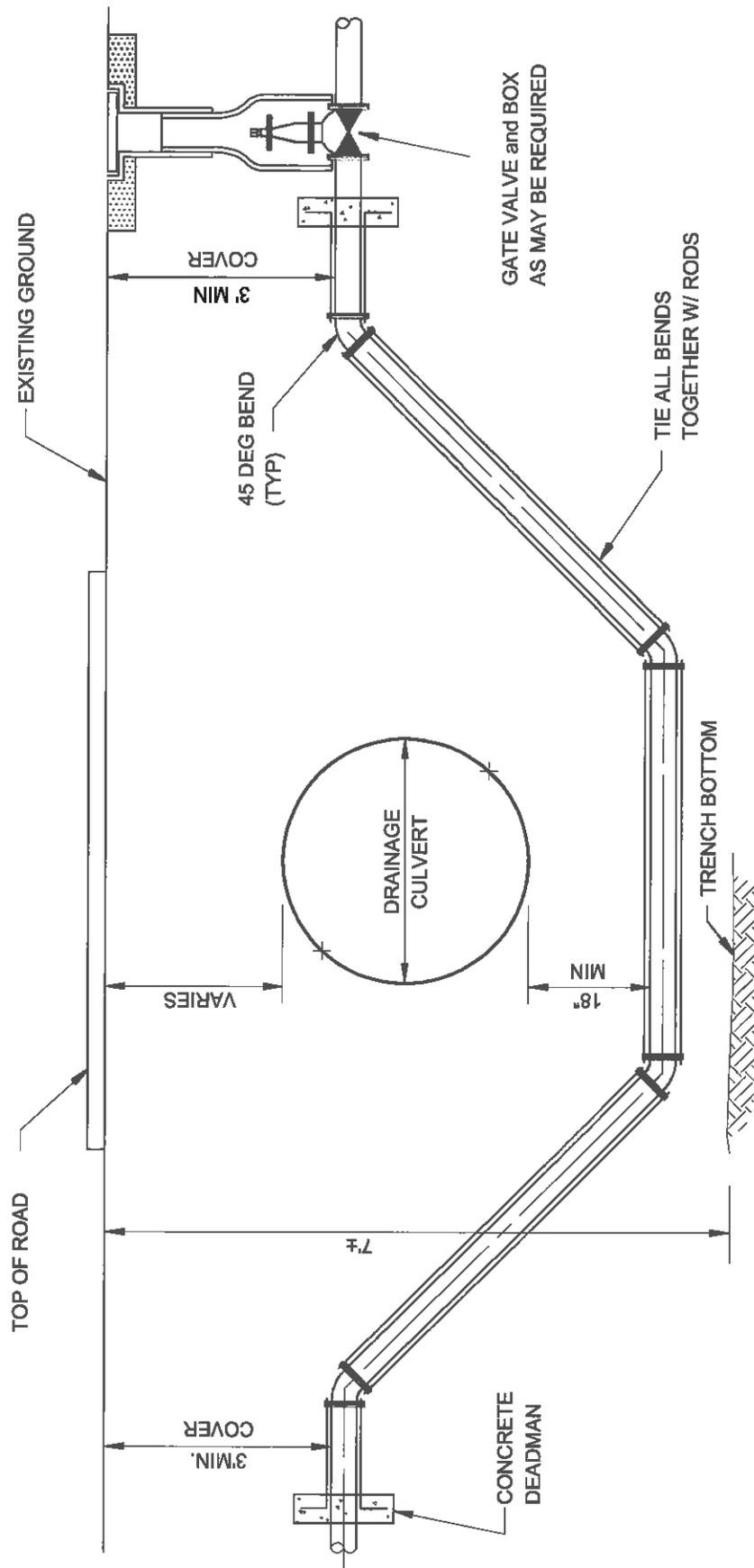
SECTION A-A

3/4" AND 1" WATER METER BOX DETAIL



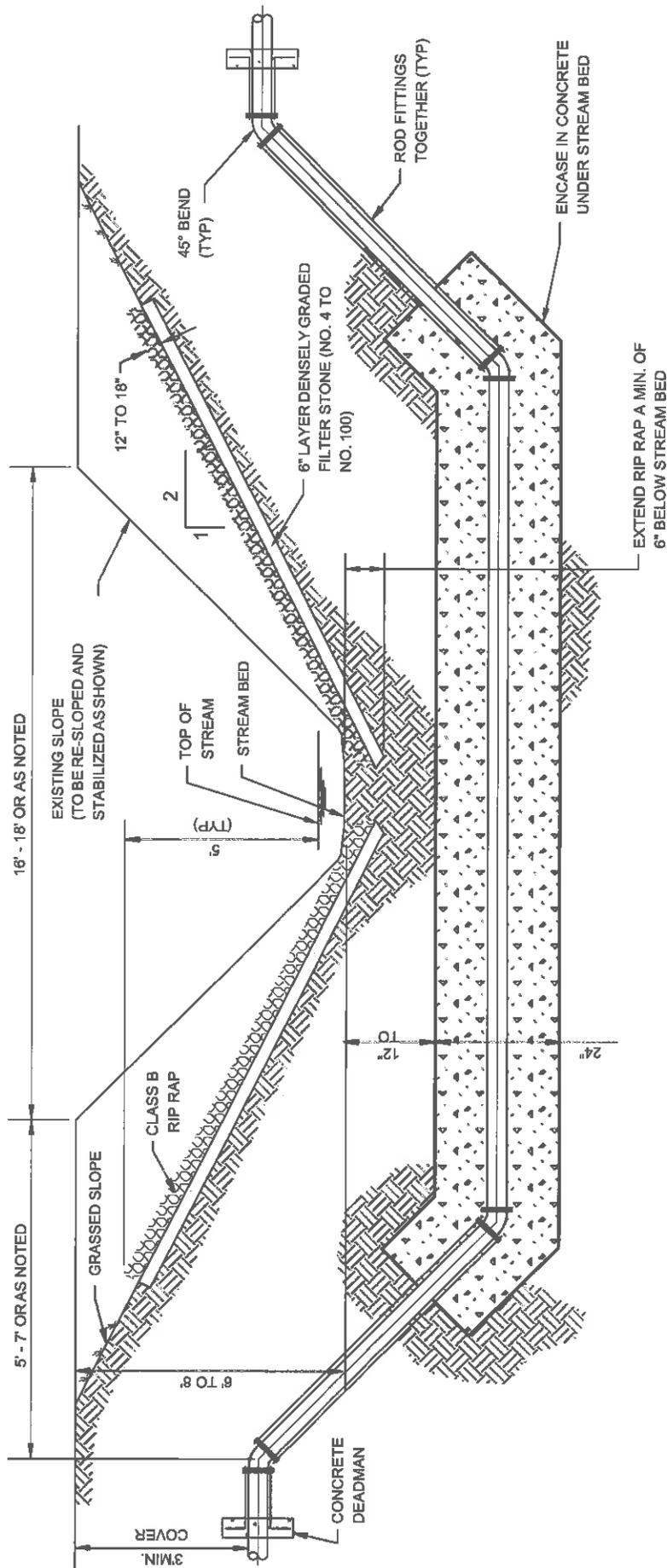
REV. 7/17/07

3/4" WATER METER BOX DETAIL (1" SERVICE)



CULVERT CROSSING DETAIL

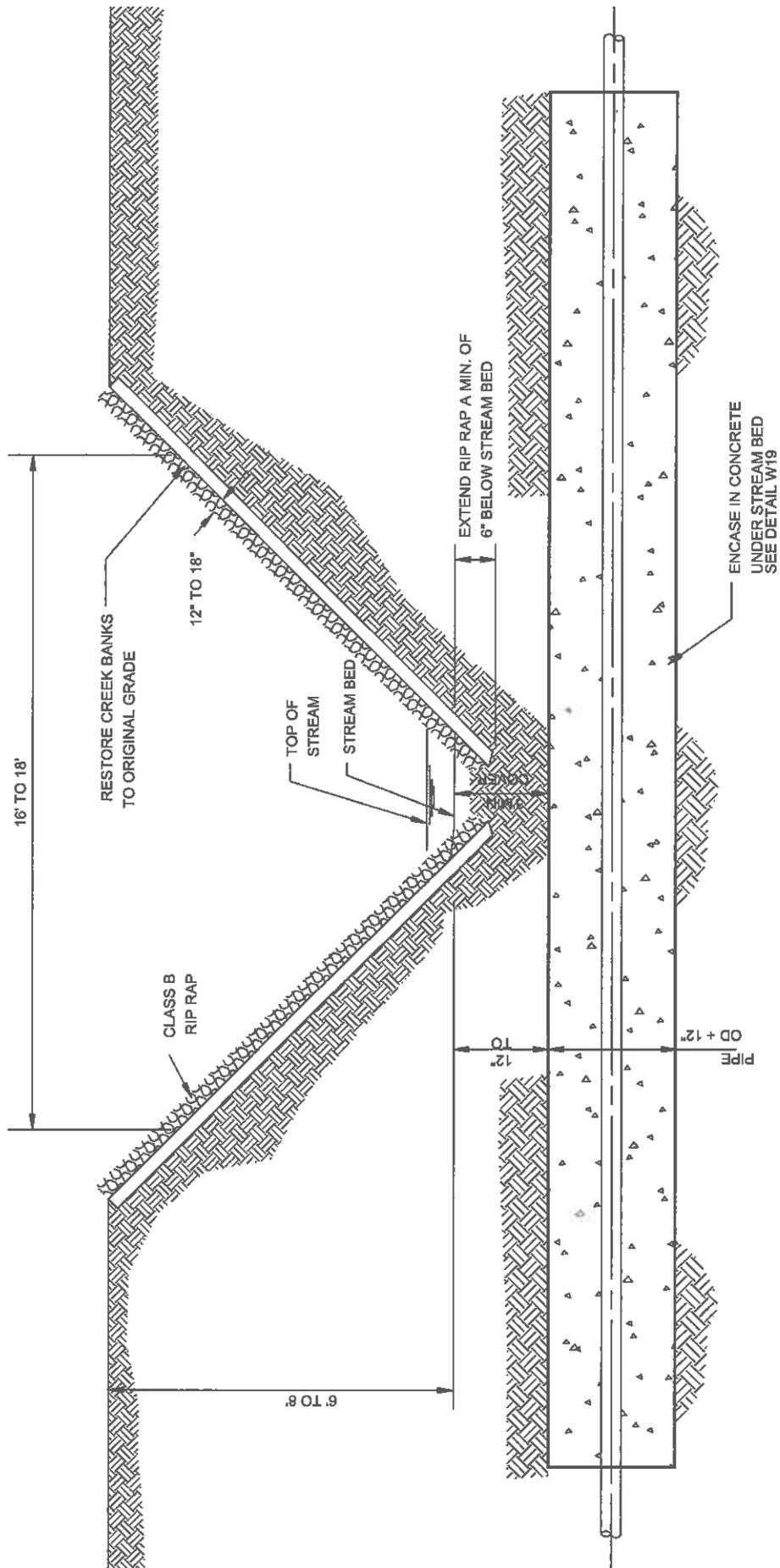
REV. 02/03/05



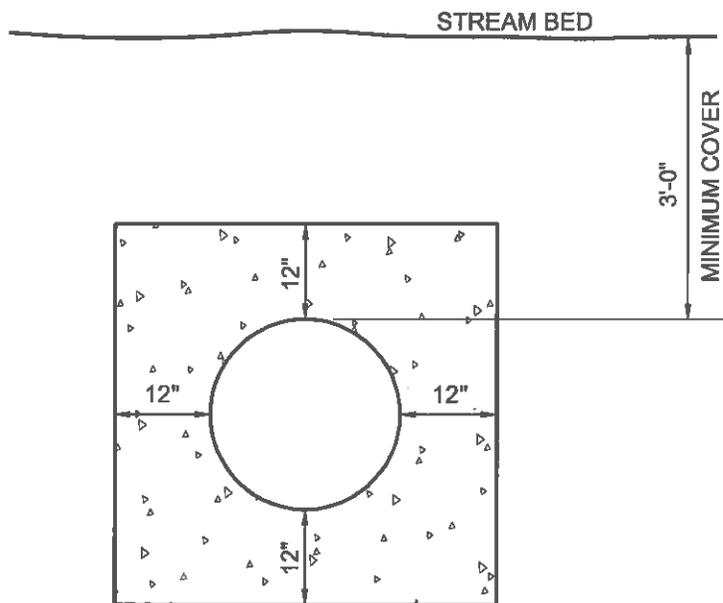
CREEK CROSSING AND CREEK BANK STABILIZATION

TOWN OF WEAVERVILLE

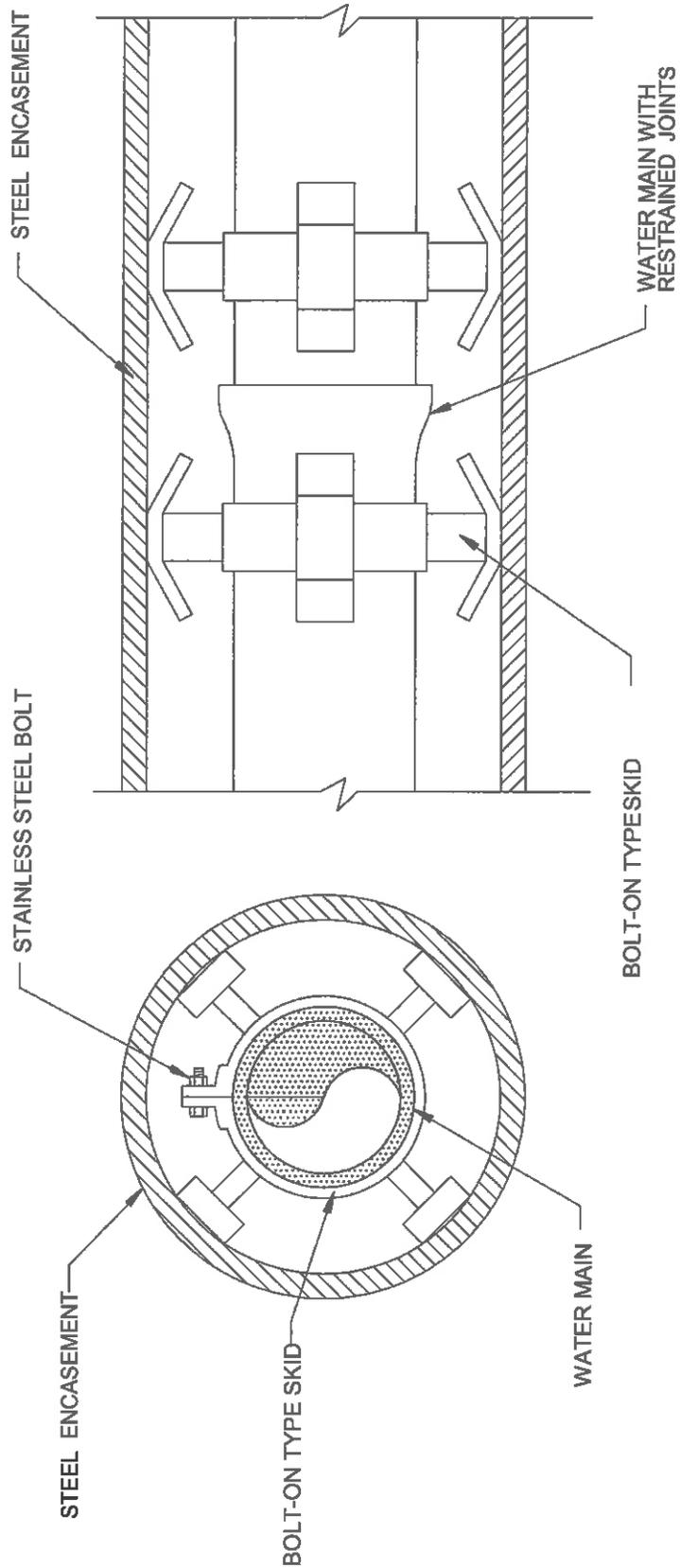
STANDARD DETAIL-W17



CREEK CROSSING AND CREEK BANK STABILIZATION

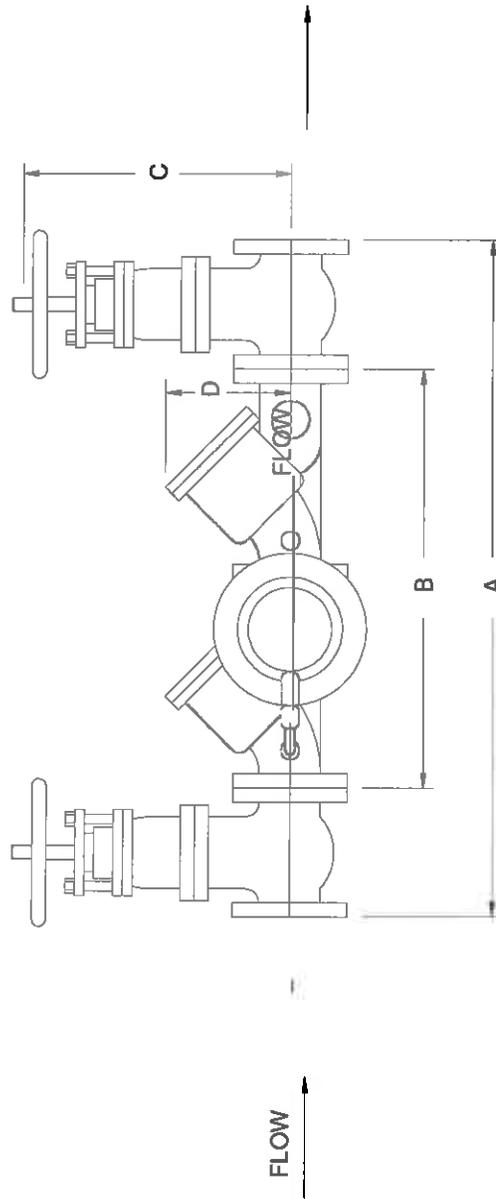
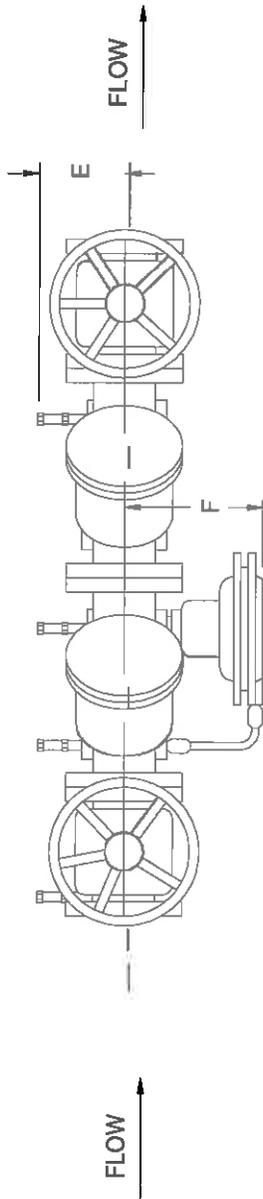


CROSS SECTION CONCRETE ENCASEMENT



REV. 02/03/05

ENCASEMENT DETAIL



SIZE	A	B	C	D	E	F	NET WT. (Lbs.)
2 1/2	37 3/16	22 1/16	12 1/2	7 1/2	5 1/4	10 1/2	270
3	41 11/16	25 9/16	14	8 1/16	6	11 1/2	305
4	50 7/16	32 5/16	17 3/8	11	6 3/4	12 1/2	490
6	59 11/16	38 9/16	21 1/4	14	8 1/4	14	860
8	69 3/16	46 1/16	26	18	9 1/2	15	1250
10	84 3/16	58 1/16	30	22	10 1/2	16	1720

DIMENSIONS BASED ON FEBCO 825YD AND FURNISHED FOR INFORMATION ONLY - VERIFY FOR DESIGN PURPOSES

BACKFLOW PREVENTOR

NOTE: SCH. 40 PVC DRAIN PIPE. DRAIN MUST BE PIPED TO DAYLIGHT, FREE DISCHARGE @ MIN. 1% SLOPE. DRAIN SIZE = 2 X RPZ SIZE; (4" MIN - 8" MAX) IF DRAIN PIPE CANNOT BE DAYLIGHTED WITH AN UNDERGROUND PIT, THE RPZ SHALL BE LOCATED IN AN ABOVE GRADE, WEATHERPROOF, HEATED, STRUCTURE WITH A DAYLIGHT DRAIN. FIT OPEN END OF DRAIN WITH APPROVED FLAP VALVE

ALUMINUM ACCESS LADDER

8"x8"x16" CONC. BLOCK WATERPROOF EXTERIOR

REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTOR WATTS 909 OR FEBCO 825Y

24" MIN TO ANY PART OF ASSY

VALVES FURNISHED AS PART OF BACKFLOW PREVENTOR ASSEMBLY (TYPICAL)

WIDTH

12" MIN

SPOOL

24" MIN TO ANY PART OF ASSY

12" MIN

TO SPRINKLER OR FIRE LINE SYSTEM

FLOW

A

LENGTH

REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTOR WATTS 909 RPDA OR FEBCO 826YD

THIS VALVE TO BE USED BY THE TOWN TO ISOLATE FIRELINE SYSTEM

MAINTAINED BY PROPERTY OWNER

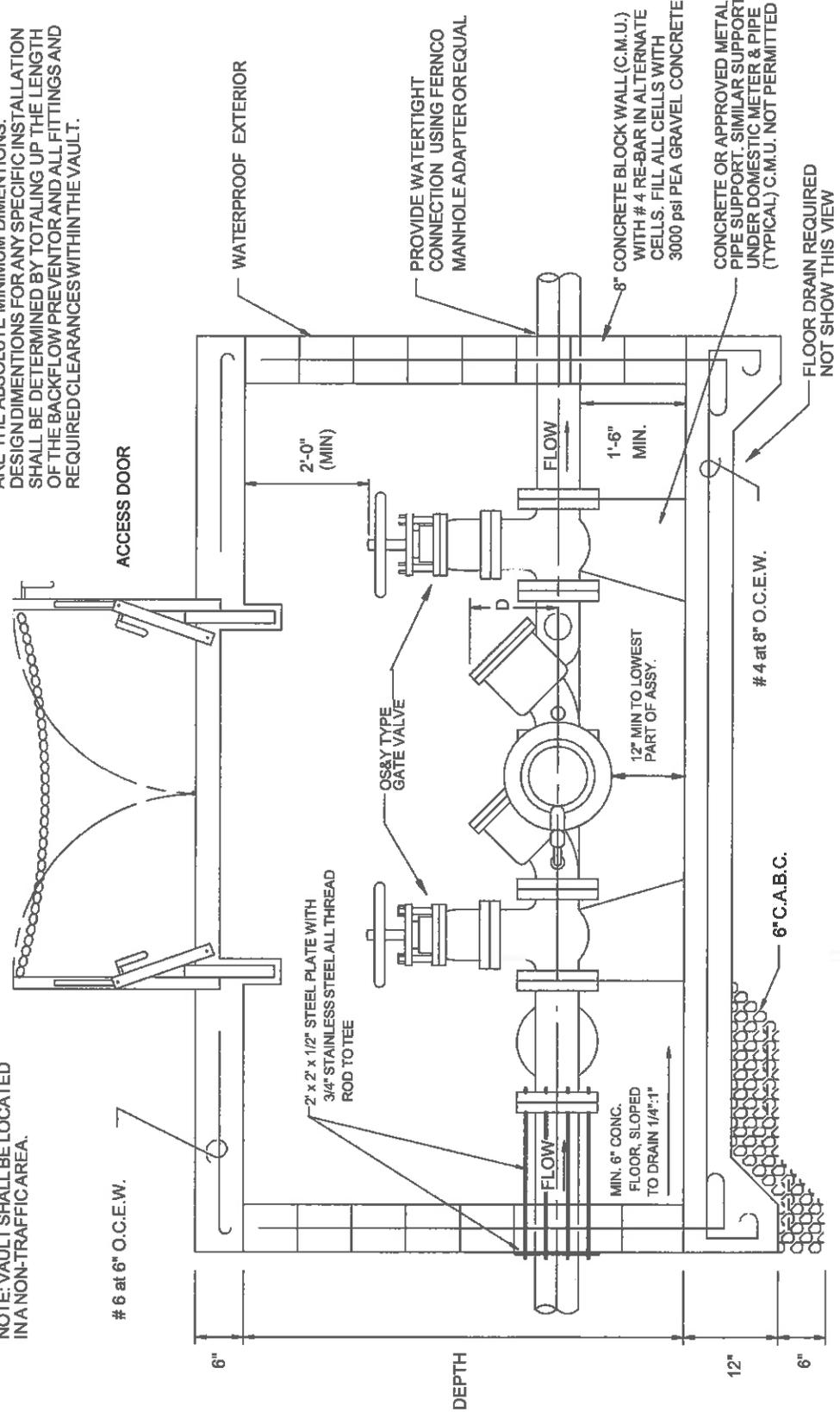
MAINTAINED BY TOWN OF WEAVERVILLE

BACKFLOW PREVENTOR AND METER VAULT FOR PRIVATE FIRE PROTECTION SYSTEMS WITHOUT DOMESTIC WATER METER

FIRE LINE SIZE	MINIMUM PIT DIMENSIONS			ACCESS DOOR SIZE
	LENGTH	WIDTH	DEPTH	
6 INCH	8'-0"	6'-0"	6'-6"	BILCO JD/2 4'-0" x 4'-0"
8 INCH	9'-0"	6'-0"	7'-0"	BILCO JD/2 4'-0" x 4'-0"
10 INCH	10'-0"	6'-0"	7'-6"	BILCO JD/3 4'-0" x 6'-0"

NOTE: DIMENSIONS LISTED IN THE TABLE ARE THE ABSOLUTE MINIMUM DIMENSIONS. DESIGN DIMENSIONS FOR ANY SPECIFIC INSTALLATION SHALL BE DETERMINED BY TOTALING UP THE LENGTH OF THE BACKFLOW PREVENTOR AND ALL FITTINGS AND REQUIRED CLEARANCES WITHIN THE VAULT.

NOTE: VAULT SHALL BE LOCATED IN A NON-TRAFFIC AREA.



BACKFLOW PREVENTOR AND VAULT SECTION A-A

METER VAULT DIMENSIONS (INSIDE)		
METER SIZE	WIDTH (MIN.)	LENGTH (MIN.)
2" & SMALLER	5' - 0"	6' - 0"
3" & 4"	6' - 0"	8' - 0"
6" & LARGER	CONTACT WATER DEPT.	

NOTE: METER VAULT SHALL BE LOCATED IN A NON-TRAFFIC AREA.

MAINTAINED BY PROPERTY OWNER

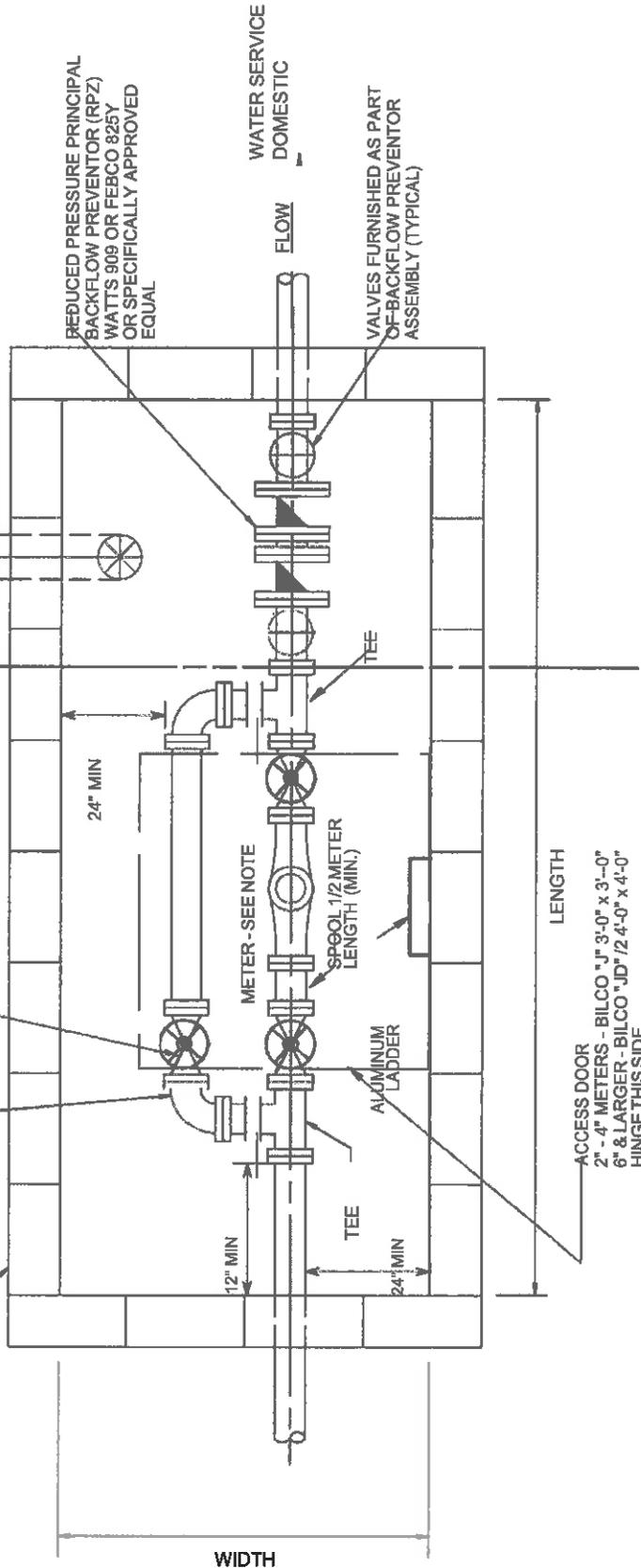
MAINTAINED BY TOWN OF WEAVERVILLE

NOTE: SCH. 40 PVC DRAIN PIPE. DRAIN MUST BE PIPED TO DAYLIGHT, FREE DISCHARGE @ MIN. 1% SLOPE. DRAIN SIZE = 2 x RPZ SIZE, (4" MIN - 8" MAX) IF DRAIN PIPE CANNOT BE DAYLIGHTED WITH AN UNDERGROUND PIT, THE RPZ SHALL BE LOCATED IN AN ABOVE GRADE, WEATHERPROOF, HEATED, STRUCTURE WITH A DAYLIGHT DRAIN

NOTE: PIPING FOR DOMESTIC METERS 2" AND SMALLER SHALL BE TYPE K COPPER WITH COPPER FITTINGS OR BRASS PIPING WITH CAST BRASS FITTINGS. PIPE AND FITTINGS FOR METERS LARGER THAN 2" SHALL BE DUCTILE IRON WITH FLANGED JOINTS.

2" & SMALLER - NO LEAD FULL PORT 1/4 TURN BALL VALVES W/ LOCK TAB
 O&B GATE VALVE (TYP)
 3" & LARGER - MUELLER 2360

8" x 8" x 16" CONC. BLOCKS



REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTOR (RPZ) WATTS 909 OR FEBCO 825Y OR SPECIFICALLY APPROVED EQUAL

WATER SERVICE DOMESTIC

VALVES FURNISHED AS PART OF BACKFLOW PREVENTOR ASSEMBLY (TYPICAL)

NOTE: METER SHALL BE AS FOLLOWS: AS SPECIFICALLY SPECIFIED BY THE TOWN FOR THE SPECIFIC APPLICATION

REV 03/27/2007

1-1/2" AND LARGER METER, BY-PASS AND VAULT WITH BACKFLOW PROTECTION

METER VAULT DIMENSIONS (INSIDE)		
METER SIZE	WIDTH (MIN.)	LENGTH (MIN.)
2" & SMALLER	5'-0"	6'-0"
3" & 4"	6'-0"	8'-0"
6" & LARGER	CONTACT WATER DEPT.	

NOTE: METER VAULT SHALL BE LOCATED IN A NON-TRAFFIC AREA.

MAINTAINED BY TOWN OF WEAVERVILLE

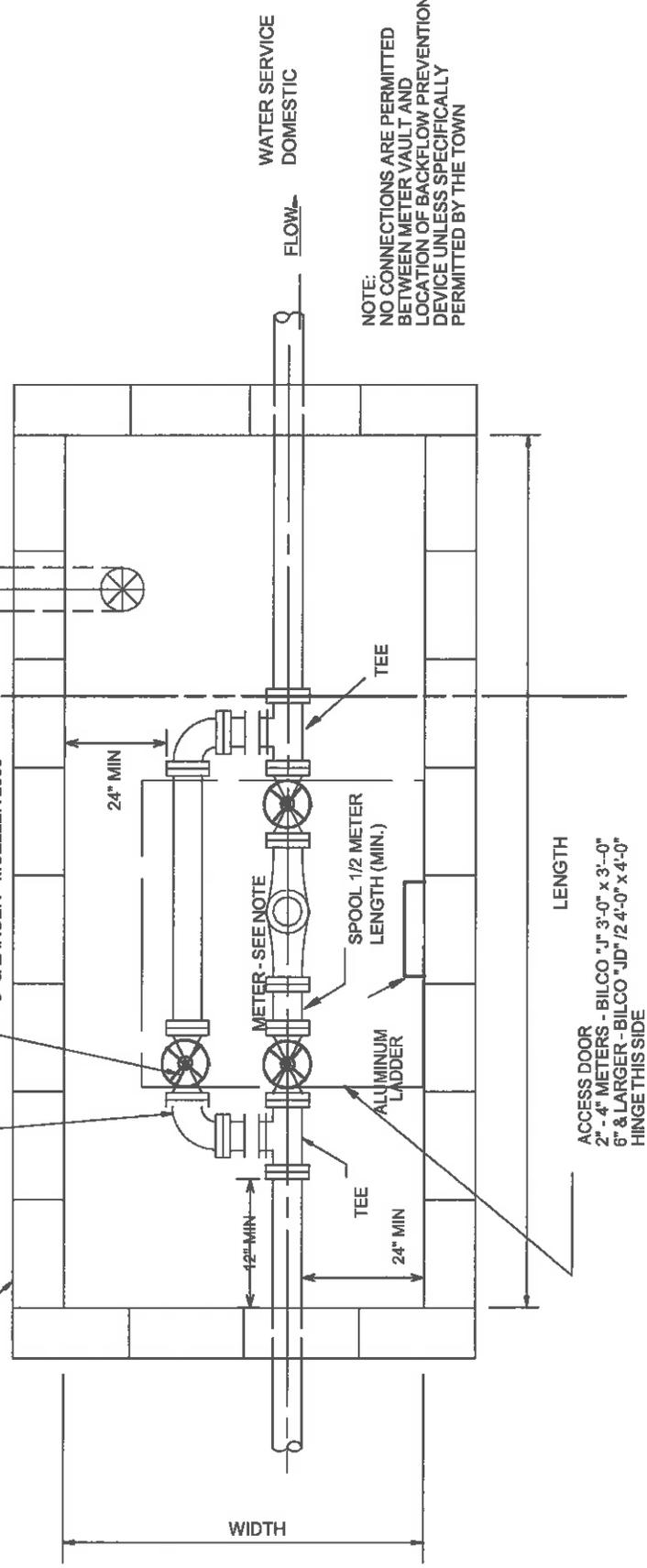
MAINTAINED BY PROPERTY OWNER

NOTE: SCH. 40 PVC DRAIN PIPE TO FREE DISCHARGE @ MIN. 1% SLOPE. DRAIN SIZE = 4" FOR METERS LESS THAN 3" 6" FOR 4" & 6" METERS, FOR METERS LARGER THAN 6" CONTACT WATER DEPT.

NOTE: PIPING FOR DOMESTIC METERS 2" AND SMALLER SHALL BE TYPE K COPPER WITH COPPER FITTINGS OR BRASS PIPING WITH CAST BRASS FITTINGS. PIPE AND FITTINGS FOR METERS LARGER THAN 2" SHALL BE DUCTILE IRON WITH FLANGED JOINTS.

8" x 8" x 16" CONC. BLOCKS

2" & SMALLER - NO LEAD FULL PORT 1/4 TURN BALL VALVES W/ LOCK TAB OS&Y GATE VALVE (TYP) 3" & LARGER - MUELLER 2360



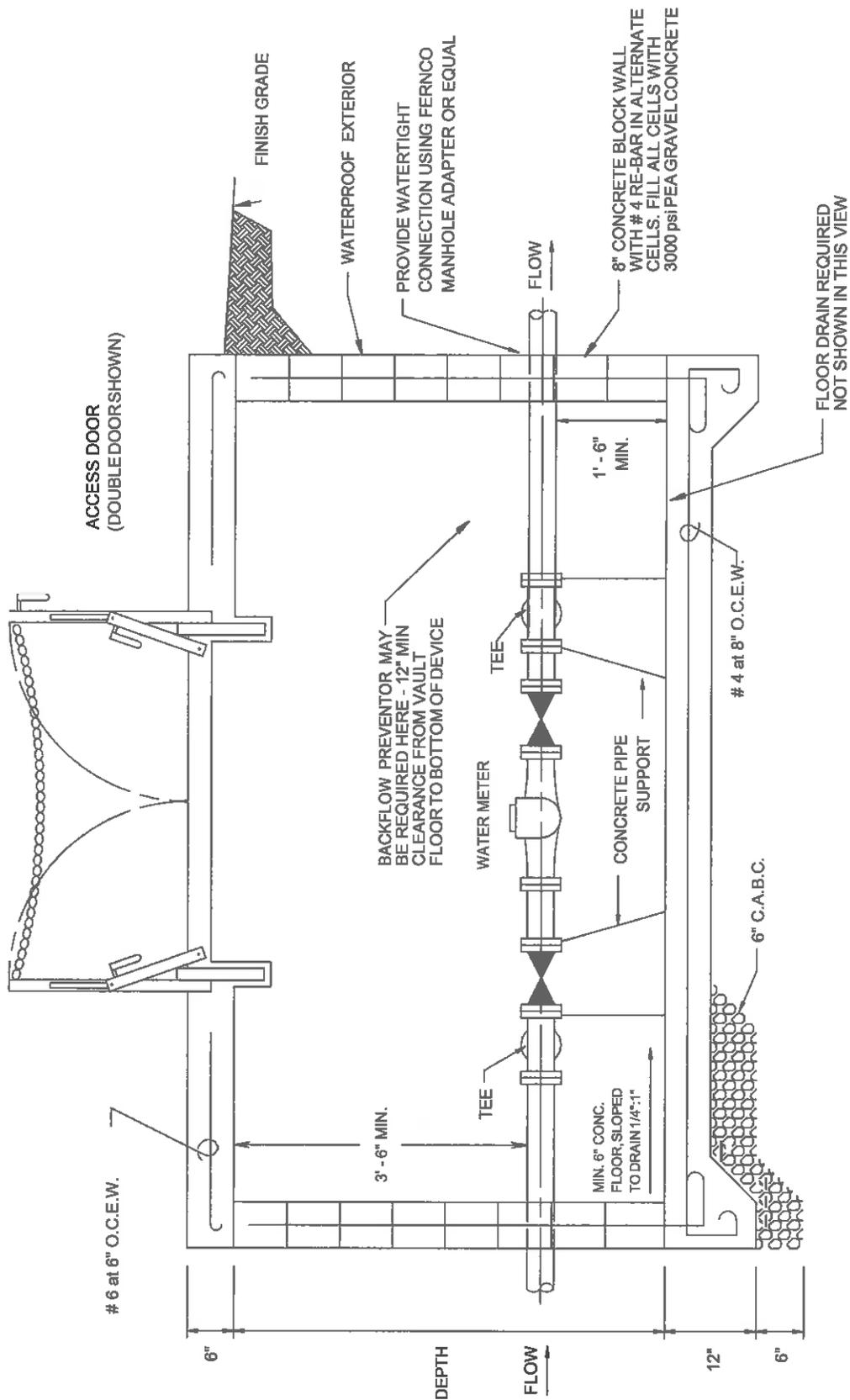
NOTE: NO CONNECTIONS ARE PERMITTED BETWEEN METER VAULT AND LOCATION OF BACKFLOW PREVENTION DEVICE UNLESS SPECIFICALLY PERMITTED BY THE TOWN

NOTE: METER SHALL BE AS SPECIFICALLY SPECIFIED BY THE TOWN FOR THE SPECIFIC APPLICATION

REV 03/27/2007

2" AND LARGER METER, BY-PASS AND VAULT BACKFLOW PROTECTION LOCATED ELSEWHERE

NOTE: METER VAULT SHALL BE LOCATED IN A NON-TRAFFIC AREA.



NOTES:

1. SEE PLAN DETAIL FOR ACCESS DOOR SPECIFICATION AND VAULT LENGTH & WIDTH DIMENSIONS
2. VAULT FOR METER WITH BACKFLOW PREVENTOR CONSTRUCTED IN SAME MANNER.

REV 03/27/2007

1-1/2" AND LARGER METER, BY-PASS AND VAULT SECTION

APPENDIX "A"

WEAVERVILLE WATER

POLICIES AND PROCEDURES

ARTICLE 3

SPECIFIC POLICIES AND PROCEDURES
RELATED TO WATER SERVICE

Code of Ordinances
Town of Weaverville

SECTION 3.2 - WEAVERVILLE STANDARD REQUIREMENTS - WATER

These requirements are general in nature and are intended as a guide. They are not intended to be used as detailed specifications.

3.2.1- State Requirements

All water system extensions shall meet the requirements of the North Carolina Department of Environment & Natural Resources with respect to size, area served and loops.

3.2.2 - Pressure Requirements

The designed system shall provide at all meter locations at least 30 psi during normal flow conditions and a minimum of 20 psi during fire flow conditions.

3.2.3 - Flow Requirements

The designed system shall provide adequate flow for fire protection in accordance with the North Carolina Fire Prevention Code. A minimum fire flow of 750 gallons per minute shall be available to all one- and two-family dwellings except as may be required or permitted by said Fire Prevention Code. The Fire Chief is authorized to modify fire flow requirements in accordance with said Fire Prevention Code.

3.2.4 - Capacity Requirements

The designed system shall provide adequate capacity for domestic use and fire protection combined. Minimum domestic capacity shall be based upon a demand of 400 gallons per day per connection. Fire protection capacity shall provide a minimum of 2 hours flow at the fire flow rate as determined in accordance with Section 3.2.3. Additional capacity may be required by the North Carolina Fire Prevention Code. A minimum one-half day domestic supply shall be added to fire protection capacity. Total capacity shall not be less than a 2 day domestic capacity.

3.2.5 - Water Mains

Water mains less than 6" will be allowed only when the last service Connection can be made within 400 feet of a 6" Main. The use of 6" and smaller waterlines may be further limited by fire flow demands and fire hydrant locations.

3.2.6- Depth

The minimum cover for all Mains shall be 36". The minimum depth for a meter in a meter box shall be 30".

3.2.7- Allowable Pipe Material

Ductile Iron Class 350 - (4" and larger)

Polyvinyl Chloride (SDR-13.5) (3" and smaller)

Service Lines - Type K copper with flare or compression fittings

3.2.8 - Looping

The Town may require, as a condition for approval of an Extension, that a Main be "looped", i.e., connected to more than one Main. The responsibility for the cost of said looping shall be borne by the Applicant.

3.2.9 - Valves Required

Minimum valve requirements shall be as follows:

A minimum of two (2) valves at all tees

A minimum of three (3) valves at all crosses

Where the system is looped or water may be supplied from more than one direction or source, valves are required on all sides of tees and crosses.

3.2.10 - In-Line Valve Spacing

Maximum in-line valve spacing shall not exceed 1,000 lineal feet, unless otherwise approved.

3.2.11- Fire Hydrants

Fire hydrants, flushing hydrants or blow-offs shall be provided at all dead-end mains and low points of the proposed water system extension. Fire hydrants shall be located at all street intersections and at a maximum spacing of 500 feet so that the maximum distance from any point on a street or road frontage to a hydrant does not exceed a maximum of 250 feet. Hydrant spacing closer than this maximum may be required by the Fire Chief in accordance with the North Carolina Fire Prevention Code. Fire Hydrants with 5-1/4" main valves may be required to meet the fire flow requirements of this Section. All fire hydrants shall be equipped with an auxiliary valve.

3.2.12 - Sewer Line Crossings

All crossings with sewer lines shall meet North Carolina Department of Environment & Natural Resources requirements of separation and materials.

3.2.13 - Separation of Utilities

All utilities (existing and proposed) shall be separated by ten (10) feet from the proposed Extension or five feet within existing public rights-of-way where existing utilities are located.

3.2.14 - Air Release Valves

Air release valves shall be provided at all high points of the proposed water system extension.

3.2.15- Reinforcements

All tees, bends, plugs and fire hydrants shall be provided with thrust blocks, tie rods, restrained joint pipe or a combination thereof.

3.2.16 - Pump Stations and Storage Tanks-General

Where adequate capacity, flow and/or pressure in accordance with this Section is not available at the point of connection the designed system shall provide adequate capacity by the use of pump stations and reservoirs. Pump stations and reservoirs shall be permitted where by design they are intended to pump water to a reservoir at a higher elevation. In such design domestic peak flow and fire flow conditions are met by gravity flow from the reservoir. Hydropneumatic pump stations will be approved only by special permission of the Town Council where topographic conditions do not permit adequate pressure from ground storage reservoirs. Booster type pump stations with continuous running pumps are not permitted.

3.2.17 - Pump Stations

All pump stations shall be designed with a minimum of two pumps. Pumps shall be sized so that the normal daily demand will be met during a 12 hour operating period with any single pump out of service. Except as provided for in Section 3.2.20, pump stations shall be equipped with auxiliary power generating equipment. All pump stations shall be equipped with flow meters and totalizers.

3.2.18 - Reservoirs

All reservoirs shall be sized in accordance with Section 3.2.4. Reservoirs

shall be located so as to provide adequate pressure in accordance with Section 3.2.2. All reservoirs shall be of prestressed composite concrete construction with circular configuration. All weather access roads shall be provided to all reservoir locations. Reservoirs shall be equipped with level indicators and with level transmitters as a part of the SCADA requirements of this Section.

3.2.19 - Fire Pumps

Fire pumps will be approved only as a part of a hydropneumatic system where adequate fire flow cannot be obtained by gravity flow from reservoirs. Fire pumps shall be of adequate size to meet the fire flow requirements as determined by Section 3.2.3. and shall be specifically designed for fire service. Pump station electrical services and equipment shall comply with Article 695 of the National Electrical Code. Fire pumps systems equipped with "hydrant and siamese" to allow a fire pumper to substitute for the fire pump in event of pump or power failure shall supply only fire protection systems isolated from the potable water supply by backflow protection in accordance with Section 3.4 of this Policy.

3.2.20 - Emergency Power

Except as provided in this paragraph, all pump stations shall be equipped with auxiliary power generating equipment to allow the pump station to operate normally in the event of a commercial power failure. Where the pump station supplies a reservoir or service area which, as determined by the Water Department, can be served in emergency situations by another pump station with auxiliary power generating equipment, auxiliary power generating equipment will not be required. Except as may be required by other codes, fire pumps equipped with a "hydrant and siamese" may be omitted from the auxiliary power generating equipment provided such system includes appropriate alarms to alert the fire department that the fire pump is inoperable.

3.2.21 - SCADA Systems

All reservoirs, pump stations and any other appurtenances which require monitoring and/or control shall be equipped with supervisory control and data acquisition equipment compatible with the Town's present system to monitor and control the operation thereof. The Applicant shall be responsible for furnishing and installing all such equipment and shall reimburse the Town for the cost of any and all programming required to incorporate such equipment, monitoring and control into the SCADA system. All such equipment shall be equipped with back-up power to operate the SCADA equipment in the event of a power outage for a minimum of 3 days.